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APPLICATION NUMBER: ***09/522,721***
FILING DATE: ***March 10, 2000***

By Authority of the
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Certifying Officer

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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No.	5865-1
First Inventor or Application Identifier	Eliot I. Bernstein
Title	APPARATUS AND METHOD FOR PRODUCING...
Express Mail Label No.	EL355808767US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. [X] * Fee Transmittal Form *(e.g., PTO/SB/17)*
   (Submit an original and a duplicate for fee processing)
2. [X] Specification [*Total Pages* 15]
   (preferred arrangement set forth below)
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to Microfiche Appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
3. [X] Drawing(s) *(35 U.S.C. 113)* [*Total Sheets* 4]
4. Oath or Declaration [*Total Pages* 2]
   a. [X] Newly executed (original or copy)
   b. [ ] Copy from a prior application (37 C.F.R. § 1.63(d))
   (for continuation/divisional with Box 16 completed)
   i. [ ] DELETION OF INVENTOR(S)
   Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

NOTE FOR ITEMS 1 & 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).

5. [ ] Microfiche Computer Program *(Appendix)*
6. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
   a. [ ] Computer Readable Copy
   b. [ ] Paper Copy (identical to computer copy)
   c. [ ] Statement verifying identity of above copies

jc678 U.S. PTO
09/522721
03/10/00

ACCOMPANYING APPLICATION PARTS

7. [ ] Assignment Papers (cover sheet & document(s))
8. [ ] 37 C.F.R.§3.73(b) Statement *(when there is an assignee)* [ ] Power of Attorney
9. [ ] English Translation Document *(if applicable)*
10. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
11. [ ] Preliminary Amendment
12. [ ] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
13. [X] * Small Entity Statement(s) *(PTO/SB/09-12)* [ ] Statement filed in prior application, Status still proper and desired
14. [ ] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
15. [ ] Other: ....

16. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in a preliminary amendment:*

[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No: ______/______

Prior application information: Examiner ______ *Group / Art Unit:* ______

For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

[ ] *Customer Number or Bar Code Label* *(Insert Customer No. or Attach bar code label here)* *or* [XX] *Correspondence address below*

Name	Raymond A. Joao, Esq.				
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Signature	Raymond A. Joao	*Date*	03/10/00

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Nicole Eliseo-Pinou

Attorney Docket No.: 5865-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: ELIOT I. BERNSTEIN
Serial No.: Please Assign
Filed: Concurrently Herewith
For: **APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES**

Assistant Commissioner for Patents
Box Patent Application
Washington, D.C. 20231

TRANSMITTAL LETTER

Sir:

Please find enclosed herewith for filing the following:

1) Utility Patent Application Transmittal Sheet;
2) Fee Transmittal Sheet (in duplicate);
3) Declaration (signed, faxed copy);
4) Patent Application, including Specification, Claims and Abstract of the Disclosure (15 pages) and Drawings (4 sheets);
5) Check for $354 for the filing fee; and
6) Statement Claiming Small Entity Status (37 CFR 1.9(f) & 1.27(b)) - Independent Inventor
7) Statement Claiming Small Entity Status (37 CFR 1.9(f) & 1.27(c)) - Small Business Concern
8) Return receipt postcard.

It is respectfully requested that the above documents be filed as a Patent Application.

Respectfully submitted,

Raymond A. Joao
Reg. No. 35,907

March 10, 2000
Meltzer, Lippe, Goldstein & Schlissel, P.C.
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STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) & 1.27(c))--SMALL BUSINESS CONCERN

Docket Number (Optional) 5865-1

Applicant, Patentee, or Identifier: iviewit Holdings, Inc.
Application or Patent No.: ____
Filed or Issued: ____
Title: APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

I hereby state that I am
- ☐ the owner of the small business concern identified below.
- ☒ an official of the small business concern empowered to act on behalf of the concern identified below.

NAME OF SMALL BUSINESS CONCERN iviewit Holdings, Inc.

ADDRESS OF SMALL BUSINESS CONCERN One Boca Place, 2255 Glades Road, Suite 337 West, Boca Raton, Florida 33431

I hereby state that the above identified small business concern qualifies as a small business concern as defined in 13 CFR Part 121 for purposes of paying reduced fees to the United States Patent and Trademark Office. Questions related to size standards for a small business concern may be directed to: Small Business Administration Size Standards Staff, 409 Third Street, SW, Washington, DC 20416.

I hereby state that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:

- ☐ the specification filed herewith with title as listed above.
- ☒ the application identified above
- ☐ the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern, or organization having rights in the invention must file separate statements as to their status as small entities, and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization having any rights in the invention is listed below:
- ☐ no such person, concern, or organization exists.
- ☐ each such person, concern, or organization is listed below.

Separate statements are required from each named person, concern or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

NAME OF PERSON SIGNING Brian Utley

TITLE OF PERSON IF OTHER THAN OWNER President

ADDRESS OF PERSON SIGNING 2255 Glades Road, Suite 337 W. Boca Raton, FL 33431

SIGNATURE [signature] DATE 3/10/2000

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Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) & 1.27(b))--INDEPENDENT INVENTOR	Docket Number (Optional) 5065-1

Applicant, Patentee, or Identifier: Eliot I. Bernstein

Application or Patent No.: ____________

Filed or Issued: ____________

Title: APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

As a below named inventor, I hereby state that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:

- [x] the specification filed herewith with title as listed above.
- [ ] the application identified above.
- [ ] the patent identified above.

I have not assigned, granted, conveyed, or licensed, and am under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- [ ] No such person, concern, or organization exists.
- [x] Each such person, concern, or organization is listed below.

iviewit Holdings, Inc.

Separate statements are required from each named person, concern, or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

Eliot I. Bernstein		
NAME OF INVENTOR	NAME OF INVENTOR	NAME OF INVENTOR
[signature]		
Signature of inventor	Signature of inventor	Signature of inventor
03/09/00		
Date	Date	Date

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Attorney Docket No. 5865-1

APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

FIELD OF THE INVENTION

The present invention is directed to an apparatus and a method for producing enhanced digital images and, in particular, to an apparatus and a method for producing enhanced resolution digital images from a print film image.

BACKGROUND OF THE INVENTION

The fields of telecommunications, multimedia, and related areas, are growing at increasing rates. With this continued growth, the need for high resolution digital imagery, for utilization in conjunction with the corresponding technologies, is becoming greater. Current technologies utilize digital panoramic cameras, as opposed to film or print film cameras. While the utilization of digital cameras may appear to many to be a viable manner by which to obtain digital images, there are, in fact, many disadvantages and shortcomings associated with digital camera images.

Conventional digital technologies typically have very low zoom quality and low image size restrictions or limitations associated therewith. The differences between digital imagery and print film imagery lie in the respective processing technologies and methods which are used in the processing of digital images versus those technologies and methods utilized in the processing of print film images. Generally speaking, print film produces a higher resolution image, and an associated higher resolution scanning quality, which further facilitates an improved enlargement

or reduction of the image for different sizes and different depths, without pixel distortion. Digital photography, and associated images, utilize pixels which typically have a certain size. When enlarged or reduced, these pixels of the digital image become distorted, a feature which typically results in the digital image being fixed to an original size, or being available at very low magnifications, such as, for example, magnifications of from 200 times to 300 times. These digital images are also difficult to enlarge to a full screen size without a tremendous amount of distortion present in the end product.

Currently, panoramic imaging techniques utilize digital images as their starting point. With such associated limitations, the ability to provide enhanced resolution digital images and, especially, an enhanced resolution digital panoramic image, such as those utilized on, or over, the Internet and/or the World Wide Web, has been greatly compromised.

Another major drawback in the current technology lies in the fact that conventional processes often utilize panoramic lenses in order to capture an image. This practice has been criticized as creating distortions in the image immediately upon the image's enlargement or reduction. The conventional techniques associated with the use of panoramic lenses are know to result in image "bending", which further curtails one's ability to obtain realistic views, especially upon performing any associated cropping and/or editing processes. In such instances, the upper end and the lower end of the image must be either erased, or covered, in order to prevent the flaw from being exposed. This typically results in the resulting image having a "fishbowl-type" distortion. In some instances, 32 mm lenses have been utilized in order to obtain enhanced floor to ceiling images without experiencing image bending. In these applications,

however, the ability of the lens to capture optimal images varies depending upon the scene or image being photographed.

SUMMARY OF THE INVENTION

The present invention provides an apparatus and a method for producing digital images which overcomes the shortcomings of the prior art. The apparatus includes a camera, which can be a conventional print film camera, a developing device, which can by any device or collection of devices for developing the image taken by the camera, into a print film image, and an enlarging device, for enlarging the print film image. A digital camera can also be utilized to obtain the image. If the image is taken with a digital camera, a print image is obtained from the digital image. The print image can then be enlarged.

The apparatus also includes a computer and associated peripheral devices for performing the various processing routines of the method of the present invention. The apparatus also includes a scanning device, for scanning the print film image or photograph in order to obtain a digital image representation of same.

The print film image, which is obtained by the camera, can be developed by the developing device, and enlarged by the enlarger. The image print can then be scanned by the scanner in order to generate a digital file or other high quality image extension file. A plurality of these digital files can then be stitched together thereby creating a panoramic scene or image.

The computer may be utilized in order to perform touch-up operations on the obtained image or image collection in order to make refinements and/or enhancements thereto. The image can then be converted from a high resolution image compression extension file to a low resolution graphic or video image extension file.

The resulting file may then be processed so that the image represented therein can be displayed and/or posted for display to a host computer or other suitable device.

The above process can be repeated using different photo depths for any of the obtained images, or portions thereof, in order to create areas of higher resolution for closer inspections of these areas at different image depths.

Accordingly, it is an object of the present invention to provide an apparatus and a method for providing enhanced digital images from print film images.

It is another object of the present invention to provide an apparatus and a method for producing digital images, from print film images, which have improved and enhanced resolution.

It is still another object of the present invention to provide an apparatus and a method for producing digital images, from print film images, which are suitable for display and/or downloading in a digital computer and/or in a telecommunications environment.

It is still another object of the present invention to provide an apparatus and a method for providing a digital image which is characterized by effective image compression subsequent to a stitching operation, thereby avoiding any dramatic loss in image quality.

It is yet another object of the present invention to provide an apparatus and a method for producing digital images which are characterized by high definition resolution, and which are suitable for high definition television, Web television and large, full screen, panoramic internet applications, without loss of resolution upon image magnification or reduction.

It is another object of the present invention to provide an apparatus and a method for producing and transmitting digital images in a network environment which dispenses with the need for plug-in software.

It is still another object of the present invention to provide an apparatus and a method for producing digital images which facilitates high speed file transfer in a network environment and/or in a computer environment.

Other objects and advantages of the present invention will be apparent to those skilled in the art upon a review of the Description of the Preferred Embodiment taken in conjunction with the Drawings which follow.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings:

Figure 1 illustrates the apparatus of the present invention, in block diagram form; and

Figures 2A, 2B and 2C illustrate the method of the present invention, in flow diagram form.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention provides an apparatus and a method for providing enhanced digital images which can be utilized and which can be easily managed, when displayed, projected, or posted to an Internet Web server, Web site or Web page. In particular, the present invention provides an apparatus and a method for producing an enhanced digital image from a print film image, or from a photographic image, which is taken with a print film camera. The digital images which are produced by the apparatus and method of the present invention have improved and enhanced resolution and require far less effort in the associated maintenance and management of same. The digital images, which are produced by the apparatus and method of the present invention, can be utilized and displayed on computers, projection devices, and, as noted above, can be posted to an Internet Web server, a Web site, and/or a Web page.

The present invention, in a preferred embodiment, is utilized to produce enhanced images for posting and/or for downloading, to a digital display medium, which in the preferred embodiment, is an Internet and/or a World Wide Web server, a Web site, or Web page. In this manner, enhanced digital images can be produced from print film images, with the resulting digital images having enhanced resolution. This resolution is unaffected by the typical resolution limiting parameters and phenomena which are associated with conventional digital image processing equipment, techniques and methods.

Figure 1 illustrates the apparatus of the present invention which is denoted generally by the reference numeral 100, in block diagram form. With reference to Figure 1, the apparatus 100 includes a camera 105 which, in the preferred embodiment, is a conventional print film camera, such as those cameras manufactured by Nikon, Canon, Hasselblad, or any other manufacturer. A digital camera may also be utilized to obtain the image. In the preferred embodiment, the camera 105 contains a 24-32 mm lens and can be a hand-held camera, a fixed camera, or a camera which is mountable, such as on a tripod or on a stand. The camera 105 is utilized to obtain the print film image of the image or scene which is being photographed.

The apparatus 100 also includes a developing device 110 which can be any device or collection of devices for developing the film print image which is taken by the camera 105 into a film print image. The apparatus 100 also includes an enlarging device 115 for enlarging the film print image.

The apparatus 100 also includes a computer 120, for performing the various processing routines of the method of the present invention. The computer 120 may be a personal computer, a laptop computer, a mini-computer, a microcomputer, a mainframe computer, or any other suitable computer or computer system. The computer 120 includes a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), a display device, an input device and an output device. The computer 120 may also include any other hardware or software needed to perform any of the processing tasks described herein. The input device may include a keyboard, a mouse, or other pointing device, for allowing for data and/or command input by a user. The output device may include a printer and, in the preferred embodiment, the printer may be a color laser printer or a color inkjet printer.

The apparatus 100 also includes a scanning device 125, for scanning the print film image or photograph in order to obtain a digital image representation of same. Any suitable computer or scanner and any suitable scanning software may be utilized in conjunction with the present invention. In a preferred embodiment, a UMAX™ Astra scanner is utilized in conjunction with Microsoft® Photo Editor software.

Figures 2A, 2B and 2C illustrate the method of the present invention, in flow diagram form. With reference to Figures 2A, 2B and 2C, the method of the present invention commences at step 200. At step 201, a scene or image is photographed by using the print film camera 105.

At step 202, the print film image, which is obtained by the camera 105, is developed by the developing device 110 in order to produce a high gloss photographic image print. If the image is obtained with a digital camera, a print image should be obtained from the digital image. In this manner, the higher resolution print image can then be enlarged and scanned. At step 203, the image print is enlarged by the enlarger 115. In the preferred embodiment, the image prints are enlarged to sizes of between 8"x6" to 8"x12". Although enlargement to any size may be obtained and utilized, the aforementioned sizes represent the respective lower end and upper end limits for the print sizes which provide optimal magnification capability in the preferred embodiment. In the preferred embodiment, a magnification capability of up to 1700 times may be attained for most views or scenes. It is, however, recommended that larger enlargement sizes be obtained for smaller object images.

At step 204, the image print, obtained at step 203, is scanned by the scanner 125 in order to generate a bitmap image file or other high quality image extension file. At step 205, a plurality of bit map files, which are obtained for the image prints, can be stitched together by the scanner 125, thereby creating a panoramic scene or image, or simply a scene requiring a plurality of photographs. This stitching operation is performed by utilizing photo stitching software such as, for example, Photo Vista software by Live Picture, Live Picture Reality Studio, and/or Live Picture Object Modeler and/or Photo Vista software.

At step 206, the computer 120 performs a touch-up operation on the scanned image or stitched image collection in order to make refinements and/or enhancement thereto. This touch-up operation is accomplished by utilizing imaging software. In the preferred embodiment, Adobe Photoshop software is used as the imaging software for touching up the images. At step 207, the image is then converted from a bitmap file, or any other suitable high resolution image compression extension file, to a JPEG file or other suitable low resolution graphic or video image extension file. In the preferred embodiment, Adobe Image Ready software is utilized to perform the bitmap to JPEG file conversion. The bitmap to JPEG file conversion, which is performed at step 207, serves to preserve video image quality and resolution, thereby providing an optimum video image. At step 208, the JPEG file of the image is compressed by utilizing image compression software, such as Adobe Image Ready software. The compressed image is, thereafter, ready for display and/or posting to a host computer, a Web server, a Web site, or a Web page.

The above process can be repeated using different depth photos for any of the images obtained in order to create areas of higher resolution or "hot spots", for closer inspections of these areas at different depths. These depth photos can also be stitched into the respective image or image portion by using the stitching techniques described above, which are hereby incorporated by reference herein. The above process can be utilized in order to create higher zoom capabilities with each new depth layer of an image.

At step 208, a determination is made as to whether different depth photographs are desired. If different depth photographs are desired, the method repeats steps 201 through 207 to obtain the desired image. If no additional depth photographs are desired, the method proceeds to step 209.

At step 209, the resulting digital image can be displayed on a digital display device, projected from a projection device, or posted to a host computer, a Web server, a Web site, or a Web page. In the instance where the image is posted to an Internet Web server, Web site, or

Web page, the upload from the computer 120, to the respective server, site, or page, can be performed by utilizing file uploading software, such as WFTP Pro software. The image can then be viewed at reasonable speeds. Upon completion of the file upload at Step 209, the method ceases operation at Step 210.

The processing steps described herein provide for the production of digital images which have enhanced resolution and which can be easily and effectively managed in applications involving the display of same, or the posting of same, to a host computer, a Web server, a Web site, a Web page, a computer display, and/or a full screen projection display. Further, the method of the present invention provides for effective image compression after a requisite stitching operation, thereby preserving image quality. The apparatus and method of the present invention provides images which have enhanced resolution and quality while requiring less file management efforts.

The resulting images are characterized by a high definition resolution and are suitable for high definition television, Web television, and large, full screen, panoramic internet applications, such as those involving displaying video images, while preserving resolution upon image magnification or reduction. The present invention also dispenses with the need for plug-in software during download and/or file transfer operations. Further, a zoom capacity of up to 1700 times or greater may be easily obtained with the present invention. The present invention also facilitates high speed file transfers of high resolution digital images thereby dispensing with the need to engage in long and slow conventional file downloads and/or file transfers.

The digital images obtained with the present invention can be utilized for any digital or projection application, including full screen display and/or projection applications.

While the present invention has been described and illustrated in various preferred embodiments, such descriptions are merely illustrative of the present invention and are not to be construed to be limitations thereof. In this regard, the present invention encompasses any and all modifications, variations, and/or alternate embodiments, with the scope of the present invention being limited only by the claims which follow.

CLAIMS

What Is Claimed Is:

1. An apparatus for producing a digital image, comprising:

   a device for generating a digital signal file from a print film image; and

   a processor for processing said digital signal file and for generating an image file,

   wherein said processor generates a first signal file from said digital signal file, and further wherein said processor processes said first signal file and generates said image file.

2. The apparatus of claim 1, further comprising:

   a camera for obtaining a photographic representation of an image.

3. The apparatus of claim 2, further comprising:

   a developing device for developing said photographic representation and for generating said print film image.

4. The apparatus of claim 3, further comprising:

   an enlarging device for enlarging said print film image.

5. The apparatus of claim 4, further comprising:

   a scanning device for generating said digital signal file from said print film image.

6. The apparatus of claim 1, wherein said first signal file is a bitmap file.

7. The apparatus of claim 1, wherein said image file is a JPEG file.

8. An apparatus for producing a digital image, comprising:

   means for generating a digital signal file from a print film image file; and

   means for processing said digital signal file and for generating an image file, wherein said processing means generates a first signal file from said digital signal file, and further wherein said processing means processes said first signal file and generates said image file.

9. The apparatus of claim 8, further comprising:

means for obtaining a photographic representation of an image.

10. The apparatus of claim 9, further comprising:

means for developing said photographic representation and for generating said print film image.

11. The apparatus of claim 10, further comprising:

means for enlarging said print film image.

12. The apparatus of claim 11, further comprising:

means for generating said digital signal file from said print film image.

13. The apparatus of claim 8, wherein said image file is a bitmap file.

14. The apparatus of claim 8, wherein said image file is a JPEG file.

15. A method for producing a digital image, comprising:

generating a digital signal file from a print film image;

processing said digital signal file; and

generating an image file, wherein said processing operation further comprises:

generating a first signal file from said digital signal file; and

processing said first signal file and generating said image file.

16. The method of claim 15, further comprising:

obtaining a photographic representation of an image.

17. The method of claim 16, further comprising:

developing said photographic representation; and

generating said print film image.

18. The method of claim 16, further comprising:

enlarging said print film image: and

generating said digital signal file from said print film image.

19. The method of claim 15, wherein at least one of said digital signal file, said print film image and said image file, is a three-dimensional image file.

20. The apparatus of claim 15, wherein said first signal file is a bitmap file, and further wherein said image file is a JPEG file.

21. The method of claim 15, further comprising:

stitching together at least two digital representations of images.

ABSTRACT OF THE DISCLOSURE

An apparatus and a method for producing a digital image, which includes a device for generating a digital signal file from a print film image, and a processor for processing the digital signal file and for generating an image file. The processor generates a first signal file from the digital signal file. The processor processes the first signal file and generates the image file.

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted with Initial Filing OR ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1 16 (e)) required)

Attorney Docket Number	5865-1
First Named Inventor	Eliot I. Bernstein
COMPLETE IF KNOWN	
Application Number	/
Filing Date	
Group Art Unit	
Examiner Name	

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

(Title of the Invention)

the specification of which

☒ is attached hereto
OR
☐ was filed on (MM/DD/YYYY) [ ] as United States Application Number or PCT International Application Number [ ] and was amended on (MM/DD/YYYY) [ ] (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1 56

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	NO
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)
60/125,824	03/24/99

☐ Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

Please type a plus sign (+) inside this box → [+]

PTO/SB/01 (12-97)
Approved for use through 9/30/00. OMB 0651-0032
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DECLARATION — Utility or Design Patent Application

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT International application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. ☐ Customer Number [ ] → Place Customer Number Bar Code Label here
OR
☒ Registered practitioner(s) name/registration number listed below

Name	Registration Number	Name	Registration Number
Raymond A. Joao, Esq.	35,907		

☐ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

Direct all correspondence to: ☐ Customer Number or Bar Code Label [ ] OR ☒ Correspondence address below

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])				Family Name or Surname	
Eliot I.				BERNSTEIN	
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City	Boca Raton	State	FL	ZIP	33432-6080
Country	USA				

☐ Additional inventors are being named on the ___ supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto

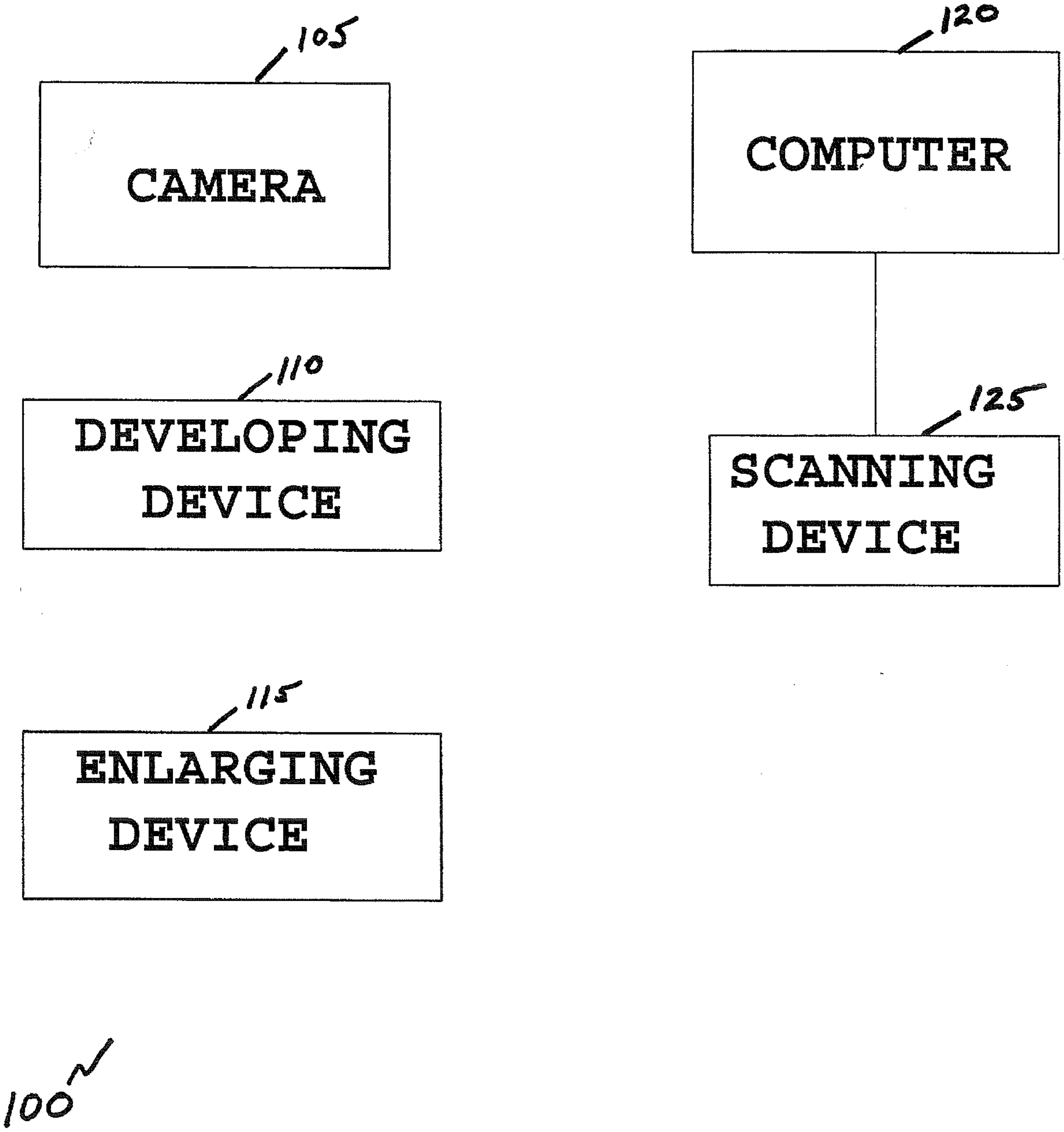
105
CAMERA
120
COMPUTER
110
DEVELOPING DEVICE
125
SCANNING DEVICE
115
ENLARGING DEVICE
100

FIG. 1

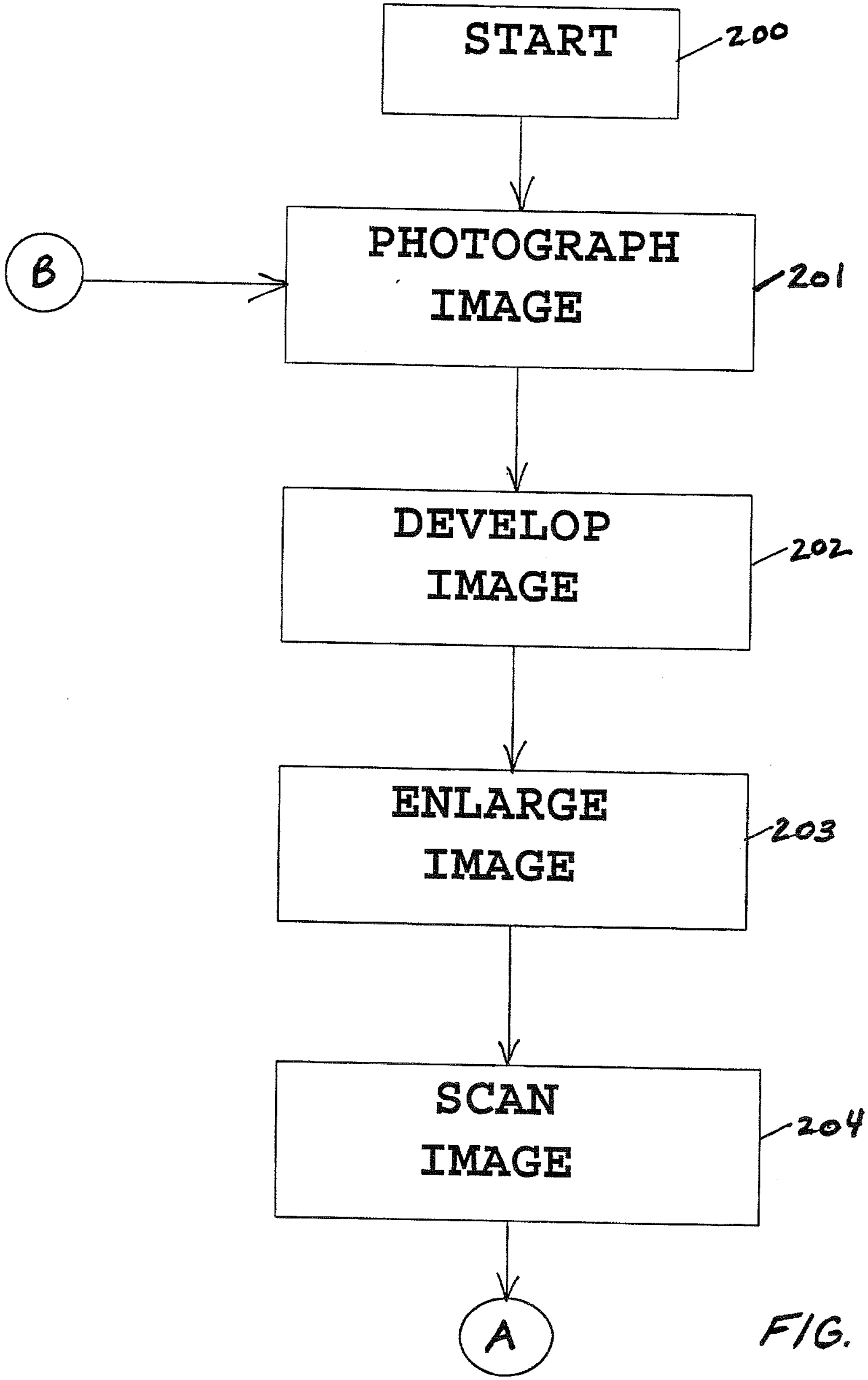
START
200
PHOTOGRAPH IMAGE
201
B
DEVELOP IMAGE
202
ENLARGE IMAGE
203
SCAN IMAGE
204
A

FIG. 2A

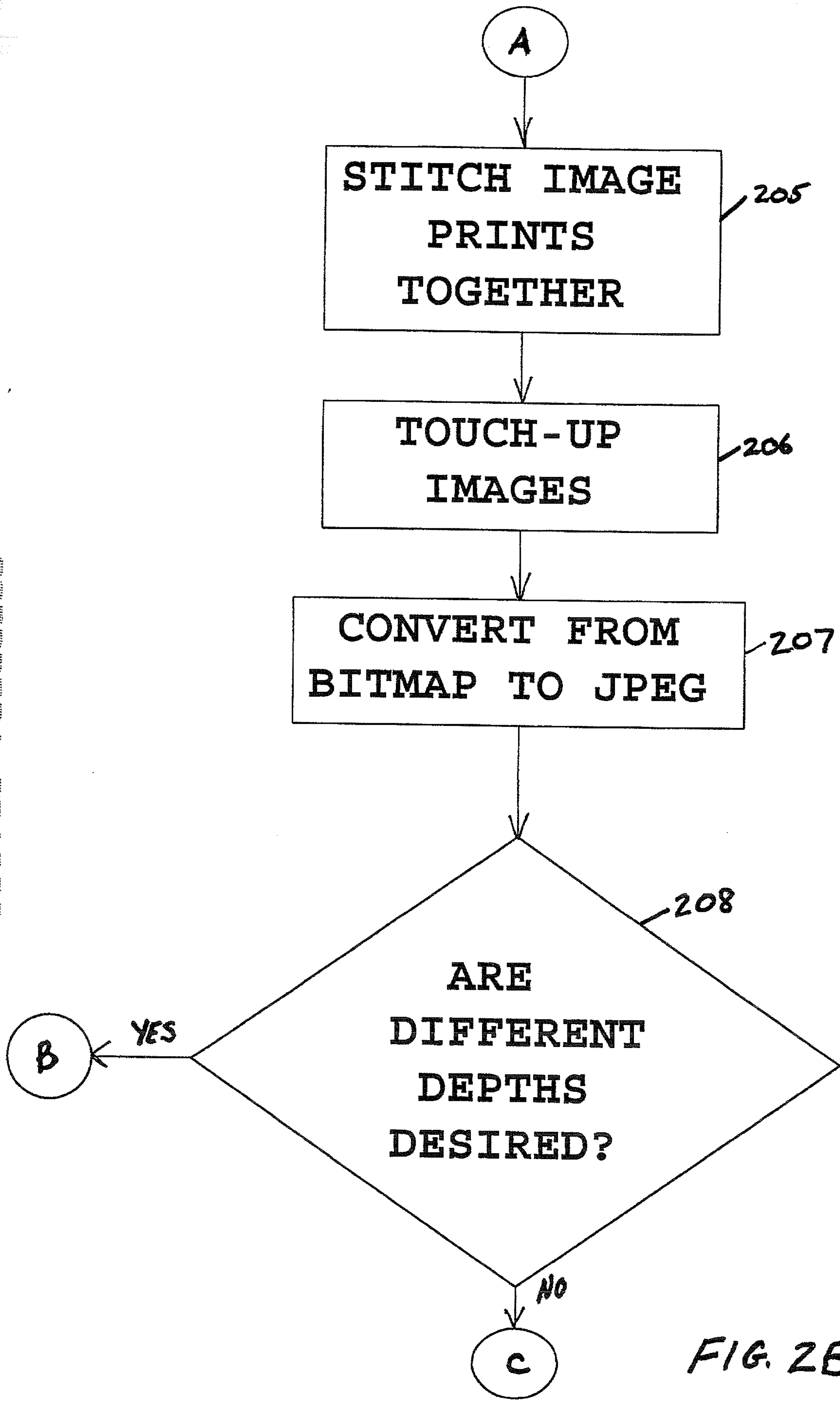
A
STITCH IMAGE PRINTS TOGETHER
205
TOUCH-UP IMAGES
206
CONVERT FROM BITMAP TO JPEG
207
ARE DIFFERENT DEPTHS DESIRED?
208
YES
B
NO
C

FIG. 2B

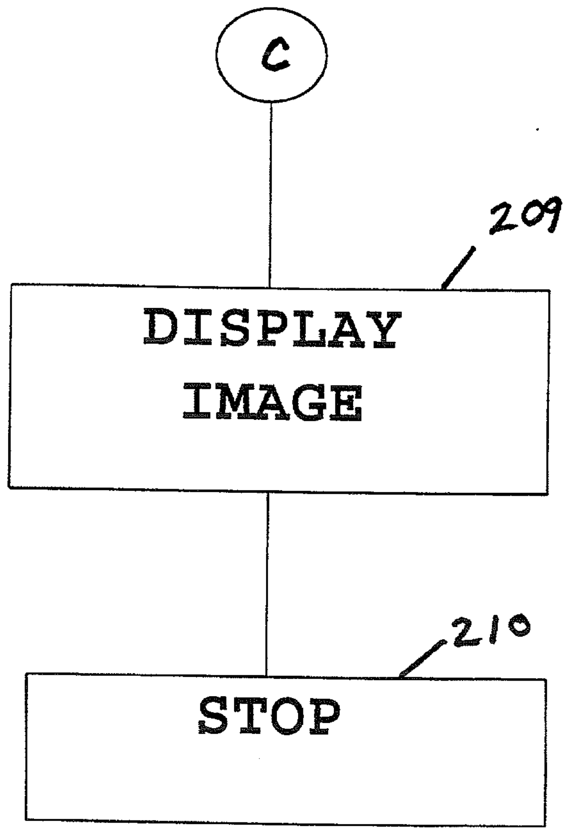

FIG. 2C

PA 1150500

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UNITED STATES DEPARTMENT OF COMMERCE

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April 06, 2004

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: ***09/587,026***
FILING DATE: ***June 05, 2000***

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

L. Edelen

L. EDELEN
Certifying Officer

06-06-00 A

06/05/00 jc839 U.S. PTO

Atty. Dkt. No. 57103/115

JC541 U.S. PTO 09/587026 06/05/00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Bernstein et al.
Title:	System And Method For Playing A Digital Video File
Appl. No.:	Unknown
Filing Date:	Unknown
Examiner:	Unknown
Art Unit:	Unknown

CERTIFICATE OF EXPRESS MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service's "Express Mail Post Office To Addressee" service under 37 C.F.R. § 1.10 on the date indicated below and is addressed to: **Assistant Commissioner for Patents, Washington, D.C. 20231.**

EL640468331US (Express Mail Label Number)

June 5, 2000 (Date of Deposit)

Shirley Miksa (Printed Name)

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UTILITY PATENT APPLICATION TRANSMITTAL

09587026.060500

Assistant Commissioner for Patents
Box PATENT APPLICATION
Washington, D.C. 20231

Sir:

Transmitted herewith for filing under 37 C.F.R. § 1.53(b) is the nonprovisional utility patent application of:

Eliot I. Bernstein
Zakirul A. Shirajee

Enclosed are:

[X] Specification, Claim(s), and Abstract (29 pages).

[X] Informal drawings (3 sheets, Figures 1-3).

[X] Unexecuted Declaration and Power of Attorney (4 pages).

[ ] Assignment of the invention to Iviewit.com, Inc..

[ ] Assignment Recordation Cover Sheet.

[ ] Check in the amount of $40.00 for Assignment recordation.

[ ] Small Entity statement.

[ ] Information Disclosure Statement.

[ ] Form PTO-1449 with copies of ___ listed reference(s).

The filing fee is calculated below:

	Claims as Filed		Included in Basic Fee		Extra Claims		Rate		Fee Totals
Basic Fee							$690.00		$690.00
Total Claims:	26	-	20	=	6	x	$18.00	=	$108.00
Independents:	3	-	3	=	0	x	$78.00	=	$0.00
If any Multiple Dependent Claim(s) present:						+	$260.00	=	$0.00
							SUBTOTAL:	=	$798.00
[ ]	Small Entity Fees Apply (subtract ½ of above):							=	$0.00
							TOTAL FILING FEE:	=	$798.00

[ ] A check in the amount of $798.00 to cover the filing fee is enclosed.

[X] The required filing fees are not enclosed but will be submitted in response to the Notice to File Missing Parts of Application.

[ ] The Assistant Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 06-1447. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Assistant Commissioner is authorized to charge the unpaid amount to Deposit Account No. 06-1447.

Please direct all correspondence to the undersigned attorney or agent at the address indicated below.

Respectfully submitted,

Date 6/5/00

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Attorney for Applicant
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57103/115

UNITED STATES PATENT APPLICATION

for

SYSTEM AND METHOD FOR PLAYING A DIGITAL VIDEO FILE

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TITLE OF THE INVENTION

SYSTEM AND METHOD FOR PLAYING A DIGITAL VIDEO FILE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 60/137,297, filed June 3, 1999, U.S. Provisional Application No. 60/155,404, filed September 22, 1999, U.S. Provisional Application No. 60/169,559, filed December 8, 1999 and PCT International Application No. _______, filed June 2, 2000.

FIELD OF THE INVENTION

The present invention relates generally to video imaging. More specifically, the present invention relates to a system and method for providing high quality digital video files for streaming across a network.

BACKGROUND OF THE INVENTION

Streaming video is a technique by which video is played in real time as it is downloaded over the Internet, as opposed to storing it in a local file first. A video player decompresses and plays the data as it is transferred to a user computer over the World-Wide Web. Streaming video avoids the delay entailed in downloading an entire file and then playing it with a plug-in application. Streaming video requires a communications connection (e.g., a network, Internet, etc.) and a computer powerful enough to execute the decompression algorithm in real time.

In the field of streaming video, the primary design challenge is that the viewer desires perfect video quality over a limited-bandwidth network. Perfect video quality requires an enormous amount of digital data. Today's networks are not capable of providing life-like, full motion, full screen streaming video.

It is known to capture video using a capture device, compress the resulting captured video, store the compressed video, and send the compressed video across the Internet. However, prior attempts have failed to produce high quality streaming video that can be transmitted over the Internet. For example, prior attempts at streaming video have been unable to produce full-screen, real video frame rate video at any acceptable quality.

Several teachings have emerged that attempt to improve the quality and decrease the file size of streaming video. One teaching in the art is to reduce the number of frames per second that are being encoded, from the 25 to 30 fps of standard television to 6 or 7 fps or less for streaming video. While this reduces the amount of data that is being sent, the video appears jittery and corresponding voice appears asynchronous with the jittery video. Another teaching in the art is to capture the video at a small frame size of 160 x 120 or less. The small frame size of 160 x 120 is the widely used standard in Internet streaming video. Further teachings are directed to reducing the amount of data that is provided prior to compressing to reduce the file size resulting from compression. Other teachings in the art have pointed toward compressing a digital video file as much as possible prior to transmission. Full-screen, full-motion video has historically been viewed as requiring far too much data for transmission over a limited-bandwidth network.

Accordingly, there is a need for an improved system and method for providing an enhanced digital video file for streaming across a network. Further, there is a need for a digital video file having high quality at various screen sizes with minimal quality loss when the video is expanded to full screen size. Further still, there is a need for a digital video file having a real video frame rate that can be streamed across a limited bandwidth network, such as the Internet. Further yet, there is a need for a video transmission which, once commenced, need not be stopped.

BRIEF SUMMARY OF THE INVENTION

According to an exemplary embodiment, a method of playing a digital video file over a network includes providing a digital video file to a first storage device; downloading a first portion of the digital video file from the first storage device over a network to a computer having a second storage device and a display screen; expanding the viewing frame size of the computer display screen to at least 640 x 480 pixels; and playing the first downloaded portion on the expanded display screen from the second storage device while substantially simultaneously downloading a second portion of the digital video file to the second storage device.

According to an another exemplary embodiment, a system for playing a digital video file over a network includes means for providing a digital video file to a first means for storing; means for downloading a first portion of the digital video file from the first storing means over a network to a computer having a second means for storing and a display screen; means for expanding the viewing frame size of the computer display screen to a full screen size; and means for playing the first downloaded portion of the digital video file on the expanded display screen from the second storing means while substantially simultaneously downloading a second portion of the digital video file to the second storing means.

According to yet another exemplary embodiment, a method of playing a digital video file across the Internet includes capturing and compressing a source video signal to generate a digital video file; providing a first portion of the digital video file across the Internet to a computer; playing the first portion of the digital video file at substantially full screen size on the computer while substantially simultaneously downloading a second portion of the digital video file to the computer.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will become more fully understood from the following detailed description, taken in conjunction with the accompanying drawings, wherein like reference numerals refer to like parts, in which:

FIG. 1 is a block diagram of a system for generating an enhanced digital video file according to an exemplary embodiment;

FIG. 2 is a flowchart of a method for generating an enhanced digital video file according to the exemplary embodiment of FIG. 1; and

FIG. 3 is a block diagram of a system for playing a digital video file across a network.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, a system 10 for generating an enhanced digital video file is shown. System 10 may be used as shown, or portions of system 10 may be integrated with other video processing systems, such as medical imaging equipment, motion picture production equipment, etc. System 10 generates a digital video file expandable to a full screen size and having a real video frame rate (i.e., life-like, smooth, not jerky, comparable with recorded video formats, such as, NTSC (National Television Standards Committee) at 29.97 frames per second (fps), PAL (Phase Alternative Line) at 25 fps, and SECAM (Séquentiel Couleur Avec Mémoire) at 25 fps)) with a file size that is suitable for streaming over the Internet, for such uses as high definition television, Web television, computers and servers utilized in wireless environments, etc.

As known in the art, video is recorded having certain standard recorded video parameters, such as, frame rate, and number of lines scanned. For example, it is will known that a source conforming to the NTSC (National Television Standards Committee) standard operates at 29.97 frames per second (fps), a source conforming to the PAL (Phase Alternative Line) standard operates at 25 fps, and a source conforming to the SECAM (Séquentiel Couleur Avec Mémoire) standard operates at 25 fps. It is will known in the art that the NTSC standard includes two interleaved frames at 240 lines scanned, while the PAL standard is 270 lines scanned. Note that the number of lines scanned corresponds to the number of vertical pixels in a standard 320 x 240 frame size compatible with standard capture cards, such as, a Dazzle LAV-1000S capture device manufactured by Dazzle, Inc. of Fremont, California.

System 10 includes one or more sources, including recording devices 12 or playback device 25, a capture device 14, a computer 16, and a network server 18. Recording devices 12 include a camcorder 20, a digital video camera 22, and a reel-to-reel camera 24, each of which may be hand-held or mounted on a tripod or stand. System 10 may include a playback device 25 (e.g., tape player, VHS (Vertical Helix Scan) player, Beta player, DVD (Digital Versatile Disk) player, etc.). Camcorder 20 may be a VHS recorder, Beta recorder, or other camcorder, and is configured to store video on magnetic tape. Digital video camera 22 may be any type of digital video camera configured to generate video in a digital format. In this exemplary embodiment, digital video camera 22 stores the digital video data to a tape. Digital video camera 22 is configured to provide digital video data in real time or via the tape in a digital format, such as, Beta digital, AVI, MOV, MPEG (Motion Picture Experts Group), or other format compatible with the IEEE 1394 standard, etc., to capture device 14. AVI is an audio/video standard designed by Microsoft Corp., Redmond, Washington. According to one exemplary embodiment, a digital video camera including 3CCD technology is used to record the video. The 3CCD technology (3-chip charge-coupled device) includes a dichroic prism and three CCDs, each CCD being aligned to detect only the red, green, or blue color. A 3CCD camera will provide enhanced color resolution. Reel-to-reel camera 24 includes recording equipment that uses magnetic tape which must be threaded through the equipment and onto an empty reel. According to one alternative embodiment, a separate audio recording device, such as a microphone, may be utilized in conjunction with recording devices 12, in which embodiment recording devices 12 are used to record only video. Other recording devices may be used, such as, devices optimized for live video-conferencing.

Computer 16 includes a processor, memory, magnetic storage device, input/output devices and circuitry, etc. Computer 16 may include multiple computer at multiple sites, with different portions of the process described hereinafter operating on different computers.

Capture device 14 is coupled to one or more of sources 11. Capture device 14 is shown external to computer 16, but may alternatively be an internal capture device coupled within the housing of computer 16 or an internal capture device within the housing of one of recording devices 12 or playback device 25. In this exemplary embodiment, a Dazzle LAV-1000S capture device is utilized, though other capture devices may be used, such as a Pinnacle DC10PLUS or Pinnacle DC30PRO device, both manufactured by Pinnacle Systems, Inc., Mountain View, California, or a MotoDV Mobile capture device, manufactured by Digital Origin, Inc., Mountain View, California. Capture software 26, such as Amigo 2.11, manufactured by Dazzle, Inc. or Adobe Premier 5.1, manufactured by Adobe Systems Inc., San Jose, California, is operable on computer 16 to interface capture device 14 with computer 16. Other capture software may be utilized, such as, RealProducer G2, manufactured by RealNetworks, Inc., Seattle, Washington.

In conjunction with capture software 26, capture device 14 is configured to receive a video signal from one of recording devices 12 or playback device 25, to digitize the video signal, and to store the video signal as a digital video file. The parameters of the video capture will be discussed below with reference to FIG. 2. The digital video file is an MPEG-1 file in this exemplary embodiment, but may alternatively be generated in other digital video formats, such as, MPEG-2, AVI, etc. Capture device 14 is a combined audio/video capture device, but may alternatively include discrete audio and video capture devices, the audio capture device configured to digitize any audio which corresponds to the video being captured by the video capture device. As a further alternative, audio captured device may be utilized alone without a video capture device. The audio capture device may be, for example, a Montego II device, manufactured by Voyetra Turtle Beach, Inc., Yonkers, New York, and configured to generate a digital audio file in a digital audio format, such as, PCM (Pulse Code Modulation).

Editing software 28 is operable on computer 16. In this exemplary embodiment, Adobe Premier 5.1 is utilized, though other video editing software may be used. Editing software 28 receives the captured digital video file and enables an operator to edit the digital video file by adding or deleting frames, adjusting the color, contrast, and brightness of the frames, etc. The edits are then saved to the digital video file or can be exported to AVI or MOV file types.

Encoding software 30 is operable on computer 16. In this exemplary embodiment, RealProducer G2 is utilized, though other encoding software may be used. Encoding software 30 receives the edited digital video file and encodes the digital video file into an encoded format, such as, an RM format. Encoding software 30 may also compress the digital video file, if needed, to reduce the size of the digital video file, using a video compression algorithm, such as MPEG-1, MPEG-4, etc.

Markup software 32 is operable on computer 16. In this exemplary embodiment, a hypertext markup language (e.g., HTML, Dynamic HTML, Cold Fusion) is utilized. An operator marks up the encoded digital video file in HTML to prepare the digital video file for uploading to the network server 18. In this exemplary embodiment, a code segment representing a full screen frame size, such as 640 x 480 pixels, is associated with the digital video file in the HTML code. The full screen frame size code segment may alternatively include other screen sizes, such as 800 x 600 pixels, 1024 x 768 pixels, 1280 x 1024 pixels, and 1600 x 1200 pixels. During a subsequent video streaming step, the full screen frame size code segment causes or enables a video player program, such as RealPlayer, manufactured by RealNetworks, Inc., to enlarge the streaming video to a full screen frame size, such as 640 x 480 pixels.

References herein to frame sizes in pixels, such as, 320 x 240 pixels, 640 x 480 pixels, are intended to include equivalent frames sizes thereto. For example, it is known that a frame size of 320 x 240 pixels may include an additional number of unneeded pixels (e.g., which can be as much as 10% of the total pixels) attributed to overscan. Thus, one equivalent to a 320 x 240 pixel frame size is 304 x 228 pixels. As a second example, when rectangular pixels are used, the exact pixel count differs from the stated frame size. Thus, one equivalent to a 320 x 240 pixel frame size is 352 x 240. Accordingly, references to frame sizes in pixels are intended to included these and other equivalent frame sizes, and the teachings herein include any and all such insubstantial variations.

The uploading process utilizes uploading software 33, such as, a Web FTP (file transfer protocol) software (e.g., WS FTP PRO, manufactured by Ipswitch, Inc., Lexington, Massachusetts.) The digital video file is uploaded to network server 18, which includes a computer configured to generate a web page on an internet-protocol network, such as the Internet or a company-wide intranet. A web page is a block of data written in a markup language, such as HTML, and any related files for scripts and graphics. Network server 18 may alternatively be coupled to a non-internet-protocol network, such as, an ethernet, a local area network, a wide area network, a wireless network, etc.

A user computer 34 may access the web page provided by network server 18 via a network, such as, the Internet. Upon actuating a user input device (e.g., a web page button, hypertext link, etc.) associated with the uploaded digital video file, the HTML code launches a suitable video player program (e.g., RealPlayer) at user computer 34, activates the full screen frame size at user computer 34, and streams the video from the digital video file to user computer 34. Alternatively, the video player program may initially play the streaming video at a smaller frame size (e.g., 320 x 240), and the user may actuate a user input device on the video player to enlarge the streaming video to a full-screen size, such as 640 x 480. Notably, capture software 26, editing software 28, encoding software 30, markup software 32, and uploading software 33 may be operable on one computer or on different computers during different steps in the process.

According to one alternative embodiment, the encoded digital video file is stored directly to a storage device, such as, a compact disk, a digital video disk, a magnetic storage device, etc., for subsequent viewing on another computer, on a personal digital assistant (e.g., a Palm Pilot manufactured by Palm, Inc., Santa Clara, California), etc. According to another alternative embodiment, digital video data is provided on a storage device (e.g., a floppy disk, a hard disk storage, etc.) which has been pre-captured. The pre-captured digital video data is provided in a compressed or uncompressed digital video format to encoding software 30 for subsequent processing.

Referring now to FIG. 2, a method 50 for generating an enhanced digital video file according to the exemplary embodiment of FIG. 1 is shown. Method 50 is operable using one or more of the elements of system 10, as needed. While the steps of method 50 are explained with reference to captured video, it is understood that captured audio may be processed along with the captured video, or perhaps processed independently in a similar manner. As will be seen, the recorded video will be captured and encoded at near-optimal levels, as determined by the selected parameters in these processes, thereby preserving the highest quality video content. While exemplary values are presented herein for such parameters, it is understood that one of ordinary skill in the art will recognize other combinations of parameters based on these teachings.

According to one exemplary embodiment, a customer provides pre-recorded video saved to a disk or other storage device. At step 52, if the video has been pre-recorded by the customer, the method proceeds to step 58. If the video has not yet been recorded, at step 54, video is recorded using one or more of recording devices 12 or playback device 25. The video is recorded into any suitable format, such as, VHS or Beta, and is played back using a television standard, such as, NTSC (National Television Standards Committee), PAL (Phase Alternative Line), SECAM (Séquentiel Couleur Avec Mémoire), a digital format, such as, AVI, MOV, MPEG, a digital format compatible with the IEEE 1394 standard, or another format, etc. At step 56, the video is captured by coupling one of recording devices 12 or playback device 25 to capture device 14, which is an external Dazzle LAV-1000 capture device in this exemplary embodiment, but may alternatively be an internal card or other capture devices, such as a Pinnacle DC10 device.

Capture software is also utilized, such as, Amigo 2.11, Adobe Premier 5.1 or Real Producer G2. Capture device 14 and capture software 26 generate a digital video file based on the recorded video. If the recorded video is in an analog format, capture device 14 digitizes the analog video to create digital video data. If the recorded video is in a digital format, capture device 14 merely receives the digital video data and formats a file in the appropriate standard (e.g., AVI, MOV, MPEG1, etc.). According to one exemplary embodiment, capture software 26 is set for real video capture, i.e., having a frame rate of a television or movie standard, such as, 29.97 frames per second. Real video capture may further have a frame rate of between 24 and 30 frames per second, or at least substantially more than the 6 to 9 frames per second conventionally used in streaming video applications. Further, the video is captured with at least approximately 76,800 pixels per frame (at least approximately 69,000 pixels taking into consideration overscan). For a 4:3 aspect ratio, the frame size of the video capture is at least 320 x 240 in this exemplary embodiment (at least 304 x 228 taking into consideration overscan), or at least more than the 160 x 120 used in conventional streaming video applications. Frame sizes of 480 x 320 and 640 x 480 may also be utilized in the video capture. However, particularly advantageous results are associated with the 320 x 240 capture frame size.

In an alternative embodiment, a separate audio capture device is utilized in parallel with the video capture device. In the alternative embodiment, corresponding audio capture software is operable on computer 16 to digitize the audio into a digital audio format, such as PCM. The sampling rate is between 44 and 48 kiloHertz (kHz); the bus size is 16-bit, allowing an audio resolution of 16-bits; and the audio is sampled in stereo. These parameters may also be set using the video capture software in an embodiment wherein video and audio are captured using one capture device.

The captured video data may be stored as a data file in a storage device (e.g., a hard drive) or may be stored in memory and fed directly to an encoder. The captured video data may further be compressed, for example, to an MPEG-1 file before being saved to the storage device.

At step 58, the digital video file is edited using a video editing software, such as, Adobe Premier 5.1. Adobe Premier 5.1 generates an output file in a MOV or AVI format, but may alternatively generate an output file in any digital video format. The edited digital video file may be stored in the storage device. Step 58 is optional but, if included, preferably Adobe Premier 5.1 maintains a frame size of at least 320 x 240 pixels and a real video frame rate.

At step 60, the edited digital video file is converted or encoded using a video encoding algorithm to create a streaming video file. The edited digital video file is first retrieved from the storage device (unless the digital video data is provided directly from capture device 14). In this exemplary embodiment, the digital video file is encoded to a RealMedia format (i.e., RM) using a RealNetworks encoding algorithm. RM is an audiovisual file format proprietary to RealNetworks, Inc. As a further alternative, Windows Media Encoder, manufactured by Microsoft Corp., may be utilized to encode the captured digital video file, for example, to an ASF format (Advanced Streaming Format) or ASX format. Further still, QuickTime, manufactured by Apple Computer, Inc., Cupertino, California, may be utilized to encode the captured digital video file, for example, to an MOV format.

Encoding may additionally include compression, if a smaller file size is desirable, as indicated by steps 62 and 64. The amount of compression may be selected by the operator using encoding software 30 or alternative compression software. During the encoding process, the digital video file is encoded to have a data rate of between approximately 35 kbps (kilobits per second) to 750 kbps, and a frame rate of between approximately 24 fps (frames per second) and 30 fps (e.g. 29.97 fps.). The number of pixels per frame is set to at least approximately 76,800 (again, at least approximately 69,000 pixels taking into consideration overscan) which, for a 4:3 aspect ratio, is 320 x 240 pixels (again, at least 304 x 228 pixels taking into consideration overscan), or at least more than the 160 x 120 pixels of conventional usage. However, editing, encoding, and compression are optional steps.

At step 66, the digital video file is marked up with a markup language, such as, HTML. At step 68, a full screen frame size is associated with the digital video file. A full screen frame size is at least 640 x 480 pixels, and may also be 800 x 600 pixels, 1024 x 768 pixels, 1280 x 1024 pixels, 1600 x 1200 pixels, etc. In this exemplary embodiment, the markup language associated with the digital video file includes a code segment that causes the digital video file to stream at the desired full screen frame size. While the markup language is used to associate the full screen frame size code segment with the digital video file in this exemplary embodiment, the full screen frame size code segment may be associated with the digital video file in another step of the method, such as the encode step 60, compression step 62, or another step.

At step 70, the digital video file is uploaded to an Internet web page using uploading software, such as, WS FTP PRO. At step 72, a script (e.g., an ASCII file (American Standard Code for Information Interchange)) is associated with the marked-up digital video file. The script calls the video to stream in response to a user actuation from user computer 34. The script is written in a RAM format, such as from a Microsoft Notepad software program. The script is included in the markup language associated with the digital video file. In this exemplary embodiment, an actuatable user input device (e.g., a hypertext link) is associated with the HTML code.

Thus, a user from anywhere in the world may access network server 18 via the Internet, actuate the user input device, and call the video to stream. Upon actuation, the HTML codes launch video playing software (e.g., RealPlayer) at the user computer, enlarge the viewing window of the software to full screen mode (i.e., at least 640 x 480), and begin streaming the video to the user computer. Alternatively, the user may expand the viewing screen to full screen mode by actuating an input device on the video player software. Other methods of expanding the viewing screen to a full screen are contemplated. The transmission speed of the digital video file is dependent upon the bandwidth of the user's network connection, but may range from approximately 35 kbps to 750 kbps, or as low as 28.8 kbps, with a frame rate of between approximately 24 fps to 29.97 or 30 fps.

According to one alternative embodiment, network server 18 is configured to query user computer 34 to ascertain the network connection used by computer 34 (e.g., 28.8 kbps modem, T1 line, ISDN, etc.). Thereafter, network server 18 determines the appropriate transmission rate based on the ascertained network connection.

EXAMPLE A

A Sony DCR VX-1000 digital video camera, having 3CCD technology, manufactured by Sony Electronics, Inc., Park Ridge, N.J., was utilized to record a video signal. The video camera generated an output signal of 6MHz in NTSC format.

A Dazzle LAV-1000S external capture device was coupled to the video camera. Amigo 2.11, Dazzle's capture software was used. The Dazzle capture device and capture software were programmed with several parameters. The frame size was left at the default setting of 320 x 240 pixels. The frame speed was set to 29.97 frames per second. The bit rate was set to 3.0 Megabits (Mb) per second. The audio capture was set to 44 kHz, 16 bit sampling rate. An MPEG-1 file was generated based on the video signal using the capture device and software programmed with these parameters.

When the captured MPEG-1 file was provided to RealEncoder G2, the resulting encoded file failed to retain the real video frame rate. Therefore, Adobe Premier 5.1 was utilized to receive the MPEG-1 file and export it to a MOV or AVI or MPEG file., based on several parameters. The frame rate in Adobe Premier 5.1 was set to 29.97 fps. The frame size was set to 320 x 240. The "Quality" setting, representing the number of colors to appear in the edited file, was set to a high setting (e.g., 100%). Adobe Premier

5.1 generated an AVI file or an MOV file or a MPEG file, depending upon the operator selection.

RealEncoder G2 software was used to encode the AVI or MOV file into a streaming video file in RM format. The RealEncoder G2 software was programmed with several parameters. The bitrate was set to 220 kbps. The frame rate was set to 30 fps. The "Surestream" option was selected. "Surestream" technology adjusts the playing speed of the encoded digital video file to accommodate the network connection speed of the user. For sound quality, "stereo/music", the highest quality, was selected. For image quality, "sharpest image", the highest quality, was selected. Regarding frame size, this version of RealEncoder generated an output signal having a frame size equal to that of the frame size of the MOV or AVI input file. RealEncoder compressed the MOV or AVI input file using the RealNetworks compression algorithm. An RM file was generated based on the these parameters.

The RM file was uploaded to an Internet server. Using Microsoft Notepad, a script was written in RAM format to 1) identify the location of the RM file, 2) launch RealPlayer on the user computer, 3) resize the viewing screen on the user computer to 640 x 480, and 4) begin the video stream. The result was unexpectedly high-quality, full-screen, real video frame rate, streaming video. The RM file was subsequently streamed to a client computer via a telephone modem and via other broadband connections. The same unexpectedly high-quality, full-screen, real video frame rate, streaming video was experienced. The streaming playback was intermittent due to the need to buffer to accommodate the lower bit-rate of transmission.

EXAMPLE B

According to another example, an NTSC analog signal is provided to a Pinnacle DC-10PLUS capture device. The Pinnacle capture device and associated software generate a digital video file in AVI format based on several parameters. The capture type is set to NTSC. The frame size is set to 320 x 240 pixels, or "1/4 full frame size". Brightness, sharpness, and color are adjusted, as desired. The compression rate is set to 2.5:1. The frame rate is set to 29.97. Square pixel ratio is selected. Audio is set to stereo format, 44 kHz, 16 bit sampling. The data rate is set to 1739 kbps. The capture device utilizes a Miro codec to create a digital video file in AVI format.

Optionally, a header and footer is provided to the beginning and end of the digital video file. The header and footer include a trademark for the assignee of the present application. Adobe Premier is used to render the header, footer, and watermark to the digital video file. A parameter within Adobe Premier is set to a frame size of 320 x 240. Adobe Premier further utilizes a Miro codec to create a digital video file in AVI format.

The edited AVI file is encoded by RealProducer software. The following parameters are programmed in the RealProducer software. One set of parameters was used for a low-speed network connection at the user computer (hereinafter designated "LO"), and another set of parameters was used for a high-speed network connection at the user computer (hereinafter designated "HI"). RealNetworks "Surestream" technology is selected. Alternatively, "single-stream" can be selected, and an RAM file can be generated to query the connection speed of the user computer and stream the video at the proper connection speed. The encoding speed is set to, for LO, 28 kbps or 56 kbps, and for HI, LAN, DSL, Cable Modem, or T1. Sound quality is set to "voice only" or "stereo music" or "CD quality". Video quality is set to "sharper image". Frame rate is set to 29.97 fps. Target bit rate is set to 350 kbps. The target player is specified as RealPlayer G2. Frame size is set to 320 x 240. Based on these parameters, the RealEncoder software generates an RM file or other streaming video data file, which is subsequently uploaded to RealServer.

The exemplary embodiments disclosed herein provide greatly enhanced streaming video suitable for streaming over a limited-bandwidth network, such as the Internet. Several discoveries have enabled various aspects of this technology. The first discovery was that the efficiency of encoding from a captured digital video file to a streaming video file is increased with an increase in the frame size of the captured digital video file. Thus, while conventional teachings pointed toward minimizing the capturing and encoding frame sizes (typically to 160 x 120 pixels, which has widely become an Internet standard for streaming video) to reduce the size of the resulting file, the present inventors turned away from these teachings and increased the capturing and encoding frame sizes to 320 x 240 pixels. Second, one goal of the present inventors was to achieve full-screen, real video frame rate, streaming video. Conventional teachings would point toward encoding at a frame size of 640 x 480 pixels to achieve full-screen streaming video. However, with today's technology, enlarging the frame size of a captured digital video file during encoding to 640 x 480 (for example, from 160 x 120 pixels) pixels causes an enormous increase in the amount of data in the resulting encoded digital video file and requires enormous bandwidth to stream. Therefore, the present inventors discovered that encoding at 320 x 240 pixels (or its equivalent) provided greatly improved results when doubled to full-screen for viewing.

These conventional teachings were evidenced in the capabilities of the encoder used at the time of invention, namely, RealProducer G2. RealProducer G2 taught away from real video streaming since digital video files that were captured at a real video frame rate (e.g., 30 fps) would be automatically reduced to a lower, non-real video frame rate (e.g., 15 fps) to reduce the size of the streaming video file. Furthermore, digital video files which were captured directly from a capture device using RealProducer G2 were encoded at a frame rate of only 6-7 fps and had no option to adjust frame size. Therefore, to obtain a real video frame rate, the inventors followed the steps in EXAMPLE A above to achieve the first high quality, full-screen, real frame rate streaming video file.

Referring now to FIG. 3, a system 80 for playing a digital video file across a network is shown, and a corresponding method is described. System 80 includes a network server 82 having a processor 84, a storage device 86, and a network interface 88. A capture device 90 is coupled to network server 82 and is configured to capture a video signal, as described hereinabove. Processor 84 controls capture device 90 and provides various parameters to capture device 90 regarding frame size, bit rate, etc. For example, one or more of the methods for capturing video and generating a digital video file described hereinabove may be implemented by processor 84, storage device 86, and capture device 90. Processor 84 and capture device 90 generate a digital video file in a digital video format (e.g., MPEG, AVI, etc.) and store it to storage device 86. As used in this description of FIG. 3, the term "storage device" includes such devices as magnetic tape, a hard drive, a floppy disk, magnetic disk, or other similar non-volatile storage media, but not including random access memory or other temporary memory. The capture process may alternatively be carried out on another computer, after which the resulting digital video file is stored in (e.g., uploaded to) storage device 86.

Network server 82 is coupled through network interface 88 to a network 92, such as the Internet, a LAN, etc. Processor 84 is configured to generate a web page having a hypertext link to the digital video file stored in storage device 86. A network client 94 includes a processor 96, a storage device 98, an input device 100, a display 102, and a network interface 104. Network client 94 is operable via a user to access the web page generated by network server 82 and to actuate the hypertext link to begin downloading the digital video file from storage device 86.

One drawback of downloading video files is that, for very large files, the delay before any portion of the digital video file can be viewed can be on the order of minutes, hours, or longer. Thus, according to one advantageous aspect of system 80, while the digital video file is being downloaded to network client 94 and stored in storage device 98, some of the digital video file which has already been downloaded and stored is being simultaneously played on display 102. A suitable player which supports AVI, MPEG, and other digital video formats is utilized for the video play. This procedure may be referred to as viewing/downloading. Stated another way, a first portion of the digital video file is played from storage device 98 while later portions of the digital video file are still downloading from storage device 86 via network 92 to storage device 98.

One method of launching the player and beginning the play of the first portion is for a user to simply select these steps via input device 100 (e.g., a mouse, a keyboard, etc.) a certain time after the downloading has begun. Alternatively, an algorithm may be provided, either attached to the digital video file (e.g., HTML, Java, a macro, etc.) or as part of the player (e.g., QuickTime, RealPlayer, etc.) which begins playing the digital video file at a predetermined time after the download to storage device 98 has begun. This predetermined time may be pre-programmed or adjusted in real-time based on inputs from client server 94 or network server 82. According to one example, the algorithm calculates the predetermined time based on the download speed (e.g., including network connection speed of network interface 104, etc.), the viewing speed (e.g., frames per second, etc.), and the size of the digital video file. For example, if the viewing speed is four times the download speed, the algorithm monitors the amount of the file (e.g., in bytes) which is downloaded until 75% of the file is downloaded. When 75% of the file is downloaded, the algorithm begins playing the digital video file from storage device 98. By playing the file at this predetermined time, the digital video file will play substantially without delays for buffering. Of course, other predetermined times are contemplated, including those earlier and later than that set forth in this exemplary embodiment.

Thus, one can view a digital video file shortly after clicking on the hypertext link and before the entire digital video file has downloaded to storage device 98. Once the entire digital video file is finished playing, network client 94 retains a copy of the digital video file in storage device 98 for later playing.

According to one alternative, the digital video data is captured in real-time and streamed in real-time across network 92 (i.e., without first storing to storage device 86) to storage device 98.

While the embodiments and applications of the invention illustrated in the FIGS. and described above are presently preferred, it should be understood that these embodiments are offered by way of example only. For example, while the steps of the exemplary embodiments contemplate recording audio and video at one time and streaming the audio and video at another time, the audio and video may alternatively be fed through system 10 in real-time, thereby facilitating real-time audio/video transmissions. Furthermore, the exemplary software programs mentioned may be replaced by newly developed versions and/or programs in the future. Accordingly, the present invention is not limited to a particular embodiment, but extends to various modifications that nevertheless fall within the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A method of playing a digital video file over a network, comprising:

providing a digital video file to a first storage device;

downloading a first portion of the digital video file from the first storage device over a network to a computer having a second storage device and a display screen;

expanding the viewing frame size of the computer display screen to at least 640 x 480 pixels; and

playing the first downloaded portion on the expanded display screen from the second storage device while substantially simultaneously downloading a second portion of the digital video file to the second storage device.

2. The method of claim 1, further comprising capturing a video signal to generate the digital video file.

3. The method of claim 2, further comprising compressing the captured video signal such that the digital video file is compressed.

4. The method of claim 3, wherein the digital video file is stored in an MPEG file format.

5. The method of claim 1, wherein the network is the Internet.

6. The method of claim 1, wherein the playing of the first portion of the digital video file is started a predetermined time after

the downloading of the first portion of the digital video file has started.

7. The method of claim 6, wherein the predetermined time is based on the viewing speed and the download speed of the digital video file.

8. The method of claim 6, wherein the playing of the digital video file ends at approximately the same time as the download of the digital video file.

9. The method of claim 7, wherein at least 50% of the digital video file is downloaded before the first portion of the digital video file is played.

10. The method of claim 1, wherein the second storage device includes a magnetic storage device.

11. The method of claim 10, wherein the second storage device is a hard drive.

12. A system for playing a digital video file over a network, comprising:

means for providing a digital video file to a first means for storing;

means for downloading a first portion of the digital video file from the first storing means over a network to a computer having a second means for storing and a display screen;

means for expanding the viewing frame size of the computer display screen to a full screen size; and

means for playing the first downloaded portion of the digital video file on the expanded display screen from the second storing means while substantially simultaneously downloading a second portion of the digital video file to the second storing means.

13. The system of claim 12, further comprising means for capturing a video signal to generate the digital video file.

14. The system of claim 13, further comprising means for compressing the captured video signal such that the digital video file is compressed.

15. The system of claim 14, wherein the digital video file is stored in an MPEG file format.

16. The system of claim 12, wherein the network is the Internet.

17. The system of claim 12, wherein the playing of the first portion of the digital video file is started a predetermined time after the downloading of the first portion of the digital video file has started.

18. The system of claim 17, wherein the predetermined time is based on the viewing speed and the download speed of the digital video file.

19. The system of claim 18, wherein the playing of the digital video file ends at approximately the same time as the download of the digital video file.

20. The system of claim 19, wherein at least 50% of the digital video file is downloaded before the first portion of the digital video file is played.

21. The system of claim 12, wherein the second storage device includes a magnetic storage device.

22. The system of claim 21, wherein the second storage device is a hard drive.

23. A method of playing a digital video file across the Internet, comprising:

capturing and compressing a source video signal to generate a digital video file;

providing a first portion of the digital video file across the Internet to a computer;

playing the first portion of the digital video file at substantially full screen size on the computer while substantially simultaneously downloading a second portion of the digital video file to the computer.

24. The method of claim 23, further comprising:

downloading the first portion to a storage device;

automatically launching a video file player at the second computer; and

automatically playing the first portion of the digital video file after the first portion has been downloaded.

25. The method of claim 24, wherein the playing of the digital video file ends at approximately the same time as the download of the digital video file.

26. The method of claim 24, wherein the entire digital video file is stored on a storage device coupled to the computer after the playing step.

ABSTRACT OF THE DISCLOSURE

A method of playing a digital video file over a network includes providing a digital video file to a first storage device; downloading a first portion of the digital video file from the first storage device over a network to a computer having a second storage device and a display screen; expanding the viewing frame size of the computer display screen to at least 640 x 480 pixels; and playing the first downloaded portion on the expanded display screen from the second storage device while substantially simultaneously downloading a second portion of the digital video file to the second storage device.

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I HEREBY DECLARE:

THAT my residence, post office address, and citizenship are as stated below next to my name;

THAT I believe I am the original, first, and sole inventor (if only one inventor is named below) or an original, first, and joint inventor (if plural inventors are named below or in an attached Declaration) of the subject matter which is claimed and for which a patent is sought on the invention entitled

System And Method For Playing A Digital Video File

(Attorney Docket No. 57103/115)

the specification of which (check one)

X is attached hereto.

___ was filed on _______ as United States Application Number or PCT International Application Number ______ and was amended on ______ (if applicable).

THAT I do not know and do not believe that the same invention was ever known or used by others in the United States of America, or was patented or described in any printed publication in any country, before I (we) invented it;

THAT I do not know and do not believe that the same invention was patented or described in any printed publication in any country, or in public use or on sale in the United States of America, for more than one year prior to the filing date of this United States application;

THAT I do not know and do not believe that the same invention was first patented or made the subject of an inventor's certificate that issued in any country foreign to the United States of America before the filing date of this United States application if the foreign application was filed by me (us), or by my (our) legal representatives or assigns, more than twelve months (six months for design patents) prior to the filing date of this United States application;

THAT I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment specifically referred to above;

THAT I believe that the above-identified specification contains a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention, and sets forth the best mode contemplated by me of carrying out the invention; and

THAT I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I HEREBY CLAIM foreign priority benefits under Title 35, United States Code §119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number	Country	Foreign Filing Date	Priority Claimed?	Certified Copy Attached?

I HEREBY CLAIM the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

U.S. Provisional Application Number	Filing Date

I HEREBY CLAIM the benefit under Title 35, United States Code, §120 of any United States application(s), or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Application Number	Parent Filing Date	Parent Patent Number

I HEREBY APPOINT the following registered attorneys and agents of the law firm of FOLEY & LARDNER to have full power to prosecute this application and any continuations, divisions, reissues, and reexaminations thereof, to receive the patent, and to transact all business in the United States Patent and Trademark Office connected therewith:

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I UNDERSTAND AND AGREE THAT the foregoing attorneys and agents appointed by me to prosecute this application do not personally represent me or my legal interests, but instead represent the interests of the legal owner(s) of the invention described in this application.

I FURTHER DECLARE THAT all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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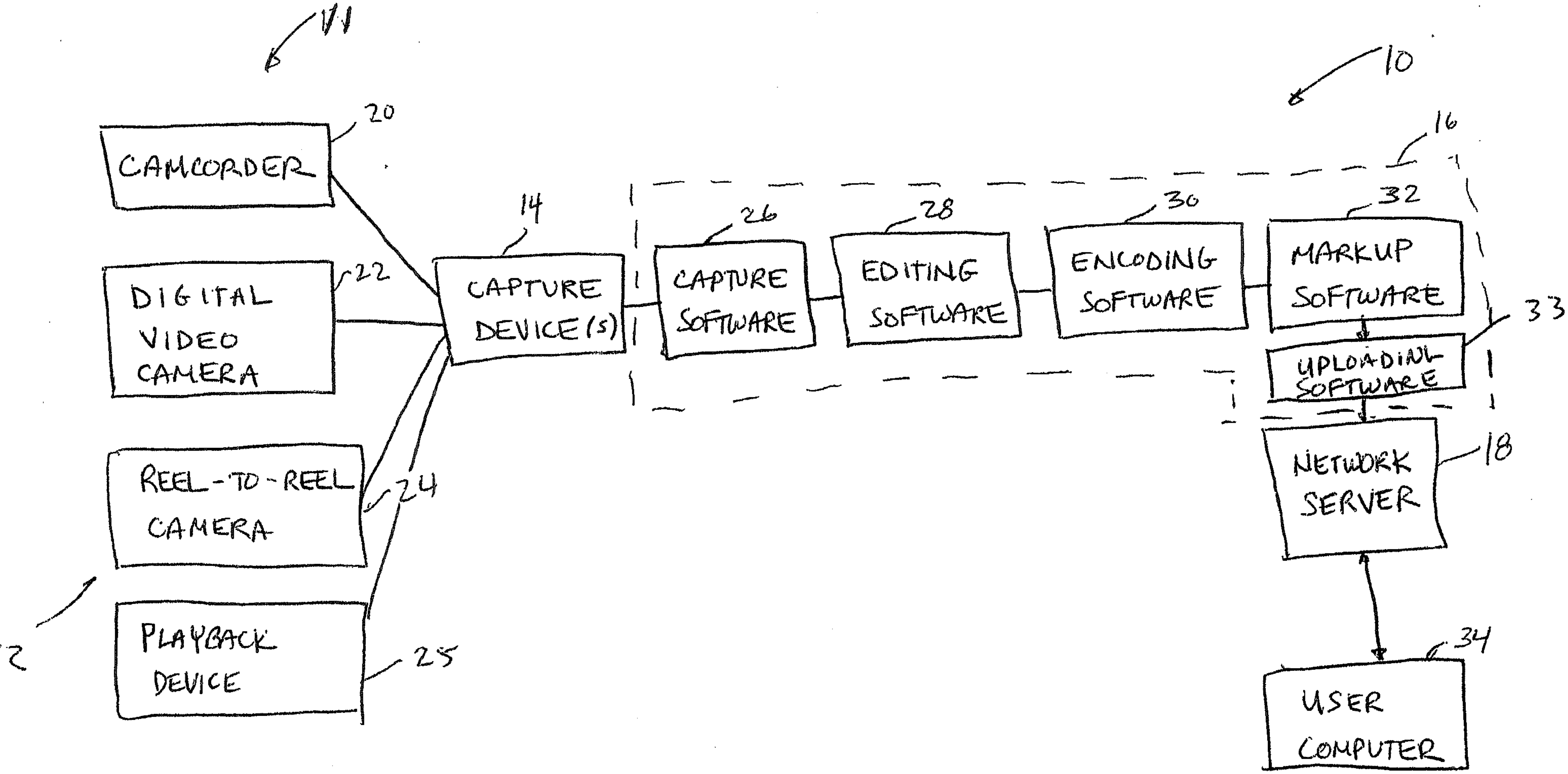
10
12
16
CAMCORDER
20
DIGITAL VIDEO CAMERA
22
REEL-TO-REEL CAMERA
24
PLAYBACK DEVICE
25
CAPTURE DEVICE(S)
14
CAPTURE SOFTWARE
26
EDITING SOFTWARE
28
ENCODING SOFTWARE
30
MARKUP SOFTWARE
32
UPLOADING SOFTWARE
33
NETWORK SERVER
18
USER COMPUTER
34

FIG. 1

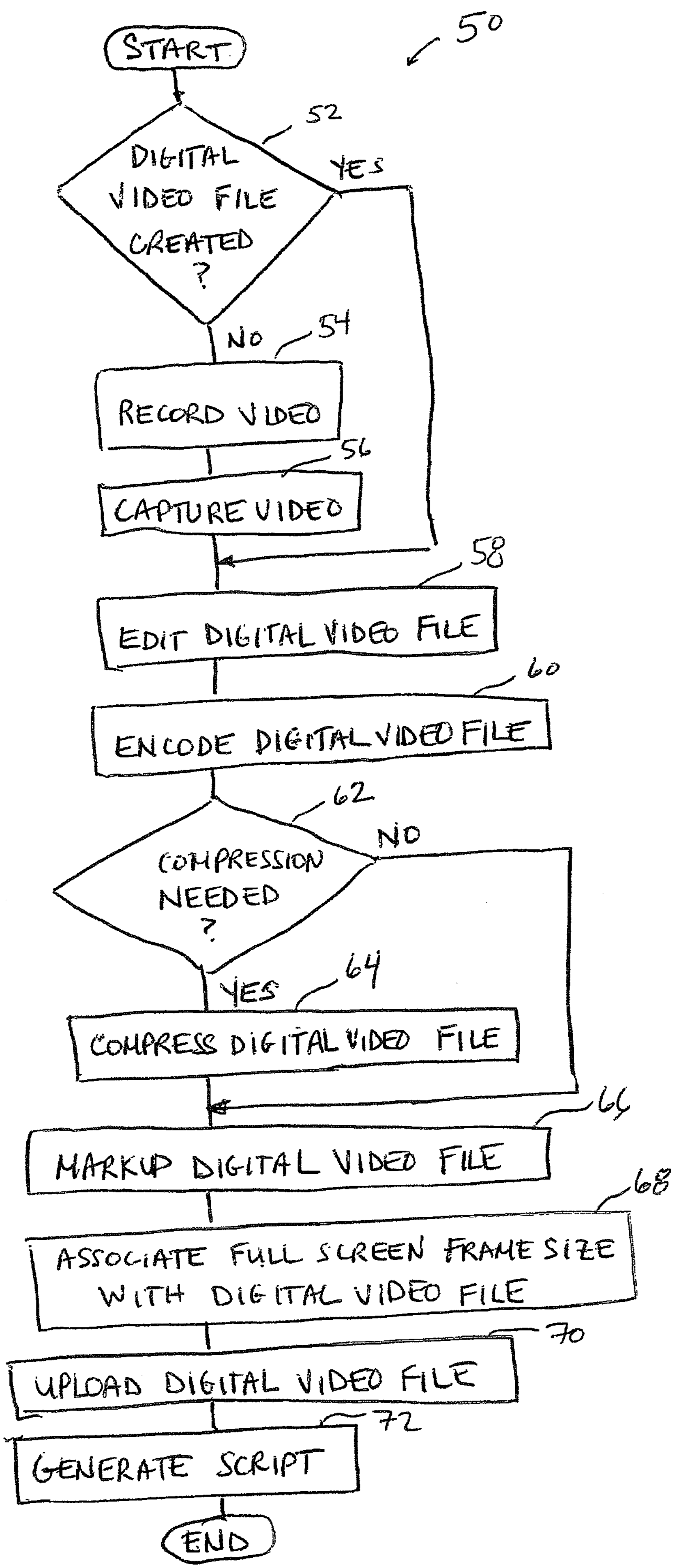
50
START
52
DIGITAL VIDEO FILE CREATED ?
YES
NO
54
RECORD VIDEO
56
CAPTURE VIDEO
58
EDIT DIGITAL VIDEO FILE
60
ENCODE DIGITAL VIDEO FILE
62
COMPRESSION NEEDED ?
NO
YES
64
COMPRESS DIGITAL VIDEO FILE
66
MARKUP DIGITAL VIDEO FILE
68
ASSOCIATE FULL SCREEN FRAME SIZE WITH DIGITAL VIDEO FILE
70
UPLOAD DIGITAL VIDEO FILE
72
GENERATE SCRIPT
END

FIG. 2

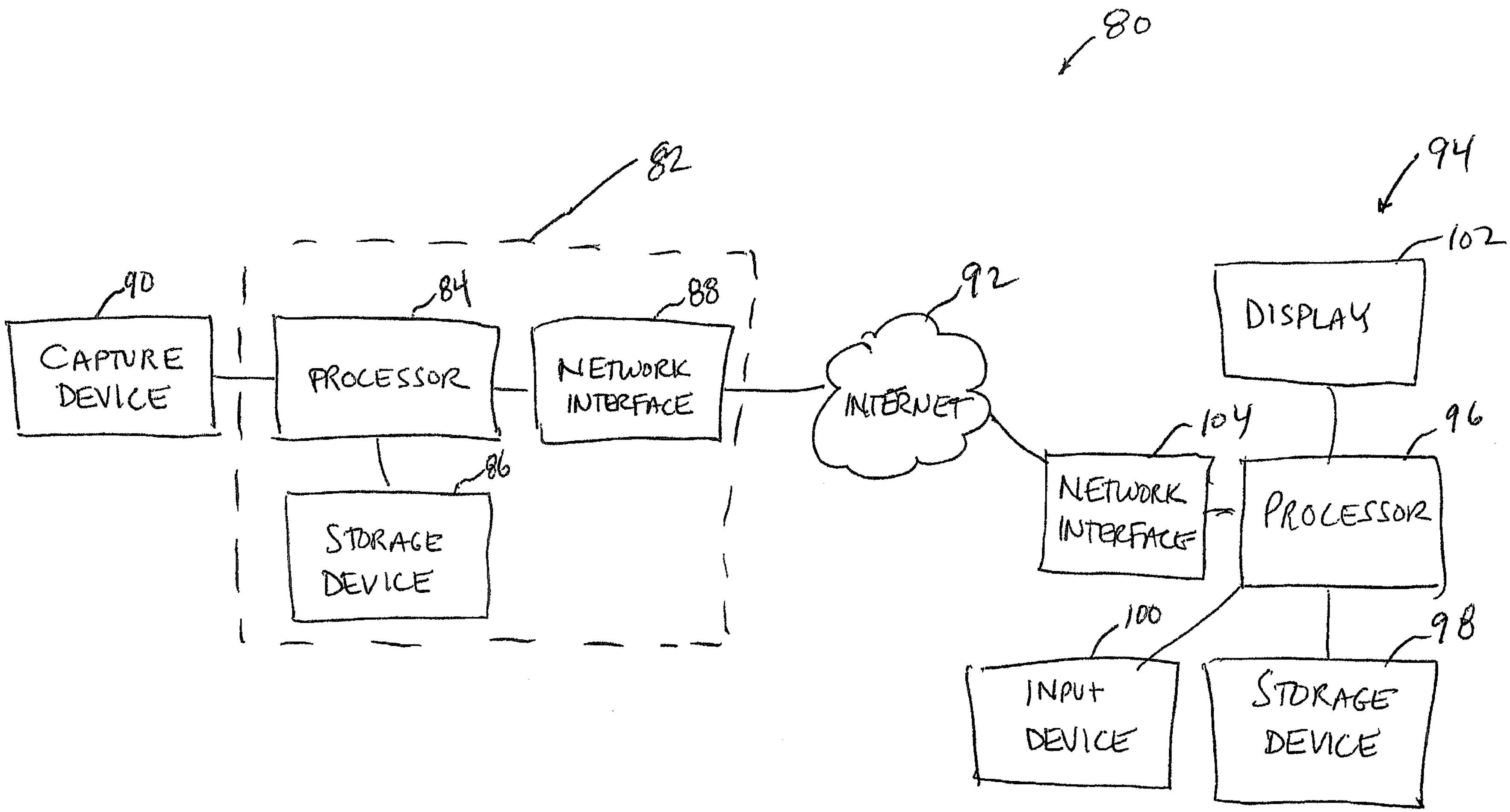
80
82
94
90
CAPTURE DEVICE
84
PROCESSOR
88
NETWORK INTERFACE
86
STORAGE DEVICE
92
INTERNET
102
DISPLAY
104
NETWORK INTERFACE
96
PROCESSOR
100
INPUT DEVICE
98
STORAGE DEVICE

FIG. 3

PA 1150500

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APPLICATION NUMBER: *09/587,730*
FILING DATE: *June 05, 2000*

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JC813 U.S. PTO 06/05/00

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JC530 U.S. PTO 09/587730 06/05/00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Bernstein et al.

Title: System And Method For Streaming An Enhanced Digital Video File

Appl. No.: Unknown

Filing Date: Unknown

Examiner: Unknown

Art Unit: Unknown

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I hereby certify that this correspondence is being deposited with the United States Postal Service's "Express Mail Post Office To Addressee" service under 37 C.F.R. § 1.10 on the date indicated below and is addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231.

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Sir:

Transmitted herewith for filing under 37 C.F.R. § 1.53(b) is the nonprovisional utility patent application of:

Eliot I. Bernstein
Zakirul A. Shirajee

Enclosed are:

[X] Specification, Claim(s), and Abstract (29 pages).

[X] Informal drawings (3 sheets, Figures 1-3).

[X] Unexecuted Declaration and Power of Attorney (4 pages).

[X] Preliminary Amendment.

[ ] Assignment of the invention to Iviewit.com, Inc..

[ ] Assignment Recordation Cover Sheet.

[ ] Check in the amount of $40.00 for Assignment recordation.

[ ] Small Entity statement.

[ ] Information Disclosure Statement.

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Basic Fee							$690.00		$690.00
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Independents:	3	-	3	=	0	x	$78.00	=	$0.00
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[ ] The Assistant Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 06-1447. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Assistant Commissioner is authorized to charge the unpaid amount to Deposit Account No. 06-1447.

Please direct all correspondence to the undersigned attorney or agent at the address indicated below.

Respectfully submitted,

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UNITED STATES PATENT APPLICATION

for

SYSTEM AND METHOD FOR STREAMING AN ENHANCED DIGITAL VIDEO FILE

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TITLE OF THE INVENTION

SYSTEM AND METHOD FOR STREAMING AN ENHANCED DIGITAL VIDEO FILE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 60/137,297, filed June 3, 1999, U.S. Provisional Application No. 60/155,404, filed September 22, 1999, U.S. Provisional Application No. 60/169,559, filed December 8, 1999, and PCT International Application No. _________, filed June 2, 2000.

FIELD OF THE INVENTION

The present invention relates generally to video imaging. More specifically, the present invention relates to a system and method for providing high quality digital video files for streaming across a network.

BACKGROUND OF THE INVENTION

Streaming video is a technique by which video is played in real time as it is downloaded over the Internet, as opposed to storing it in a local file first. A video player decompresses and plays the data as it is transferred to a user computer over the World-Wide Web. Streaming video avoids the delay entailed in downloading an entire file and then playing it with a plug-in application. Streaming video requires a communications connection (e.g., a network, Internet, etc.) and a computer powerful enough to execute the decompression algorithm in real time.

In the field of streaming video, the primary design challenge is that the viewer desires perfect video quality over a limited-bandwidth network. Perfect video quality requires an enormous amount of digital data. Today's networks are not capable of providing life-like, full motion, full screen streaming video.

It is known to capture video using a capture device, compress the resulting captured video, store the compressed video, and send the compressed video across the Internet. However, prior attempts have failed to produce high quality streaming video that can be transmitted over the Internet. For example, prior attempts at streaming video have been unable to produce full-screen, real video frame rate video at any acceptable quality.

Several teachings have emerged that attempt to improve the quality and decrease the file size of streaming video. One teaching in the art is to reduce the number of frames per second that are being encoded, from the 25 to 30 fps of standard television to 6 or 7 fps or less for streaming video. While this reduces the amount of data that is being sent, the video appears jittery and corresponding voice appears asynchronous with the jittery video. Another teaching in the art is to capture the video at a small frame size of 160 x 120 or less. The small frame size of 160 x 120 is the widely used standard in Internet streaming video. Further teachings are directed to reducing the amount of data that is provided prior to compressing to reduce the file size resulting from compression. Other teachings in the art have pointed toward compressing a digital video file as much as possible prior to transmission. Full-screen, full-motion video has historically been viewed as requiring far too much data for transmission over a limited-bandwidth network.

Accordingly, there is a need for an improved system and method for providing an enhanced digital video file for streaming across a network. Further, there is a need for a digital video file having high quality at various screen sizes with minimal quality loss when the video is expanded to full screen size. Further still, there is a need for a digital video file having a real video frame rate that can be streamed across a limited bandwidth network, such as the Internet. Further yet, there is a need for a video transmission which, once commenced, need not be stopped.

BRIEF SUMMARY OF THE INVENTION

According to one exemplary embodiment, a method of streaming video includes providing a source video signal having a predetermined source video parameter; converting the source video signal to a streaming digital video file while maintaining substantially the same source video parameter; uploading the streaming digital video file to a network server; expanding the viewing frame size of the display screen to a full screen display mode; and playing the streaming digital video file in the full screen display mode.

According to another exemplary embodiment, a method of streaming an enhanced digital video file includes receiving a digital video file; encoding the received digital video file using a video encoder; associating a viewing frame size of at least 640 x 480 pixels with the encoded digital video file; uploading the encoded digital video file to a web page; and in response to a user request, streaming the uploaded digital video file over the Internet.

According to yet another exemplary embodiment, a system for streaming video includes means for providing a source video signal having a predetermined source video parameter; means for converting the source video signal to a streaming digital video file while maintaining substantially the same source video parameter; means for uploading the streaming digital video file to a network server; and means for playing the streaming digital video file at a display mode of at least 640 x 480 pixels.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will become more fully understood from the following detailed description, taken in conjunction with the accompanying drawings, wherein like reference numerals refer to like parts, in which:

FIG. 1 is a block diagram of a system for generating an enhanced digital video file according to an exemplary embodiment;

FIG. 2 is a flowchart of a method for generating an enhanced digital video file according to the exemplary embodiment of FIG. 1; and

FIG. 3 is a block diagram of a system for playing a digital video file across a network.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, a system 10 for generating an enhanced digital video file is shown. System 10 may be used as shown, or portions of system 10 may be integrated with other video processing systems, such as medical imaging equipment, motion picture production equipment, etc. System 10 generates a digital video file expandable to a full screen size and having a real video frame rate (i.e., life-like, smooth, not jerky, comparable with recorded video formats, such as, NTSC (National Television Standards Committee) at 29.97 frames per second (fps), PAL (Phase

Alternative Line) at 25 fps, and SECAM (Séquentiel Couleur Avec Mémoire) at 25 fps)) with a file size that is suitable for streaming over the Internet, for such uses as high definition television, Web television, computers and servers utilized in wireless environments, etc.

As known in the art, video is recorded having certain standard recorded video parameters, such as, frame rate, and number of lines scanned. For example, it is will known that a source conforming to the NTSC (National Television Standards Committee) standard operates at 29.97 frames per second (fps), a source conforming to the PAL (Phase Alternative Line) standard operates at 25 fps, and a source conforming to the SECAM (Séquentiel Couleur Avec Mémoire) standard operates at 25 fps. It is will known in the art that the NTSC standard includes two interleaved frames at 240 lines scanned, while the PAL standard is 270 lines scanned. Note that the number of lines scanned corresponds to the number of vertical pixels in a standard 320 x 240 frame size compatible with standard capture cards, such as, a Dazzle LAV-1000S capture device manufactured by Dazzle, Inc. of Fremont, California.

System 10 includes one or more sources, including recording devices 12 or playback device 25, a capture device 14, a computer 16, and a network server 18. Recording devices 12 include a camcorder 20, a digital video camera 22, and a reel-to-reel camera 24, each of which may be hand-held or mounted on a tripod or stand. System 10 may include a playback device 25 (e.g., tape player, VHS (Vertical Helix Scan) player, Beta player, DVD (Digital Versatile Disk) player, etc.). Camcorder 20 may be a VHS recorder, Beta recorder, or other camcorder, and is configured to store video on magnetic tape. Digital video camera 22 may be any type of digital video camera configured to generate video in a digital format. In this exemplary embodiment, digital video camera 22 stores the digital video data to a tape. Digital video camera 22 is configured to provide digital video data in real time or via the tape in a digital format, such as, Beta digital, AVI, MOV, MPEG (Motion Picture Experts Group), or other format compatible with the IEEE 1394 standard, etc., to capture device 14. AVI is an audio/video standard designed by Microsoft Corp., Redmond, Washington. According to one exemplary embodiment, a digital video camera including 3CCD technology is used to record the video. The 3CCD technology (3-chip charge-coupled device) includes a dichroic prism and three CCDs, each CCD being aligned to detect only the red, green, or blue color. A 3CCD camera will provide enhanced color resolution. Reel-to-reel camera 24 includes recording equipment that uses magnetic tape which must be threaded through the equipment and onto an empty reel. According to one alternative embodiment, a separate audio recording device, such as a microphone, may be utilized in conjunction with recording devices 12, in which embodiment recording devices 12 are used to record only video. Other recording devices may be used, such as, devices optimized for live video-conferencing.

Computer 16 includes a processor, memory, magnetic storage device, input/output devices and circuitry, etc. Computer 16 may include multiple computer at multiple sites, with different portions of the process described hereinafter operating on different computers.

Capture device 14 is coupled to one or more of sources 11. Capture device 14 is shown external to computer 16, but may alternatively be an internal capture device coupled within the housing of computer 16 or an internal capture device within the housing of one of recording devices 12 or playback device 25. In this exemplary embodiment, a Dazzle LAV-1000S capture device is utilized, though other capture devices may be used, such as a Pinnacle DC10PLUS or Pinnacle DC30PRO device, both manufactured by Pinnacle Systems, Inc., Mountain View, California, or a MotoDV Mobile capture device, manufactured by Digital Origin, Inc., Mountain View, California. Capture software 26, such as Amigo 2.11, manufactured by Dazzle, Inc. or Adobe Premier 5.1, manufactured by Adobe Systems Inc., San Jose, California, is operable on computer 16 to interface capture device 14 with computer 16. Other capture software may be utilized, such as, RealProducer G2, manufactured by RealNetworks, Inc., Seattle, Washington.

In conjunction with capture software 26, capture device 14 is configured to receive a video signal from one of recording devices 12 or playback device 25, to digitize the video signal, and to store the video signal as a digital video file. The parameters of the video capture will be discussed below with reference to FIG. 2. The digital video file is an MPEG-1 file in this exemplary embodiment, but may alternatively be generated in other digital video formats, such as, MPEG-2, AVI, etc. Capture device 14 is a combined audio/video capture device, but may alternatively include discrete audio and video capture devices, the audio capture device configured to digitize any audio which corresponds to the video being captured by the video capture device. As a further alternative, audio captured device may be utilized alone without a video capture device. The audio capture device may be, for example, a Montego II device, manufactured by Voyetra Turtle Beach, Inc., Yonkers, New York, and configured to generate a digital audio file in a digital audio format, such as, PCM (Pulse Code Modulation).

Editing software 28 is operable on computer 16. In this exemplary embodiment, Adobe Premier 5.1 is utilized, though other video editing software may be used. Editing software 28 receives the captured digital video file and enables an operator to edit the digital video file by adding or deleting frames, adjusting the color, contrast, and brightness of the frames, etc. The edits are then saved to the digital video file or can be exported to AVI or MOV file types.

Encoding software 30 is operable on computer 16. In this exemplary embodiment, RealProducer G2 is utilized, though other encoding software may be used. Encoding software 30 receives the edited digital video file and encodes the digital video file into an encoded format, such as, an RM format. Encoding software 30 may also compress the digital video file, if needed, to reduce the size of the digital video file, using a video compression algorithm, such as MPEG-1, MPEG-4, etc.

Markup software 32 is operable on computer 16. In this exemplary embodiment, a hypertext markup language (e.g., HTML, Dynamic HTML, Cold Fusion) is utilized. An operator marks up the encoded digital video file in HTML to prepare the digital video file for uploading to the network server 18. In this exemplary embodiment, a code segment representing a full screen frame size, such as 640 x 480 pixels, is associated with the digital video file in the HTML code. The full screen frame size code segment may alternatively include other screen sizes, such as 800 x 600 pixels, 1024 x 768 pixels, 1280 x 1024 pixels, and 1600 x 1200 pixels. During a subsequent video streaming step, the full screen frame size code segment causes or enables a video player program, such as RealPlayer, manufactured by RealNetworks, Inc., to enlarge the streaming video to a full screen frame size, such as 640 x 480 pixels.

References herein to frame sizes in pixels, such as, 320 x 240 pixels, 640 x 480 pixels, are intended to include equivalent frames sizes thereto. For example, it is known that a frame size of 320 x 240 pixels may include an additional number of unneeded pixels (e.g., which can be as much as 10% of the total pixels) attributed to overscan. Thus, one equivalent to a 320 x 240 pixel frame size is 304 x 228 pixels. As a second example, when rectangular pixels are used, the exact pixel count differs from the stated frame size. Thus, one equivalent to a 320 x 240 pixel frame size is 352 x 240. Accordingly, references to frame sizes in pixels are intended to included these and other equivalent frame sizes, and the teachings herein include any and all such insubstantial variations.

The uploading process utilizes uploading software 33, such as, a Web FTP (file transfer protocol) software (e.g., WS FTP PRO, manufactured by Ipswitch, Inc., Lexington, Massachusetts.) The digital video file is uploaded to network server 18, which includes a computer configured to generate a web page on an internet-protocol network, such as the Internet or a company-wide intranet. A web page is a block of data written in a markup language, such as HTML, and any related files for scripts and graphics. Network server 18 may alternatively be coupled to a non-internet-protocol network, such as, an ethernet, a local area network, a wide area network, a wireless network, etc.

A user computer 34 may access the web page provided by network server 18 via a network, such as, the Internet. Upon actuating a user input device (e.g., a web page button, hypertext link, etc.) associated with the uploaded digital video file, the HTML code launches a suitable video player program (e.g., RealPlayer) at user computer 34, activates the full screen frame size at user computer 34, and streams the video from the digital video file to user computer 34. Alternatively, the video player program may initially play the streaming video at a smaller frame size (e.g., 320 x 240), and the user may actuate a user input device on the video player to enlarge the streaming video to a full-screen size, such as 640 x 480. Notably, capture software 26, editing software 28, encoding software 30, markup software 32, and uploading software 33 may be operable on one computer or on different computers during different steps in the process.

According to one alternative embodiment, the encoded digital video file is stored directly to a storage device, such as, a compact disk, a digital video disk, a magnetic storage device, etc., for subsequent viewing on another computer, on a personal digital assistant (e.g., a Palm Pilot manufactured by Palm, Inc., Santa Clara, California), etc. According to another alternative embodiment, digital video data is provided on a storage device (e.g., a floppy disk, a hard disk storage, etc.) which has been pre-captured. The pre-captured digital video data is provided in a compressed or uncompressed digital video format to encoding software 30 for subsequent processing.

Referring now to FIG. 2, a method 50 for generating an enhanced digital video file according to the exemplary embodiment of FIG. 1 is shown. Method 50 is operable using one or more of the elements of system 10, as needed. While the steps of method 50 are explained with reference to captured video, it is understood that captured audio may be processed along with the captured video, or perhaps processed independently in a similar manner. As will be seen, the recorded video will be captured and encoded at near-optimal levels, as determined by the selected parameters in these processes, thereby preserving the highest quality video content. While exemplary values are presented herein for such parameters, it is understood that one of ordinary skill in the art will recognize other combinations of parameters based on these teachings.

According to one exemplary embodiment, a customer provides pre-recorded video saved to a disk or other storage device. At step 52, if the video has been pre-recorded by the customer, the method proceeds to step 58. If the video has not yet been recorded, at step 54, video is recorded using one or more of recording devices 12 or playback device 25. The video is recorded into any suitable format, such as, VHS or Beta, and is played back using a television standard, such as, NTSC (National Television Standards Committee), PAL (Phase Alternative Line), SECAM (Séquentiel Couleur Avec Mémoire), a digital format, such as, AVI, MOV, MPEG, a digital format compatible with the IEEE 1394 standard, or another format, etc. At step 56, the video is captured by coupling one of recording devices 12 or playback device 25 to capture device 14, which is an external Dazzle LAV-1000 capture device in this exemplary embodiment, but may alternatively be an internal card or other capture devices, such as a Pinnacle DC10 device.

Capture software is also utilized, such as, Amigo 2.11, Adobe Premier 5.1 or Real Producer G2. Capture device 14 and capture software 26 generate a digital video file based on the recorded video. If the recorded video is in an analog format, capture device 14 digitizes the analog video to create digital video data. If the recorded video is in a digital format, capture device 14 merely receives the digital video data and formats a file in the appropriate standard (e.g., AVI, MOV, MPEG1, etc.). According to one exemplary embodiment, capture software 26 is set for real video capture, i.e., having a frame rate of a television or movie standard, such as, 29.97 frames per second. Real video capture may further have a frame rate of between 24 and 30 frames per second, or at least substantially more than the 6 to 9 frames per second conventionally used in streaming video applications. Further, the video is captured with at least approximately 76,800 pixels per frame (at least approximately 69,000 pixels taking into consideration overscan). For a 4:3 aspect ratio, the frame size of the video capture is at least 320 x 240 in this exemplary embodiment (at least 304 x 228 taking into consideration overscan), or at least more than the 160 x 120 used in conventional streaming video applications. Frame sizes of 480 x 320 and 640 x 480 may also be utilized in the video capture. However, particularly advantageous results are associated with the 320 x 240 capture frame size.

In an alternative embodiment, a separate audio capture device is utilized in parallel with the video capture device. In the alternative embodiment, corresponding audio capture software is operable on computer 16 to digitize the audio into a digital audio format, such as PCM. The sampling rate is between 44 and 48 kiloHertz (kHz); the bus size is 16-bit, allowing an audio resolution of 16-bits; and the audio is sampled in stereo. These parameters may also be set using the video capture software in an embodiment wherein video and audio are captured using one capture device.

The captured video data may be stored as a data file in a storage device (e.g., a hard drive) or may be stored in memory and fed directly to an encoder. The captured video data may further be compressed, for example, to an MPEG-1 file before being saved to the storage device.

At step 58, the digital video file is edited using a video editing software, such as, Adobe Premier 5.1. Adobe Premier 5.1 generates an output file in a MOV or AVI format, but may alternatively generate an output file in any digital video format. The edited digital video file may be stored in the storage device. Step 58 is optional but, if included, preferably Adobe Premier 5.1 maintains a frame size of at least 320 x 240 pixels and a real video frame rate.

At step 60, the edited digital video file is converted or encoded using a video encoding algorithm to create a streaming video file. The edited digital video file is first retrieved from the storage device (unless the digital video data is provided directly from capture device 14). In this exemplary embodiment, the digital video file is encoded to a RealMedia format (i.e., RM) using a RealNetworks encoding algorithm. RM is an audiovisual file format proprietary to RealNetworks, Inc. As a further alternative, Windows Media Encoder, manufactured by Microsoft Corp., may be utilized to encode the captured digital video file, for example, to an ASF format (Advanced Streaming Format) or ASX format. Further still, QuickTime, manufactured by Apple Computer, Inc., Cupertino, California, may be utilized to encode the captured digital video file, for example, to an MOV format.

Encoding may additionally include compression, if a smaller file size is desirable, as indicated by steps 62 and 64. The amount of compression may be selected by the operator using encoding software 30 or alternative compression software. During the encoding process, the digital video file is encoded to have a data rate of between approximately 35 kbps (kilobits per second) to 750 kbps, and a frame rate of between approximately 24 fps (frames per second) and 30 fps (e.g. 29.97 fps.). The number of pixels per frame is set to at least approximately 76,800 (again, at least approximately 69,000 pixels taking into consideration overscan) which, for a 4:3 aspect ratio, is 320 x 240 pixels (again, at least 304 x 228 pixels taking into consideration overscan), or at least more than the 160 x 120 pixels of conventional usage. However, editing, encoding, and compression are optional steps.

At step 66, the digital video file is marked up with a markup language, such as, HTML. At step 68, a full screen frame size is associated with the digital video file. A full screen frame size is at least 640 x 480 pixels, and may also be 800 x 600 pixels, 1024 x 768 pixels, 1280 x 1024 pixels, 1600 x 1200 pixels, etc. In this exemplary embodiment, the markup language associated with the digital video file includes a code segment that causes the digital video file to stream at the desired full screen frame size. While the markup language is used to associate the full screen frame size code segment with the digital video file in this exemplary embodiment, the full screen frame size code segment may be associated with the digital video file in another step of the method, such as the encode step 60, compression step 62, or another step.

At step 70, the digital video file is uploaded to an Internet web page using uploading software, such as, WS FTP PRO. At step 72, a script (e.g., an ASCII file (American Standard Code for Information Interchange)) is associated with the marked-up digital video file. The script calls the video to stream in response to a user actuation from user computer 34. The script is written in a RAM format, such as from a Microsoft Notepad software program. The script is included in the markup language associated with the digital video file. In this exemplary embodiment, an actuatable user input device (e.g., a hypertext link) is associated with the HTML code.

Thus, a user from anywhere in the world may access network server 18 via the Internet, actuate the user input device, and call the video to stream. Upon actuation, the HTML codes launch video playing software (e.g., RealPlayer) at the user computer, enlarge the viewing window of the software to full screen mode (i.e., at least 640 x 480), and begin streaming the video to the user computer. Alternatively, the user may expand the viewing screen to full screen mode by actuating an input device on the video player software. Other methods of expanding the viewing screen to a full screen are contemplated. The transmission speed of the digital video file is dependent upon the bandwidth of the user's network connection, but may range from approximately 35 kbps to 750 kbps, or as low as 28.8 kbps, with a frame rate of between approximately 24 fps to 29.97 or 30 fps.

According to one alternative embodiment, network server 18 is configured to query user computer 34 to ascertain the network connection used by computer 34 (e.g., 28.8 kbps modem, T1 line, ISDN, etc.). Thereafter, network server 18 determines the appropriate transmission rate based on the ascertained network connection.

EXAMPLE A

A Sony DCR VX-1000 digital video camera, having 3CCD technology, manufactured by Sony Electronics, Inc., Park

Ridge, N.J., was utilized to record a video signal. The video camera generated an output signal of 6MHz in NTSC format.

A Dazzle LAV-1000S external capture device was coupled to the video camera. Amigo 2.11, Dazzle's capture software was used. The Dazzle capture device and capture software were programmed with several parameters. The frame size was left at the default setting of 320 x 240 pixels. The frame speed was set to 29.97 frames per second. The bit rate was set to 3.0 Megabits (Mb) per second. The audio capture was set to 44 kHz, 16 bit sampling rate. An MPEG-1 file was generated based on the video signal using the capture device and software programmed with these parameters.

When the captured MPEG-1 file was provided to RealEncoder G2, the resulting encoded file failed to retain the real video frame rate. Therefore, Adobe Premier 5.1 was utilized to receive the MPEG-1 file and export it to a MOV or AVI or MPEG file., based on several parameters. The frame rate in Adobe Premier 5.1 was set to 29.97 fps. The frame size was set to 320 x 240. The "Quality" setting, representing the number of colors to appear in the edited file, was set to a high setting (e.g., 100%). Adobe Premier 5.1 generated an AVI file or an MOV file or a MPEG file, depending upon the operator selection.

RealEncoder G2 software was used to encode the AVI or MOV file into a streaming video file in RM format. The RealEncoder G2 software was programmed with several parameters. The bitrate was set to 220 kbps. The frame rate was set to 30 fps. The "Surestream" option was selected. "Surestream" technology adjusts the playing speed of the encoded digital video file to accommodate the network connection speed of the user. For sound quality, "stereo/music", the highest quality, was selected. For image quality, "sharpest image", the highest quality, was selected. Regarding frame size, this version of RealEncoder generated an output signal having a frame size equal to that of the frame size of the MOV or AVI input file. RealEncoder compressed the MOV or AVI input file using the RealNetworks compression algorithm. An RM file was generated based on the these parameters.

The RM file was uploaded to an Internet server. Using Microsoft Notepad, a script was written in RAM format to 1) identify the location of the RM file, 2) launch RealPlayer on the user computer, 3) resize the viewing screen on the user computer to 640 x 480, and 4) begin the video stream. The result was unexpectedly high-quality, full-screen, real video frame rate, streaming video. The RM file was subsequently streamed to a client computer via a telephone modem and via other broadband connections. The same unexpectedly high-quality, full-screen, real video frame rate, streaming video was experienced. The streaming playback was intermittent due to the need to buffer to accommodate the lower bit-rate of transmission.

EXAMPLE B

According to another example, an NTSC analog signal is provided to a Pinnacle DC-10PLUS capture device. The Pinnacle capture device and associated software generate a digital video file in AVI format based on several parameters. The capture type is set to NTSC. The frame size is set to 320 x 240 pixels, or "1/4 full frame size". Brightness, sharpness, and color are adjusted, as desired. The compression rate is set to 2.5:1. The frame rate is set to 29.97. Square pixel ratio is selected. Audio is set to stereo format, 44 kHz, 16 bit sampling. The data rate is set to 1739 kbps. The capture device utilizes a Miro codec to create a digital video file in AVI format.

Optionally, a header and footer is provided to the beginning and end of the digital video file. The header and footer include a trademark for the assignee of the present application. Adobe Premier is used to render the header, footer, and watermark to the digital video file. A parameter within Adobe Premier is set to a frame size of 320 x 240. Adobe Premier further utilizes a Miro codec to create a digital video file in AVI format.

The edited AVI file is encoded by RealProducer software. The following parameters are programmed in the RealProducer software. One set of parameters was used for a low-speed network connection at the user computer (hereinafter designated "LO"), and another set of parameters was used for a high-speed network connection at the user computer (hereinafter designated "HI"). RealNetworks "Surestream" technology is selected. Alternatively, "single-stream" can be selected, and an RAM file can be generated to query the connection speed of the user computer and stream the video at the proper connection speed. The encoding speed is set to, for LO, 28 kbps or 56 kbps, and for HI, LAN, DSL, Cable Modem, or T1. Sound quality is set to "voice only" or "stereo music" or "CD quality". Video quality is set to "sharper image". Frame rate is set to 29.97 fps. Target bit rate is set to 350 kbps. The target player is specified as RealPlayer G2. Frame size is set to 320 x 240. Based on these parameters, the RealEncoder software generates an RM file or other streaming video data file, which is subsequently uploaded to RealServer.

The exemplary embodiments disclosed herein provide greatly enhanced streaming video suitable for streaming over a limited-bandwidth network, such as the Internet. Several discoveries have enabled various aspects of this technology. The first discovery was that the efficiency of encoding from a captured digital video file to a streaming video file is increased with an increase in the frame size of the captured digital video file. Thus, while conventional teachings pointed toward minimizing the capturing and encoding frame sizes (typically to 160 x 120 pixels, which has widely become an Internet standard for streaming video) to reduce the size of the resulting file, the present inventors turned away from these teachings and increased the capturing and encoding frame sizes to 320 x 240 pixels. Second, one goal of the present inventors was to achieve full-screen, real video frame rate, streaming video. Conventional teachings would point toward encoding at a frame size of 640 x 480 pixels to achieve full-screen streaming video. However, with today's technology, enlarging the frame size of a captured digital video file during encoding to 640 x 480 (for example, from 160 x 120 pixels) pixels causes an enormous increase in the amount of data in the resulting encoded digital video file and requires enormous bandwidth to stream. Therefore, the present inventors discovered that encoding at 320 x 240 pixels (or its equivalent) provided greatly improved results when doubled to full-screen for viewing.

These conventional teachings were evidenced in the capabilities of the encoder used at the time of invention, namely, RealProducer G2. RealProducer G2 taught away from real video streaming since digital video files that were captured at a real video frame rate (e.g., 30 fps) would be automatically reduced to a lower, non-real video frame rate (e.g., 15 fps) to reduce the size of the streaming video file. Furthermore, digital video files which were captured directly from a capture device using RealProducer G2 were encoded at a frame rate of only 6-7 fps and had no option to adjust frame size. Therefore, to obtain a real video frame rate, the inventors followed the steps in EXAMPLE A above to achieve the first high quality, full-screen, real frame rate streaming video file.

Referring now to FIG. 3, a system 80 for playing a digital video file across a network is shown, and a corresponding method is described. System 80 includes a network server 82 having a processor 84, a storage device 86, and a network interface 88. A capture device 90 is coupled to network server 82 and is configured to capture a video signal, as described hereinabove. Processor 84 controls capture device 90 and provides various parameters to capture device 90 regarding frame size, bit rate, etc. For example, one or more of the methods for capturing video and generating a digital video file described hereinabove may be implemented by processor 84, storage device 86, and capture device 90. Processor 84 and capture device 90 generate a digital video file in a digital video format (e.g., MPEG, AVI, etc.) and store it to storage device 86. As used in this description of FIG. 3, the term "storage device" includes such devices as magnetic tape, a hard drive, a floppy disk, magnetic disk, or other similar non-volatile storage media, but not including random access memory or other temporary memory. The capture process may alternatively be carried out on another computer, after which the resulting digital video file is stored in (e.g., uploaded to) storage device 86.

Network server 82 is coupled through network interface 88 to a network 92, such as the Internet, a LAN, etc. Processor 84 is configured to generate a web page having a hypertext link to the digital video file stored in storage device 86. A network client 94 includes a processor 96, a storage device 98, an input device 100, a display 102, and a network interface 104. Network client 94 is operable via a user to access the web page generated by network server 82 and to actuate the hypertext link to begin downloading the digital video file from storage device 86.

One drawback of downloading video files is that, for very large files, the delay before any portion of the digital video file can be viewed can be on the order of minutes, hours, or longer. Thus, according to one advantageous aspect of system 80, while the digital video file is being downloaded to network client 94 and stored in storage device 98, some of the digital video file which has already been downloaded and stored is being simultaneously played on display 102. A suitable player which supports AVI, MPEG, and other digital video formats is utilized for the video play. This procedure may be referred to as viewing/downloading. Stated another way, a first portion of the digital video file is played from storage device 98 while later portions of the digital video file are still downloading from storage device 86 via network 92 to storage device 98.

One method of launching the player and beginning the play of the first portion is for a user to simply select these steps via input device 100 (e.g., a mouse, a keyboard, etc.) a certain time after the downloading has begun. Alternatively, an algorithm may be provided, either attached to the digital video file (e.g., HTML, Java, a macro, etc.) or as part of the player (e.g., QuickTime, RealPlayer, etc.) which begins playing the digital video file at a predetermined time after the download to storage device 98 has begun. This predetermined time may be pre-programmed or adjusted in real-time based on inputs from client server 94 or network server 82. According to one example, the algorithm calculates the predetermined time based on the download speed (e.g., including network connection speed of network interface 104, etc.), the viewing speed (e.g., frames per second, etc.), and the size of the digital video file. For example, if the viewing speed is four times the download speed, the algorithm monitors the amount of the file (e.g., in bytes) which is downloaded until 75% of the file is downloaded. When 75% of the file is downloaded, the algorithm begins playing the digital video file from storage device 98. By playing the file at this predetermined time, the digital video file will play substantially without delays for buffering. Of course, other predetermined times are contemplated, including those earlier and later than that set forth in this exemplary embodiment.

Thus, one can view a digital video file shortly after clicking on the hypertext link and before the entire digital video file has downloaded to storage device 98. Once the entire digital video file is finished playing, network client 94 retains a copy of the digital video file in storage device 98 for later playing.

According to one alternative, the digital video data is captured in real-time and streamed in real-time across network 92 (i.e., without first storing to storage device 86) to storage device 98.

While the embodiments and applications of the invention illustrated in the FIGS. and described above are presently preferred, it should be understood that these embodiments are offered by way of example only. For example, while the steps of the exemplary embodiments contemplate recording audio and video at one time and streaming the audio and video at another time, the audio and video may alternatively be fed through system 10 in real-time, thereby facilitating real-time audio/video transmissions. Furthermore, the exemplary software programs mentioned may be replaced by newly developed versions and/or programs in the future. Accordingly, the present invention is not limited to a particular embodiment, but extends to various modifications that nevertheless fall within the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A method of streaming video, comprising:

providing a source video signal having a predetermined source video parameter;

converting the source video signal to a streaming digital video file while maintaining substantially the same source video parameter;

uploading the streaming digital video file to a network server;

expanding the viewing frame size of the display screen to a full screen display mode; and

playing the streaming digital video file in the full screen display mode.

2. The method of claim 1, wherein the step of converting the source video signal includes associating a viewing frame size code segment with the streaming digital video file.

3. The method of claim 2, wherein the viewing frame size code segment is hypertext markup language.

4. The method of claim 2, wherein the viewing frame size code segment causes the video to stream upon actuation of a user input device.

5. The method of claim 4, wherein the user actuation includes selection of a hypertext link on a web page, wherein the hypertext link is associated with the streaming digital video file.

6. The method of claim 1, further comprising capturing and encoding the source video signal.

7. The method of claim 6, wherein the source video parameter includes the frame rate.

8. The method of claim 7, wherein the source video frame rate is at least 24 frames per second.

9. The method of claim 6, wherein the source video parameter includes the number of scanned lines of video per frame.

10. The method of claim 1, wherein the size of the full screen display mode is at least 640 x 480 pixels.

11. The method of claim 10, wherein the streaming digital video file has a capture frame size of at least 320 x 240 pixels.

12. The method of claim 6, further comprising editing the source video signal using video editing software.

13. A method of streaming an enhanced digital video file, comprising:

receiving a digital video file;

encoding the received digital video file using a video encoder;

associating a viewing frame size of at least 640 x 480 pixels with the encoded digital video file;

uploading the encoded digital video file to a web page; and

in response to a user request, streaming the uploaded digital video file over the Internet.

14. The method of claim 13, further comprising expanding the viewing frame size of a display screen to a full screen.

15. The method of claim 13, wherein the received digital video file is in the MPEG file format.

16. The method of claim 13, wherein the step of associating includes associating a viewing frame size of approximately 640 x 480 pixels with the encoded digital video file.

17. The method of claim 13, wherein the step of associating includes manually setting the viewing frame size to at least 640 x 480 pixels.

18. The method of claim 13, wherein the user request is received via an Internet web page.

19. The method of claim 13, further comprising, in response to the user request, automatically launching a video player at a user computer.

20. The method of claim 13, wherein the received digital video file has a frame rate of at least 24 frames per second and a frame size of at least 320 x 240 pixels.

21. A system for streaming video, comprising:

means for providing a source video signal having a predetermined source video parameter;

means for converting the source video signal to a streaming digital video file while maintaining substantially the same source video parameter;

means for uploading the streaming digital video file to a network server; and

means for playing the streaming digital video file at a display mode of at least 640 x 480 pixels.

22. The method of claim 21, further comprising means for expanding the viewing frame size of the display screen to a full screen display mode.

23. The system of claim 21, further comprising means for capturing the source video signal to generate the streaming digital video file.

24. The system of claim 23, wherein the means for capturing includes a Dazzle LAV-1000 device.

25. The system of claim 21, further comprising means for editing the streaming digital video file.

26. The system of claim 21, further comprising a means for encoding the digital video file into an RM file format.

27. The system of claim 21, further comprising means for linking the uploaded digital video file to an actuatable input device on a web page.

ABSTRACT OF THE DISCLOSURE

A method of streaming video includes providing a source video signal having a predetermined source video parameter; converting the source video signal to a streaming digital video file while maintaining substantially the same source video parameter; uploading the streaming digital video file to a network server; expanding the viewing frame size of the display screen to a full screen display mode; and playing the streaming digital video file in the full screen display mode.

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I HEREBY DECLARE:

THAT my residence, post office address, and citizenship are as stated below next to my name;

THAT I believe I am the original, first, and sole inventor (if only one inventor is named below) or an original, first, and joint inventor (if plural inventors are named below or in an attached Declaration) of the subject matter which is claimed and for which a patent is sought on the invention entitled

System And Method For Streaming An Enhanced Digital Video File

(Attorney Docket No. 57103/114)

the specification of which (check one)

_X_ is attached hereto.

___ was filed on _______ as United States Application Number or PCT International Application Number ______ and was amended on ______ (if applicable).

THAT I do not know and do not believe that the same invention was ever known or used by others in the United States of America, or was patented or described in any printed publication in any country, before I (we) invented it;

THAT I do not know and do not believe that the same invention was patented or described in any printed publication in any country, or in public use or on sale in the United States of America, for more than one year prior to the filing date of this United States application;

THAT I do not know and do not believe that the same invention was first patented or made the subject of an inventor's certificate that issued in any country foreign to the United States of America before the filing date of this United States application if the foreign application was filed by me (us), or by my (our) legal representatives or assigns, more than twelve months (six months for design patents) prior to the filing date of this United States application;

THAT I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment specifically referred to above;

THAT I believe that the above-identified specification contains a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention, and sets forth the best mode contemplated by me of carrying out the invention; and

THAT I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I HEREBY CLAIM foreign priority benefits under Title 35, United States Code §119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number	Country	Foreign Filing Date	Priority Claimed?	Certified Copy Attached?

I HEREBY CLAIM the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

U.S. Provisional Application Number	Filing Date

I HEREBY CLAIM the benefit under Title 35, United States Code, §120 of any United States application(s), or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Application Number	Parent Filing Date	Parent Patent Number

I HEREBY APPOINT the following registered attorneys and agents of the law firm of FOLEY & LARDNER to have full power to prosecute this application and any continuations, divisions, reissues, and reexaminations thereof, to receive the patent, and to transact all business in the United States Patent and Trademark Office connected therewith:

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I UNDERSTAND AND AGREE THAT the foregoing attorneys and agents appointed by me to prosecute this application do not personally represent me or my legal interests, but instead represent the interests of the legal owner(s) of the invention described in this application.

I FURTHER DECLARE THAT all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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Inventor's signature	
Date	

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Citizenship	Bangladesh
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Inventor's signature	
Date	

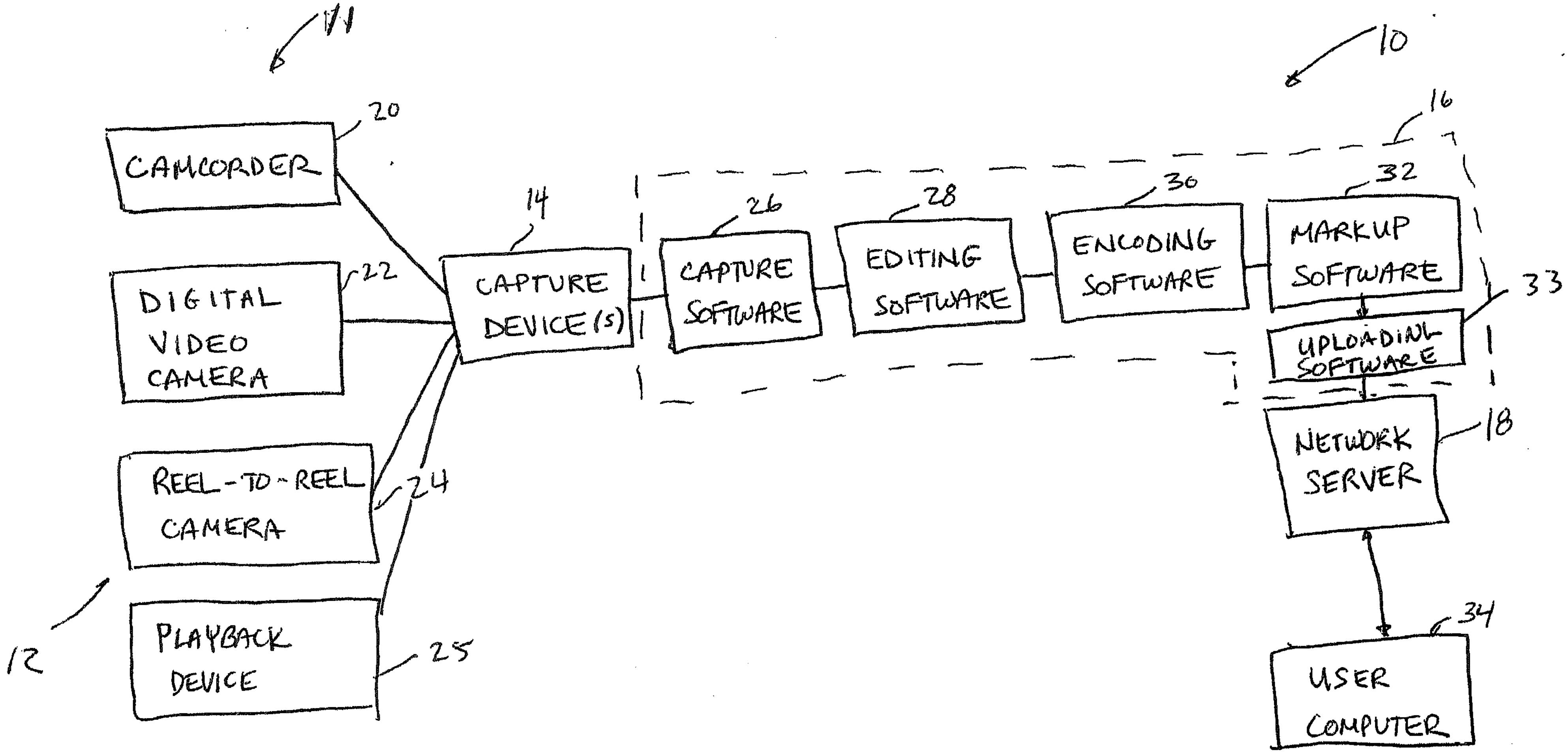
11
10
12
CAMCORDER
20
DIGITAL
VIDEO
CAMERA
22
REEL-TO-REEL
CAMERA
24
PLAYBACK
DEVICE
25
CAPTURE
DEVICE(S)
14
16
CAPTURE
SOFTWARE
26
EDITING
SOFTWARE
28
ENCODING
SOFTWARE
30
MARKUP
SOFTWARE
32
UPLOADING
SOFTWARE
33
NETWORK
SERVER
18
USER
COMPUTER
34

FIG. 1

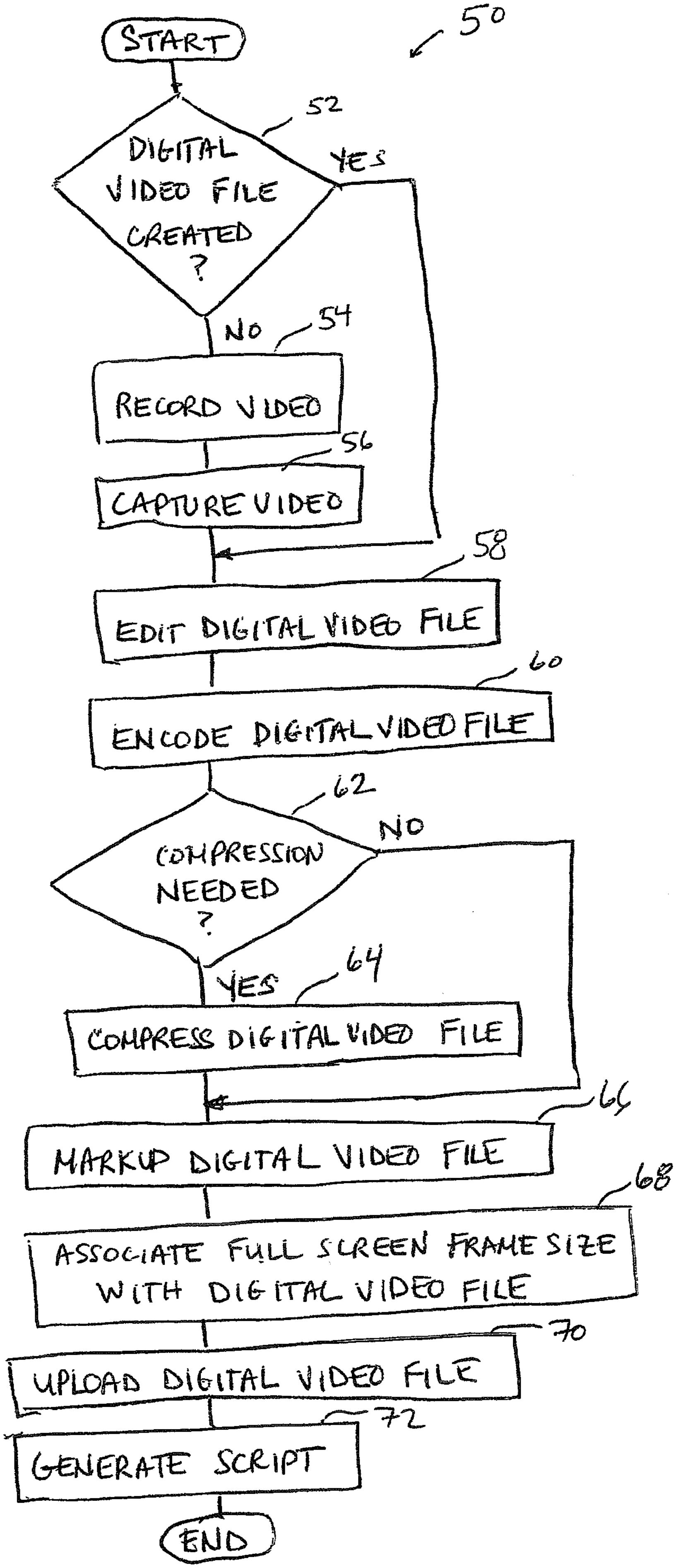
50
START
52
DIGITAL VIDEO FILE CREATED ?
YES
NO
54
RECORD VIDEO
56
CAPTURE VIDEO
58
EDIT DIGITAL VIDEO FILE
60
ENCODE DIGITAL VIDEO FILE
62
COMPRESSION NEEDED ?
NO
YES
64
COMPRESS DIGITAL VIDEO FILE
66
MARKUP DIGITAL VIDEO FILE
68
ASSOCIATE FULL SCREEN FRAME SIZE WITH DIGITAL VIDEO FILE
70
UPLOAD DIGITAL VIDEO FILE
72
GENERATE SCRIPT
END

FIG. 2

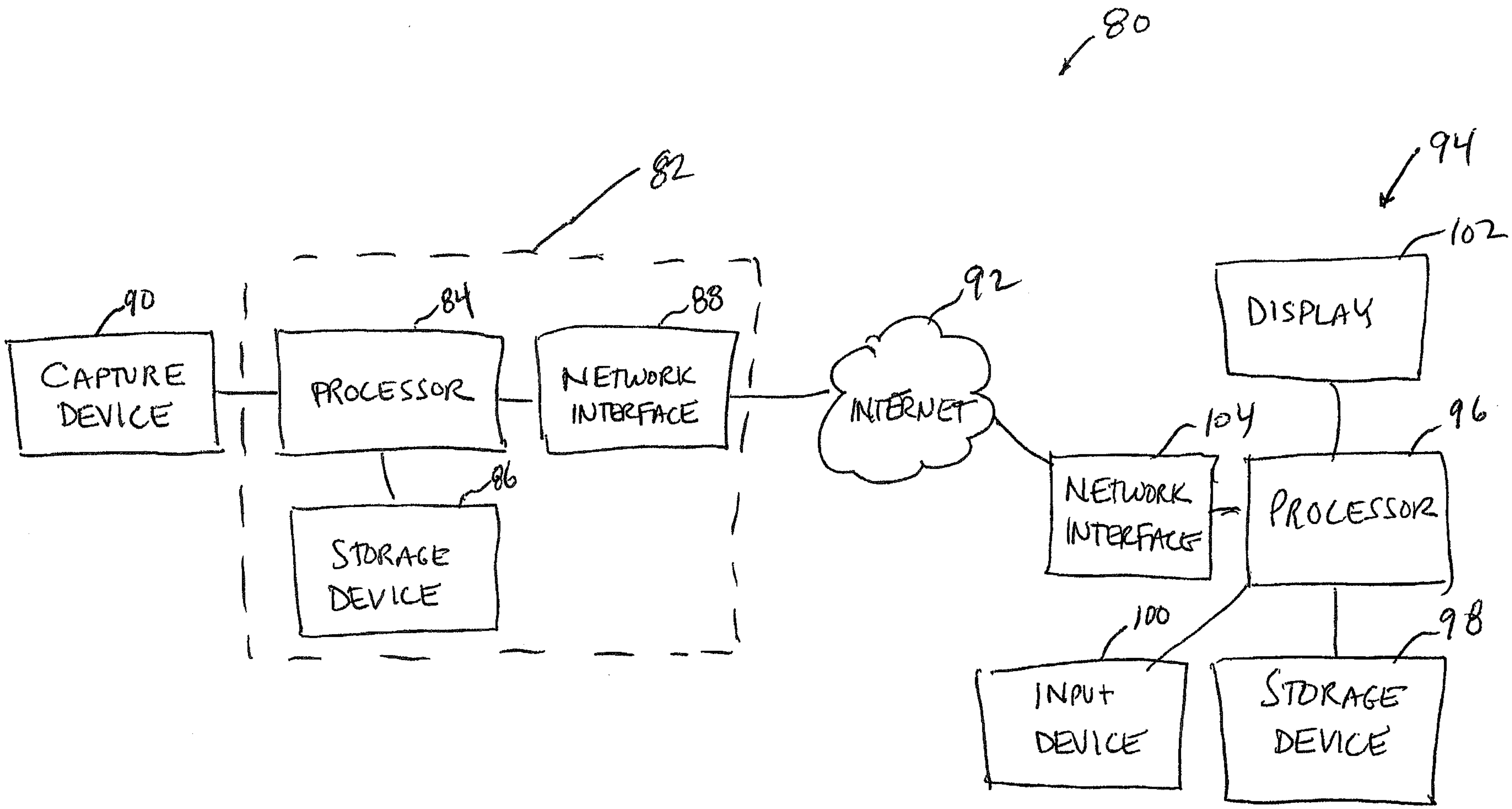
80
82
94
CAPTURE DEVICE
90
PROCESSOR
84
NETWORK INTERFACE
88
STORAGE DEVICE
86
INTERNET
92
DISPLAY
102
NETWORK INTERFACE
104
PROCESSOR
96
INPUT DEVICE
100
STORAGE DEVICE
98

FIG. 3

PA 1150500

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

April 06, 2004

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: *09/587,734*
FILING DATE: *June 05, 2000*

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

L. Edelen

L. EDELEN
Certifying Officer

06-06-00

A

06/05/00 JC813 U.S. PTO

Atty. Dkt. No. 57103/116

JC530 U.S. PTO 09/587734 06/05/00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Bernstein et al.

Title: System And Method For Providing An Enhanced Digital Video File

Appl. No.: Unknown

Filing Date: Unknown

Examiner: Unknown

Art Unit: Unknown

CERTIFICATE OF EXPRESS MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service's "Express Mail Post Office To Addressee" service under 37 C.F.R. § 1.10 on the date indicated below and is addressed to: **Assistant Commissioner for Patents, Washington, D.C. 20231.**

EL640468359US (Express Mail Label Number) June 5, 2000 (Date of Deposit)

Shirley Miksa (Printed Name)

Shirley Miksa (Signature)

UTILITY PATENT APPLICATION TRANSMITTAL

Assistant Commissioner for Patents
Box PATENT APPLICATION
Washington, D.C. 20231

Sir:

Transmitted herewith for filing under 37 C.F.R. § 1.53(b) is the nonprovisional utility patent application of:

Eliot I. Bernstein
Brian G. Utley
Jude R. Rosario

Enclosed are:

[X] Specification, Claim(s), and Abstract (33 pages).

[X] Informal drawings (3 sheets, Figures 1-3).

[X] Unexecuted Declaration and Power of Attorney (4 pages).

[ ] Assignment of the invention to Iviewit.com, Inc..

[ ] Assignment Recordation Cover Sheet.

[ ] Check in the amount of $40.00 for Assignment recordation.

[ ] Small Entity statement.

[ ] Information Disclosure Statement.

001.793794.1

06/05/00 09587734

[ ] Form PTO-1449 with copies of ___ listed reference(s).

The filing fee is calculated below:

	Claims as Filed		Included in Basic Fee		Extra Claims		Rate		Fee Totals
Basic Fee							$690.00		$690.00
Total Claims:	55	-	20	=	35	x	$18.00	=	$630.00
Independents:	6	-	3	=	3	x	$78.00	=	$234.00
If any Multiple Dependent Claim(s) present:						+	$260.00	=	$0.00
							SUBTOTAL:	=	$1554.00
[ ]	Small Entity Fees Apply (subtract ½ of above):							=	$0.00
							TOTAL FILING FEE:	=	$1554.00

[ ] A check in the amount of $1,554.00 to cover the filing fee is enclosed.

[X] The required filing fees are not enclosed but will be submitted in response to the Notice to File Missing Parts of Application.

[ ] The Assistant Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 06-1447. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Assistant Commissioner is authorized to charge the unpaid amount to Deposit Account No. 06-1447.

Please direct all correspondence to the undersigned attorney or agent at the address indicated below.

Respectfully submitted,

Date 6/5/00

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[ ] Form PTO-1449 with copies of ___ listed reference(s).

The filing fee is calculated below:

	Claims as Filed		Included in Basic Fee		Extra Claims		Rate		Fee Totals
Basic Fee							$690.00		$690.00
Total Claims:	55	-	20	=	35	x	$18.00	=	$630.00
Independents:	6	-	3	=	3	x	$78.00	=	$234.00
If any Multiple Dependent Claim(s) present:						+	$260.00	=	$0.00
							SUBTOTAL:	=	$1554.00
[ ]	Small Entity Fees Apply (subtract ½ of above):							=	$0.00
							TOTAL FILING FEE:	=	$1554.00

[ ] A check in the amount of $1,554.00 to cover the filing fee is enclosed.

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[ ] The Assistant Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 06-1447. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Assistant Commissioner is authorized to charge the unpaid amount to Deposit Account No. 06-1447.

Please direct all correspondence to the undersigned attorney or agent at the address indicated below.

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57103/116

UNITED STATES PATENT APPLICATION

for

SYSTEM AND METHOD FOR PROVIDING AN ENHANCED DIGITAL VIDEO FILE

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TITLE OF THE INVENTION

SYSTEM AND METHOD FOR PROVIDING AN ENHANCED DIGITAL VIDEO FILE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 60/137,297, filed June 3, 1999, U.S. Provisional Application No. 60/155,404, filed September 22, 1999, U.S. Provisional Application No. 60/169,559, filed December 8, 1999, and PCT International Application No. __________, filed June 2, 2000.

FIELD OF THE INVENTION

The present invention relates generally to video imaging. More specifically, the present invention relates to a system and method for providing high quality digital video files for streaming across a network.

BACKGROUND OF THE INVENTION

Streaming video is a technique by which video is played in real time as it is downloaded over the Internet, as opposed to storing it in a local file first. A video player decompresses and plays the data as it is transferred to a user computer over the World-Wide Web. Streaming video avoids the delay entailed in downloading an entire file and then playing it with a plug-in application. Streaming video requires a communications connection (e.g., a network, Internet, etc.) and a computer powerful enough to execute the decompression algorithm in real time.

In the field of streaming video, the primary design challenge is that the viewer desires perfect video quality over a limited-bandwidth network. Perfect video quality requires an enormous amount of digital data. Today's networks are not capable of providing life-like, full motion, full screen streaming video.

It is known to capture video using a capture device, compress the resulting captured video, store the compressed video, and send the compressed video across the Internet. However, prior attempts have failed to produce high quality streaming video that can be transmitted over the Internet. For example, prior attempts at streaming video have been unable to produce full-screen, real video frame rate video at any acceptable quality.

Several teachings have emerged that attempt to improve the quality and decrease the file size of streaming video. One teaching in the art is to reduce the number of frames per second that are being encoded, from the 25 to 30 fps of standard television to 6 or 7 fps or less for streaming video. While this reduces the amount of data that is being sent, the video appears jittery and corresponding voice appears asynchronous with the jittery video. Another teaching in the art is to capture the video at a small frame size of 160 x 120 or less. The small frame size of 160 x 120 is the widely used standard in Internet streaming video. Further teachings are directed to reducing the amount of data that is provided prior to compressing to reduce the file size resulting from compression. Other teachings in the art have pointed toward compressing a digital video file as much as possible prior to transmission. Full-screen, full-motion video has historically been viewed as requiring far too much data for transmission over a limited-bandwidth network.

Accordingly, there is a need for an improved system and method for providing an enhanced digital video file for streaming across a network. Further, there is a need for a digital video file having high quality at various screen sizes with minimal quality loss when the video is expanded to full screen size. Further still, there is a need for a digital video file having a real video frame rate that can be streamed across a limited bandwidth network, such as the Internet. Further yet, there is a need for a video transmission which, once commenced, need not be stopped.

BRIEF SUMMARY OF THE INVENTION

According to an exemplary embodiment, a method of providing a streaming video file includes providing digital video data having a capture frame size of at least 69,300 pixels per frame and converting the digital video data to a streaming video file having a converted frame size of at least 69,300 pixels per frame.

According to another exemplary embodiment, a method of providing a streaming video file includes providing digital video data having a capture frame rate of at least 24 frames per second and converting the digital video data to a streaming video file having a converted frame rate of at least 24 frames per second.

According to yet another exemplary embodiment, a method of providing a streaming video file includes obtaining a source video signal having a predetermined source video parameter; capturing the source video signal while maintaining substantially the same source video parameter to provide a captured digital video file; and encoding the captured digital video file while maintaining substantially the same source video parameter to provide a streaming video file.

According to still another exemplary embodiment, a method of generating a streaming video file for streaming over the Internet includes providing digital video data having a capture frame size of at least 320 x 240 pixels; compressing the digital video; data; encoding the digital video data into a streaming video file, wherein the streaming video file has a frame size of at least 320 x 240 pixels; uploading the streaming video file to an Internet server.

According to still another exemplary embodiment, a system for providing a streaming video file includes means for providing digital video data having a capture frame size of at least 320 x 240 pixels and means for converting the digital video data to a streaming video file having a converted frame size of at least 320 x 240 pixels.

According to still another exemplary embodiment, a system for providing a streaming video file includes means for providing digital video data having a capture frame rate of at least 24 frames per second and means for converting the digital video data to a streaming video file having a converted frame rate of at least 24 frames per second.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will become more fully understood from the following detailed description, taken in conjunction with the accompanying drawings, wherein like reference numerals refer to like parts, in which:

FIG. 1 is a block diagram of a system for generating an enhanced digital video file according to an exemplary embodiment;

FIG. 2 is a flowchart of a method for generating an enhanced digital video file according to the exemplary embodiment of FIG. 1; and

FIG. 3 is a block diagram of a system for playing a digital video file across a network.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, a system 10 for generating an enhanced digital video file is shown. System 10 may be used as shown, or portions of system 10 may be integrated with other video processing systems, such as medical imaging equipment, motion picture production equipment, etc. System 10 generates a digital video file expandable to a full screen size and having a real video frame rate (i.e., life-like, smooth, not jerky, comparable with recorded video formats, such as, NTSC (National Television Standards Committee) at 29.97 frames per second (fps), PAL (Phase Alternative Line) at 25 fps, and SECAM (Séquentiel Couleur Avec Mémoire) at 25 fps)) with a file size that is suitable for streaming over the Internet, for such uses as high definition television, Web television, computers and servers utilized in wireless environments, etc.

As known in the art, video is recorded having certain standard recorded video parameters, such as, frame rate, and number of lines scanned. For example, it is will known that a source conforming to the NTSC (National Television Standards Committee) standard operates at 29.97 frames per second (fps), a source conforming to the PAL (Phase Alternative Line) standard operates at 25 fps, and a source conforming to the SECAM (Séquentiel Couleur Avec Mémoire) standard operates at 25 fps. It is will known in the art that the NTSC standard includes two interleaved frames at 240 lines scanned, while the PAL standard is 270 lines scanned. Note that the number of lines scanned corresponds to the number of vertical pixels in a standard 320 x 240 frame size compatible with standard capture cards, such as, a Dazzle LAV-1000S capture device manufactured by Dazzle, Inc. of Fremont, California.

System 10 includes one or more sources, including recording devices 12 or playback device 25, a capture device 14, a computer 16, and a network server 18. Recording devices 12 include a camcorder 20, a digital video camera 22, and a reel-to-reel camera 24, each of which may be hand-held or mounted on a tripod or stand. System 10 may include a playback device 25 (e.g., tape player, VHS (Vertical Helix Scan) player, Beta player, DVD (Digital Versatile Disk) player, etc.). Camcorder 20 may be a VHS recorder, Beta recorder, or other camcorder, and is configured to store video on magnetic tape. Digital video camera 22 may be any type of digital video camera configured to generate video in a digital format. In this exemplary embodiment, digital video camera 22 stores the digital video data to a tape. Digital video camera 22 is configured to provide digital video data in real time or via the tape in a digital format, such as, Beta digital, AVI, MOV, MPEG (Motion Picture Experts Group), or other format compatible with the IEEE 1394 standard, etc., to capture device 14. AVI is an audio/video standard designed by Microsoft Corp., Redmond, Washington. According to one exemplary embodiment, a digital video camera including 3CCD technology is used to record the video. The 3CCD technology (3-chip charge-coupled device) includes a dichroic prism and three CCDs, each CCD being aligned to detect only the red, green, or blue color. A 3CCD camera will provide enhanced color resolution. Reel-to-reel camera 24 includes recording equipment that uses magnetic tape which must be threaded through the equipment and onto an empty reel. According to one alternative embodiment, a separate audio recording device, such as a microphone, may be utilized in conjunction with recording devices 12, in which embodiment recording devices 12 are used to record only video. Other recording devices may be used, such as, devices optimized for live video-conferencing.

Computer 16 includes a processor, memory, magnetic storage device, input/output devices and circuitry, etc. Computer 16 may include multiple computer at multiple sites, with different portions of the process described hereinafter operating on different computers.

Capture device 14 is coupled to one or more of sources 11. Capture device 14 is shown external to computer 16, but may alternatively be an internal capture device coupled within the housing of computer 16 or an internal capture device within the housing of one of recording devices 12 or playback device 25. In this exemplary embodiment, a Dazzle LAV-1000S capture device is utilized, though other capture devices may be used, such as a Pinnacle DC10PLUS or Pinnacle DC30PRO device, both manufactured by Pinnacle Systems, Inc., Mountain View, California, or a MotoDV Mobile capture device, manufactured by Digital Origin, Inc., Mountain View, California. Capture software 26, such as Amigo 2.11, manufactured by Dazzle, Inc. or Adobe Premier 5.1, manufactured by Adobe Systems Inc., San Jose, California, is operable on computer 16 to interface capture device 14 with computer 16. Other capture software may be utilized, such as, RealProducer G2, manufactured by RealNetworks, Inc., Seattle, Washington.

In conjunction with capture software 26, capture device 14 is configured to receive a video signal from one of recording devices 12 or playback device 25, to digitize the video signal, and to store the video signal as a digital video file. The parameters of the video capture will be discussed below with reference to FIG. 2. The digital video file is an MPEG-1 file in this exemplary embodiment, but may alternatively be generated in other digital video formats, such as, MPEG-2, AVI, etc. Capture device 14 is a combined audio/video capture device, but may alternatively include discrete audio and video capture devices, the audio capture device configured to digitize any audio which corresponds to the video being captured by the video capture device. As a further alternative, audio captured device may be utilized alone without a video capture device. The audio capture device may be, for example, a Montego II device, manufactured by Voyetra Turtle Beach, Inc., Yonkers, New York, and configured to generate a digital audio file in a digital audio format, such as, PCM (Pulse Code Modulation).

Editing software 28 is operable on computer 16. In this exemplary embodiment, Adobe Premier 5.1 is utilized, though other video editing software may be used. Editing software 28 receives the captured digital video file and enables an operator to edit the digital video file by adding or deleting frames, adjusting the color, contrast, and brightness of the frames, etc. The edits are then saved to the digital video file or can be exported to AVI or MOV file types.

Encoding software 30 is operable on computer 16. In this exemplary embodiment, RealProducer G2 is utilized, though other encoding software may be used. Encoding software 30 receives the edited digital video file and encodes the digital video file into an encoded format, such as, an RM format. Encoding software 30 may also compress the digital video file, if needed, to reduce the size of the digital video file, using a video compression algorithm, such as MPEG-1, MPEG-4, etc.

Markup software 32 is operable on computer 16. In this exemplary embodiment, a hypertext markup language (e.g., HTML, Dynamic HTML, Cold Fusion) is utilized. An operator marks up the encoded digital video file in HTML to prepare the digital video file for uploading to the network server 18. In this exemplary embodiment, a code segment representing a full screen frame size, such as 640 x 480 pixels, is associated with the digital video file in the HTML code. The full screen frame size code segment may alternatively include other screen sizes, such as 800 x 600 pixels, 1024 x 768 pixels, 1280 x 1024 pixels, and 1600 x 1200 pixels. During a subsequent video streaming step, the full screen frame size code segment causes or enables a video player program, such as RealPlayer, manufactured by RealNetworks, Inc., to enlarge the streaming video to a full screen frame size, such as 640 x 480 pixels.

References herein to frame sizes in pixels, such as, 320 x 240 pixels, 640 x 480 pixels, are intended to include equivalent frames sizes thereto. For example, it is known that a frame size of 320 x 240 pixels may include an additional number of unneeded pixels (e.g., which can be as much as 10% of the total pixels) attributed to overscan. Thus, one equivalent to a 320 x 240 pixel frame size is 304 x 228 pixels. As a second example, when rectangular pixels are used, the exact pixel count differs from the stated frame size. Thus, one equivalent to a 320 x 240 pixel frame size is 352 x 240. Accordingly, references to frame sizes in pixels are intended to included these and other equivalent frame sizes, and the teachings herein include any and all such insubstantial variations.

The uploading process utilizes uploading software 33, such as, a Web FTP (file transfer protocol) software (e.g., WS FTP PRO, manufactured by Ipswitch, Inc., Lexington, Massachusetts.) The digital video file is uploaded to network server 18, which includes a computer configured to generate a web page on an internet-protocol network, such as the Internet or a company-wide intranet. A web page is a block of data written in a markup language, such as HTML, and any related files for scripts and graphics. Network server 18 may alternatively be coupled to a non-internet-protocol network, such as, an ethernet, a local area network, a wide area network, a wireless network, etc.

A user computer 34 may access the web page provided by network server 18 via a network, such as, the Internet. Upon actuating a user input device (e.g., a web page button, hypertext link, etc.) associated with the uploaded digital video file, the HTML code launches a suitable video player program (e.g., RealPlayer) at user computer 34, activates the full screen frame size at user computer 34, and streams the video from the digital video file to user computer 34. Alternatively, the video player program may initially play the streaming video at a smaller frame size (e.g., 320 x 240), and the user may actuate a user input device on the video player to enlarge the streaming video to a full-screen size, such as 640 x 480. Notably, capture software 26, editing software 28, encoding software 30, markup software 32, and uploading software

33 may be operable on one computer or on different computers during different steps in the process.

According to one alternative embodiment, the encoded digital video file is stored directly to a storage device, such as, a compact disk, a digital video disk, a magnetic storage device, etc., for subsequent viewing on another computer, on a personal digital assistant (e.g., a Palm Pilot manufactured by Palm, Inc., Santa Clara, California), etc. According to another alternative embodiment, digital video data is provided on a storage device (e.g., a floppy disk, a hard disk storage, etc.) which has been pre-captured. The pre-captured digital video data is provided in a compressed or uncompressed digital video format to encoding software 30 for subsequent processing.

Referring now to FIG. 2, a method 50 for generating an enhanced digital video file according to the exemplary embodiment of FIG. 1 is shown. Method 50 is operable using one or more of the elements of system 10, as needed. While the steps of method 50 are explained with reference to captured video, it is understood that captured audio may be processed along with the captured video, or perhaps processed independently in a similar manner. As will be seen, the recorded video will be captured and encoded at near-optimal levels, as determined by the selected parameters in these processes, thereby preserving the highest quality video content. While exemplary values are presented herein for such parameters, it is understood that one of ordinary skill in the art will recognize other combinations of parameters based on these teachings.

According to one exemplary embodiment, a customer provides pre-recorded video saved to a disk or other storage device. At step 52, if the video has been pre-recorded by the customer, the method proceeds to step 58. If the video has not yet been recorded, at step 54, video is recorded using one or more of recording devices 12 or playback device 25. The video is recorded into any suitable format, such as, VHS or Beta, and is played back using a television standard, such as, NTSC (National Television Standards Committee), PAL (Phase Alternative Line), SECAM (Séquentiel Couleur Avec Mémoire), a digital format, such as, AVI, MOV, MPEG, a digital format compatible with the IEEE 1394 standard, or another format, etc. At step 56, the video is captured by coupling one of recording devices 12 or playback device 25 to capture device 14, which is an external Dazzle LAV-1000 capture device in this exemplary embodiment, but may alternatively be an internal card or other capture devices, such as a Pinnacle DC10 device.

Capture software is also utilized, such as, Amigo 2.11, Adobe Premier 5.1 or Real Producer G2. Capture device 14 and capture software 26 generate a digital video file based on the recorded video. If the recorded video is in an analog format, capture device 14 digitizes the analog video to create digital video data. If the recorded video is in a digital format, capture device 14 merely receives the digital video data and formats a file in the appropriate standard (e.g., AVI, MOV, MPEG1, etc.). According to one exemplary embodiment, capture software 26 is set for real video capture, i.e., having a frame rate of a television or movie standard, such as, 29.97 frames per second. Real video capture may further have a frame rate of between 24 and 30 frames per second, or at least substantially more than the 6 to 9 frames per second conventionally used in streaming video applications. Further, the video is captured with at least approximately 76,800 pixels per frame (at least approximately 69,000 pixels taking into consideration overscan). For a 4:3 aspect ratio, the frame size of the video capture is at least 320 x 240 in this exemplary embodiment (at least 304 x 228 taking into consideration overscan), or at least more than the 160 x 120 used in conventional streaming video applications. Frame sizes of 480 x 320 and 640 x 480 may also be utilized in the video capture. However, particularly advantageous results are associated with the 320 x 240 capture frame size.

In an alternative embodiment, a separate audio capture device is utilized in parallel with the video capture device. In the alternative embodiment, corresponding audio capture software is operable on computer 16 to digitize the audio into a digital audio format, such as PCM. The sampling rate is between 44 and 48 kiloHertz (kHz); the bus size is 16-bit, allowing an audio resolution of 16-bits; and the audio is sampled in stereo. These parameters may also be set using the video capture software in an embodiment wherein video and audio are captured using one capture device.

The captured video data may be stored as a data file in a storage device (e.g., a hard drive) or may be stored in memory and fed directly to an encoder. The captured video data may further be compressed, for example, to an MPEG-1 file before being saved to the storage device.

At step 58, the digital video file is edited using a video editing software, such as, Adobe Premier 5.1. Adobe Premier 5.1 generates an output file in a MOV or AVI format, but may alternatively generate an output file in any digital video format. The edited digital video file may be stored in the storage device. Step 58 is optional but, if included, preferably Adobe Premier 5.1 maintains a frame size of at least 320 x 240 pixels and a real video frame rate.

At step 60, the edited digital video file is converted or encoded using a video encoding algorithm to create a streaming video file. The edited digital video file is first retrieved from the storage device (unless the digital video data is provided directly from capture device 14). In this exemplary embodiment, the digital video file is encoded to a RealMedia format (i.e., RM) using a RealNetworks encoding algorithm. RM is an audiovisual file format proprietary to RealNetworks, Inc. As a further alternative, Windows Media Encoder, manufactured by Microsoft Corp., may be utilized to encode the captured digital video file, for example, to an ASF format (Advanced Streaming Format) or ASX format. Further still, QuickTime, manufactured by Apple Computer, Inc., Cupertino, California, may be utilized to encode the captured digital video file, for example, to an MOV format.

Encoding may additionally include compression, if a smaller file size is desirable, as indicated by steps 62 and 64. The amount of compression may be selected by the operator using encoding software 30 or alternative compression software. During the encoding process, the digital video file is encoded to have a data rate of between approximately 35 kbps (kilobits per second) to 750 kbps, and a frame rate of between approximately 24 fps (frames per second) and 30 fps (e.g. 29.97 fps.). The number of pixels per frame is set to at least approximately 76,800 (again, at least approximately 69,000 pixels taking into consideration overscan) which, for a 4:3 aspect ratio, is 320 x 240 pixels (again, at least 304 x 228 pixels taking into consideration overscan), or at least more than the 160 x 120 pixels of conventional usage. However, editing, encoding, and compression are optional steps.

At step 66, the digital video file is marked up with a markup language, such as, HTML. At step 68, a full screen frame size is associated with the digital video file. A full screen frame size is at least 640 x 480 pixels, and may also be 800 x 600 pixels, 1024 x 768 pixels, 1280 x 1024 pixels, 1600 x 1200 pixels, etc. In this exemplary embodiment, the markup language associated with the digital video file includes a code segment that causes the digital video file to stream at the desired full screen frame size. While the markup language is used to associate the full screen frame size code segment with the digital video file in this exemplary embodiment, the full screen frame size code segment may be associated with the digital video file in another step of the method, such as the encode step 60, compression step 62, or another step.

At step 70, the digital video file is uploaded to an Internet web page using uploading software, such as, WS FTP PRO. At step 72, a script (e.g., an ASCII file (American Standard Code for Information Interchange)) is associated with the marked-up digital video file. The script calls the video to stream in response to a user actuation from user computer 34. The script is written in a RAM format, such as from a Microsoft Notepad software program. The script is included in the markup language associated with the digital video file. In this exemplary embodiment, an actuatable user input device (e.g., a hypertext link) is associated with the HTML code.

Thus, a user from anywhere in the world may access network server 18 via the Internet, actuate the user input device, and call the video to stream. Upon actuation, the HTML codes launch video playing software (e.g., RealPlayer) at the user computer, enlarge the viewing window of the software to full screen mode (i.e., at least 640 x 480), and begin streaming the video to the user computer. Alternatively, the user may expand the viewing screen to full screen mode by actuating an input device on the video player software. Other methods of expanding the viewing screen to a full screen are contemplated. The transmission speed of the digital video file is dependent upon the bandwidth of the user's network connection, but may range from approximately 35 kbps to 750 kbps, or as low as 28.8 kbps, with a frame rate of between approximately 24 fps to 29.97 or 30 fps.

According to one alternative embodiment, network server 18 is configured to query user computer 34 to ascertain the network connection used by computer 34 (e.g., 28.8 kbps modem, T1 line, ISDN, etc.). Thereafter, network server 18 determines the appropriate transmission rate based on the ascertained network connection.

EXAMPLE A

A Sony DCR VX-1000 digital video camera, having 3CCD technology, manufactured by Sony Electronics, Inc., Park Ridge, N.J., was utilized to record a video signal. The video camera generated an output signal of 6MHz in NTSC format.

A Dazzle LAV-1000S external capture device was coupled to the video camera. Amigo 2.11, Dazzle's capture software was used. The Dazzle capture device and capture software were programmed with several parameters. The frame size was left at the default setting of 320 x 240 pixels. The frame speed was set to 29.97 frames per second. The bit rate was set to 3.0 Megabits (Mb) per second. The audio capture was set to 44 kHz, 16 bit sampling rate. An MPEG-1 file was generated based on the video signal using the capture device and software programmed with these parameters.

When the captured MPEG-1 file was provided to RealEncoder G2, the resulting encoded file failed to retain the real video frame rate. Therefore, Adobe Premier 5.1 was utilized to receive the MPEG-1 file and export it to a MOV or AVI or MPEG file., based on several parameters. The frame rate in Adobe Premier 5.1 was set to 29.97 fps. The frame size was set to 320 x 240. The "Quality" setting, representing the number of colors to appear in the edited file, was set to a high setting (e.g., 100%). Adobe Premier 5.1 generated an AVI file or an MOV file or a MPEG file, depending upon the operator selection.

RealEncoder G2 software was used to encode the AVI or MOV file into a streaming video file in RM format. The RealEncoder G2 software was programmed with several parameters. The bitrate was set to 220 kbps. The frame rate was set to 30 fps. The "Surestream" option was selected. "Surestream" technology adjusts the playing speed of the encoded digital video file to accommodate the network connection speed of the user. For sound quality, "stereo/music", the highest quality, was selected. For image quality, "sharpest image", the highest quality, was selected. Regarding frame size, this version of RealEncoder generated an output signal having a frame size equal to that of the frame size of the MOV or AVI input file. RealEncoder compressed the MOV or AVI input file using the RealNetworks compression algorithm. An RM file was generated based on the these parameters.

The RM file was uploaded to an Internet server. Using Microsoft Notepad, a script was written in RAM format to 1) identify the location of the RM file, 2) launch RealPlayer on the user computer, 3) resize the viewing screen on the user computer to 640 x 480, and 4) begin the video stream. The result was unexpectedly high-quality, full-screen, real video frame rate, streaming video. The RM file was subsequently streamed to a client computer via a telephone modem and via other broadband connections. The same unexpectedly high-quality, full-screen, real video frame rate, streaming video was experienced. The streaming playback was intermittent due to the need to buffer to accommodate the lower bit-rate of transmission.

EXAMPLE B

According to another example, an NTSC analog signal is provided to a Pinnacle DC-10PLUS capture device. The Pinnacle capture device and associated software generate a digital video file in AVI format based on several parameters. The capture type is set to NTSC. The frame size is set to 320 x 240 pixels, or "1/4 full frame size". Brightness, sharpness, and color are adjusted, as desired. The compression rate is set to 2.5:1. The frame rate is set to 29.97. Square pixel ratio is selected. Audio is set to stereo format, 44 kHz, 16 bit sampling. The data rate is set to 1739 kbps. The capture device utilizes a Miro codec to create a digital video file in AVI format.

Optionally, a header and footer is provided to the beginning and end of the digital video file. The header and footer include a trademark for the assignee of the present application. Adobe Premier is used to render the header, footer, and watermark to the digital video file. A parameter within Adobe Premier is set to a frame size of 320 x 240. Adobe Premier further utilizes a Miro codec to create a digital video file in AVI format.

The edited AVI file is encoded by RealProducer software. The following parameters are programmed in the RealProducer software. One set of parameters was used for a low-speed network connection at the user computer (hereinafter designated "LO"), and another set of parameters was used for a high-speed network connection at the user computer (hereinafter designated "HI"). RealNetworks "Surestream" technology is selected. Alternatively, "single-stream" can be selected, and an RAM file can be generated to query the connection speed of the user computer and stream the video at the proper connection speed. The encoding speed is set to, for LO, 28 kbps or 56 kbps, and for HI, LAN, DSL, Cable Modem, or T1. Sound quality is set to "voice only" or "stereo music" or "CD quality". Video quality is set to "sharper image". Frame rate is set to 29.97 fps. Target bit rate is set to 350 kbps. The target player is specified as RealPlayer G2. Frame size is set to 320 x 240. Based on these parameters, the RealEncoder software generates an RM file or other streaming video data file, which is subsequently uploaded to RealServer.

The exemplary embodiments disclosed herein provide greatly enhanced streaming video suitable for streaming over a limited-bandwidth network, such as the Internet. Several discoveries have enabled various aspects of this technology. The first discovery was that the efficiency of encoding from a captured digital video file to a streaming video file is increased with an increase in the frame size of the captured digital video file. Thus, while conventional teachings pointed toward minimizing the capturing and encoding frame sizes (typically to 160 x 120 pixels, which has widely become an Internet standard for streaming video) to reduce the size of the resulting file, the present inventors turned away from these teachings and increased the capturing and encoding frame sizes to 320 x 240 pixels. Second, one goal of the present inventors was to achieve full-screen, real video frame rate, streaming video. Conventional teachings would point toward encoding at a frame size of 640 x 480 pixels to achieve full-screen streaming video. However, with today's technology, enlarging the frame size of a captured digital video file during encoding to 640 x 480 (for example, from 160 x 120 pixels) pixels causes an enormous increase in the amount of data in the resulting encoded digital video file and requires enormous bandwidth to stream. Therefore, the present inventors discovered that encoding at 320 x 240 pixels (or its equivalent) provided greatly improved results when doubled to full-screen for viewing.

These conventional teachings were evidenced in the capabilities of the encoder used at the time of invention, namely, RealProducer G2. RealProducer G2 taught away from real video streaming since digital video files that were captured at a real video frame rate (e.g., 30 fps) would be automatically reduced to a lower, non-real video frame rate (e.g., 15 fps) to reduce the size of the streaming video file. Furthermore, digital video files which were captured directly from a capture device using RealProducer G2 were encoded at a frame rate of only 6-7 fps and had no option to adjust frame size. Therefore, to obtain a real video frame rate, the inventors followed the steps in EXAMPLE A above to achieve the first high quality, full-screen, real frame rate streaming video file.

Referring now to FIG. 3, a system 80 for playing a digital video file across a network is shown, and a corresponding method is described. System 80 includes a network server 82 having a processor 84, a storage device 86, and a network interface 88. A capture device 90 is coupled to network server 82 and is configured to capture a video signal, as described hereinabove. Processor 84 controls capture device 90 and provides various parameters to capture device 90 regarding frame size, bit rate, etc. For example, one or more of the methods for capturing video and generating a digital video file described hereinabove may be implemented by processor 84, storage device 86, and capture device 90. Processor 84 and capture device 90 generate a digital video file in a digital video format (e.g., MPEG, AVI, etc.) and store it to storage device 86. As used in this description of FIG. 3, the term "storage device" includes such devices as magnetic tape, a hard drive, a floppy disk, magnetic disk, or other similar non-volatile storage media, but not including random access memory or other temporary memory. The capture process may alternatively be carried out on another computer, after which the resulting digital video file is stored in (e.g., uploaded to) storage device 86.

Network server 82 is coupled through network interface 88 to a network 92, such as the Internet, a LAN, etc. Processor 84 is configured to generate a web page having a hypertext link to the digital video file stored in storage device 86. A network client 94 includes a processor 96, a storage device 98, an input device 100, a display 102, and a network interface 104. Network client 94 is operable via a user to access the web page generated by network server 82 and to actuate the hypertext link to begin downloading the digital video file from storage device 86.

One drawback of downloading video files is that, for very large files, the delay before any portion of the digital video file can be viewed can be on the order of minutes, hours, or longer. Thus, according to one advantageous aspect of system 80, while the digital video file is being downloaded to network client 94 and stored in storage device 98, some of the digital video file which has already been downloaded and stored is being simultaneously played on display 102. A suitable player which supports AVI, MPEG, and other digital video formats is utilized for the video play. This procedure may be referred to as viewing/downloading. Stated another way, a first portion of the digital video file is played from storage device 98 while later portions of the digital video file are still downloading from storage device 86 via network 92 to storage device 98.

One method of launching the player and beginning the play of the first portion is for a user to simply select these steps via input device 100 (e.g., a mouse, a keyboard, etc.) a certain time after the downloading has begun. Alternatively, an algorithm may be provided, either attached to the digital video file (e.g., HTML, Java, a macro, etc.) or as part of the player (e.g., QuickTime, RealPlayer, etc.) which begins playing the digital video file at a predetermined time after the download to storage device 98 has begun. This predetermined time may be pre-programmed or adjusted in real-time based on inputs from client server 94 or network server 82. According to one example, the algorithm calculates the predetermined time based on the download speed (e.g., including network connection speed of network interface 104, etc.), the viewing speed (e.g., frames per second, etc.), and the size of the digital video file. For example, if the viewing speed is four times the download speed, the algorithm monitors the amount of the file (e.g., in bytes) which is downloaded until 75% of the file is downloaded. When 75% of the file is downloaded, the algorithm begins playing the digital video file from storage device 98. By playing the file at this predetermined time, the digital video file will play substantially without delays for buffering. Of course, other predetermined times are contemplated, including those earlier and later than that set forth in this exemplary embodiment.

Thus, one can view a digital video file shortly after clicking on the hypertext link and before the entire digital video file has downloaded to storage device 98. Once the entire digital video file is finished playing, network client 94 retains a copy of the digital video file in storage device 98 for later playing.

According to one alternative, the digital video data is captured in real-time and streamed in real-time across network 92 (i.e., without first storing to storage device 86) to storage device 98.

While the embodiments and applications of the invention illustrated in the FIGS. and described above are presently preferred, it should be understood that these embodiments are offered by way of example only. For example, while the steps of the exemplary embodiments contemplate recording audio and video at one time and streaming the audio and video at another time, the audio and video may alternatively be fed through system 10 in real-time, thereby facilitating real-time audio/video transmissions. Furthermore, the exemplary software programs mentioned may be replaced by newly developed versions and/or programs in the future. Accordingly, the present invention is not limited to a particular embodiment, but extends to various modifications that nevertheless fall within the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A method of providing a streaming video file, comprising:

providing digital video data having a capture frame size of at least 69,300 pixels per frame; and

converting the digital video data to a streaming video file having a converted frame size of at least 69,300 pixels per frame.

2. The method of claim 1, wherein the capture frame size has an aspect ratio of 4:3 and the converted frame size of has an aspect ratio of 4:3.

3. The method of claim 2, wherein the capture frame size is at least 304 x 228 pixels and the converted frame size is at least 304 x 228 pixels.

4. The method of claim 3, wherein the capture frame size is approximately 320 x 240 pixels and the converted frame size is approximately 320 x 240 pixels.

5. The method of claim 1, wherein the step of providing includes capturing a video signal.

6. The method of claim 5, wherein the step of providing includes digitizing the video signal to generate the digital video data.

7. The method of claim 6, wherein the step of providing includes storing the captured video data as a data file in a storage device, and wherein the step of converting includes retrieving the stored data file from the storage device.

8. The method of claim 1, wherein the step of providing includes retrieving the digital video data from a storage device.

9. The method of claim 1, further comprising compressing the digital video data.

10. The method of claim 9, wherein the digital video data is compressed to an MPEG file format.

11. The method of claim 1, wherein the streaming video file is converted to an RM format or an ASF format.

12. The method of claim 1, wherein the converted frame size is approximately 320 x 240 pixels.

13. The method of claim 1, wherein the digital video data has a capture frame rate of at least 24 frames per second and the streaming video file has a converted frame rate of at least 24 frames per second.

14. The method of claim 1, further comprising streaming the streaming video file across a network.

15. The method of claim 14, wherein the network is the Internet.

16. A method of providing a streaming video file, comprising:

providing digital video data having a capture frame rate of at least 24 frames per second; and

converting the digital video data to a streaming video file having a converted frame rate of at least 24 frames per second.

17. The method of claim 16, wherein the capture frame rate is between 29 and 30 frames per second and the converted frame rate is between 29 and 30 frames per second.

18. The method of claim 16, wherein the step of providing includes capturing a video signal.

19. The method of claim 17, wherein the step of providing includes digitizing the video signal to generate the digital video data.

20. The method of claim 18, wherein the step of providing includes storing the captured video data as a data file in a storage device, and wherein the step of converting includes retrieving the stored data file from the storage device.

21. The method of claim 16, wherein the step of providing includes retrieving the digital video data from a storage device.

22. The method of claim 16, further comprising compressing the digital video data.

23. The method of claim 21, wherein the digital video data is compressed to an MPEG file format.

24. The method of claim 16, wherein the streaming video file is converted to an RM format or an ASF format.

25. The method of claim 16, wherein the digital video data has a capture frame size of at least 69,300 pixels per frame and the streaming video file has a converted frame size of at least 69,300 pixels per frame.

26. The method of claim 25, wherein the capture frame size has an aspect ratio of 4:3 and the converted frame size has an aspect ratio of 4:3.

27. The method of claim 26, wherein the capture frame size is at least 302 x 228 pixels and the converted frame size is at least 302 x 228 pixels.

28. The method of claim 27, wherein the capture frame size is approximately 320 x 240 and the converted frame size is approximately 320 x 240 pixels.

29. The method of claim 16, further comprising streaming the streaming video file across a network.

30. The method of claim 29, wherein the network is the Internet.

31. A method of providing a streaming video file, comprising:

obtaining a source video signal having a predetermined source video parameter;

capturing the source video signal while maintaining substantially the same source video parameter to provide a captured digital video file; and

encoding the captured digital video file while maintaining substantially the same source video parameter to provide a streaming video file.

32. The method of claim 31, wherein the source video parameter includes the frame rate.

33. The method of claim 32, wherein the source video frame rate is at least 24 frames per second.

34. The method of claim 32, wherein the source video frame rate is a real video frame rate.

35. The method of claim 31, wherein the source video parameter includes the number of scanned lines of video per frame.

36. The method of claim 35, wherein the number of scanned lines of video per frame is at least 240.

37. The method of claim 31, wherein the streaming video file has a capture frame size of at least 304 x 228 pixels.

38. The method of claim 37, wherein the streaming video file has a capture frame size is approximately 320 x 240 pixels.

39. The method of claim 31, further comprising editing the captured digital video file using video editing software.

40. The method of claim 31, wherein the step of encoding includes compressing the captured digital video file.

41. The method of claim 31, wherein the captured digital video file is in an MPEG file format.

42. The method of claim 31, wherein the source video signal is provided from a video playback device.

43. A method of generating a streaming video file for streaming over the Internet, comprising:

providing digital video data having a capture frame size of at least 320 x 240 pixels;

compressing the digital video data;

encoding the digital video data into a streaming video file, wherein the streaming video file has a frame size of at least 320 x 240 pixels; and

uploading the streaming video file to an Internet server.

44. The method of claim 43, wherein the streaming video file has a real video frame rate.

45. The method of claim 44, further comprising associating a hypertext link with the streaming video file.

46. The method of claim 45, further comprising running a video player program on an Internet client computer.

47. The method of claim 46, further comprising configuring the video player program for full-screen streaming video.

48. A system for providing a streaming video file, comprising:

means for providing digital video data having a capture frame size of at least 320 x 240 pixels; and

means for converting the digital video data to a streaming video file having a converted frame size of at least 320 x 240 pixels.

49. The system of claim 48, wherein the digital video data has a capture frame rate of at least 24 frames per second and the streaming video file has a converted frame rate of at least 24 frames per second.

50. The system of claim 48, further comprising means for capturing a video signal.

51. The system of claim 48, wherein the means for converting includes means for encoding the digital video file into an RM file format.

52. A system for providing a streaming video file, comprising:

means for providing digital video data having a capture frame rate of at least 24 frames per second; and

means for converting the digital video data to a streaming video file having a converted frame rate of at least 24 frames per second.

53. The system of claim 52, wherein the capture frame size is at least 302 x 228 pixels and the converted frame size is at least 302 x 228 pixels.

54. The system of claim 52, further comprising means for capturing a video signal.

55. The system of claim 52, wherein the means for converting includes means for encoding the digital video data into an RM file format.

ABSTRACT OF THE DISCLOSURE

A system and method of providing a streaming video file includes providing digital video data having a capture frame size of at least 69,300 pixels per frame and converting the digital video data to a streaming video file having a converted frame size of at least 69,300 pixels per frame. According to another exemplary embodiment, a method of providing a streaming video file includes providing digital video data having a capture frame rate of at least 24 frames per second and converting the digital video data to a streaming video file having a converted frame rate of at least 24 frames per second.

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I HEREBY DECLARE:

THAT my residence, post office address, and citizenship are as stated below next to my name;

THAT I believe I am the original, first, and sole inventor (if only one inventor is named below) or an original, first, and joint inventor (if plural inventors are named below or in an attached Declaration) of the subject matter which is claimed and for which a patent is sought on the invention entitled

System And Method For Providing An Enhanced Digital Video File

(Attorney Docket No. 57103/116)

the specification of which (check one)

X is attached hereto.

___ was filed on _______ as United States Application Number or PCT International Application Number ______ and was amended on ______ (if applicable).

THAT I do not know and do not believe that the same invention was ever known or used by others in the United States of America, or was patented or described in any printed publication in any country, before I (we) invented it;

THAT I do not know and do not believe that the same invention was patented or described in any printed publication in any country, or in public use or on sale in the United States of America, for more than one year prior to the filing date of this United States application;

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THAT I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment specifically referred to above;

THAT I believe that the above-identified specification contains a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention, and sets forth the best mode contemplated by me of carrying out the invention; and

THAT I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I HEREBY CLAIM foreign priority benefits under Title 35, United States Code §119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number	Country	Foreign Filing Date	Priority Claimed?	Certified Copy Attached?

I HEREBY CLAIM the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

U.S. Provisional Application Number	Filing Date

I HEREBY CLAIM the benefit under Title 35, United States Code, §120 of any United States application(s), or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Application Number	Parent Filing Date	Parent Patent Number

I HEREBY APPOINT the following registered attorneys and agents of the law firm of FOLEY & LARDNER to have full power to prosecute this application and any continuations, divisions, reissues, and reexaminations thereof, to receive the patent, and to transact all business in the United States Patent and Trademark Office connected therewith:

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WALTER E. ZIMMERMAN	Reg. No.	40,883

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Firstar Center
777 East Wisconsin Avenue
Milwaukee, Wisconsin 53202-5367

Telephone: (414) 297-5571
Facsimile: (414) 297-4900

I UNDERSTAND AND AGREE THAT the foregoing attorneys and agents appointed by me to prosecute this application do not personally represent me or my legal interests, but instead represent the interests of the legal owner(s) of the invention described in this application.

I FURTHER DECLARE THAT all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Name of first inventor	Eliot I. Bernstein
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Date	

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Inventor's signature	
Date	

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Citizenship	Bangladesh
Post Office Address	5580 NW 61 Street, Apt. #625, Coconut Creek, Florida 33073
Inventor's signature	
Date	

1/1

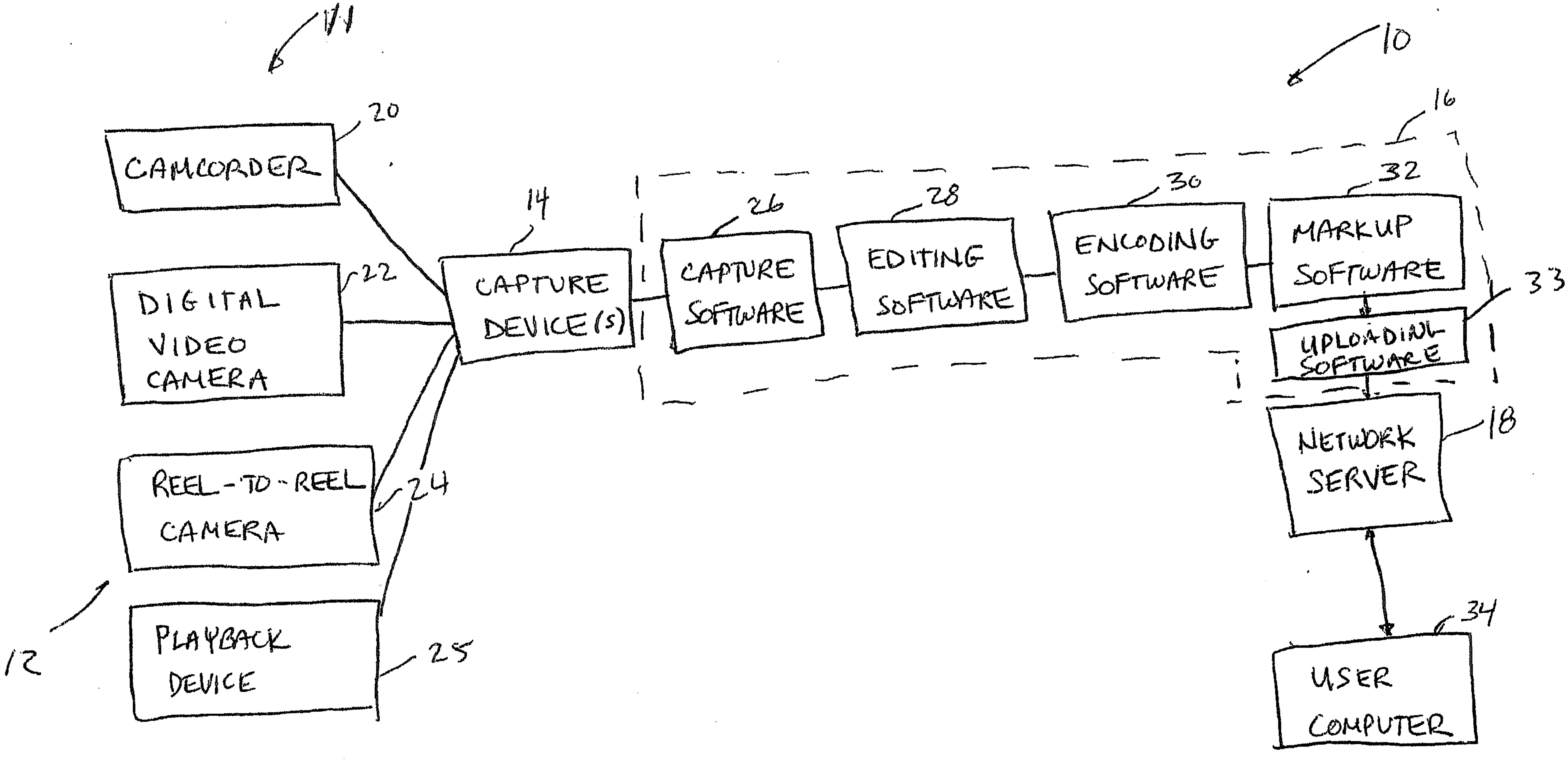
10
12
CAMCORDER
20
DIGITAL VIDEO CAMERA
22
REEL-TO-REEL CAMERA
24
PLAYBACK DEVICE
25
CAPTURE DEVICE(S)
14
16
CAPTURE SOFTWARE
26
EDITING SOFTWARE
28
ENCODING SOFTWARE
30
MARKUP SOFTWARE
32
UPLOADING SOFTWARE
33
NETWORK SERVER
18
USER COMPUTER
34

FIG. 1

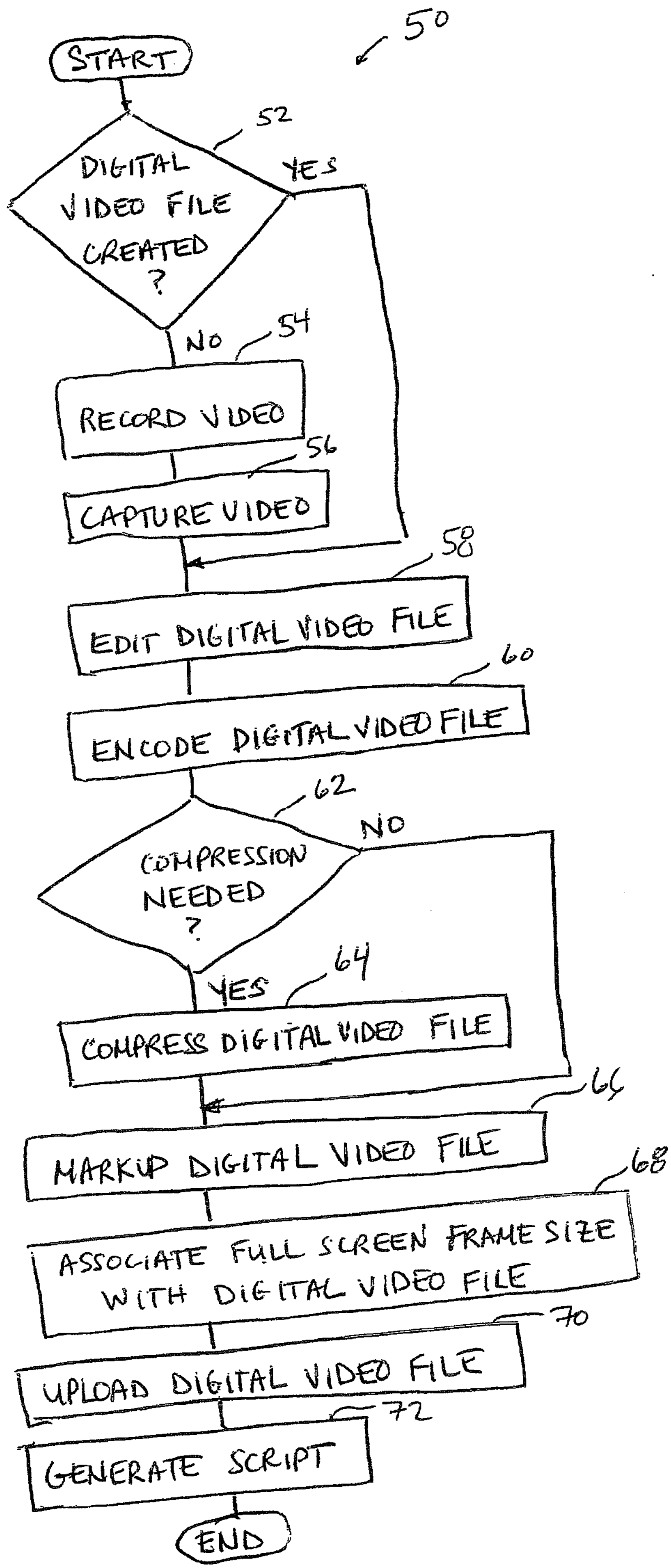
50
START
52
DIGITAL VIDEO FILE CREATED ?
YES
NO
54
RECORD VIDEO
56
CAPTURE VIDEO
58
EDIT DIGITAL VIDEO FILE
60
ENCODE DIGITAL VIDEO FILE
62
COMPRESSION NEEDED ?
NO
YES
64
COMPRESS DIGITAL VIDEO FILE
66
MARKUP DIGITAL VIDEO FILE
68
ASSOCIATE FULL SCREEN FRAME SIZE WITH DIGITAL VIDEO FILE
70
UPLOAD DIGITAL VIDEO FILE
72
GENERATE SCRIPT
END

FIG. 2

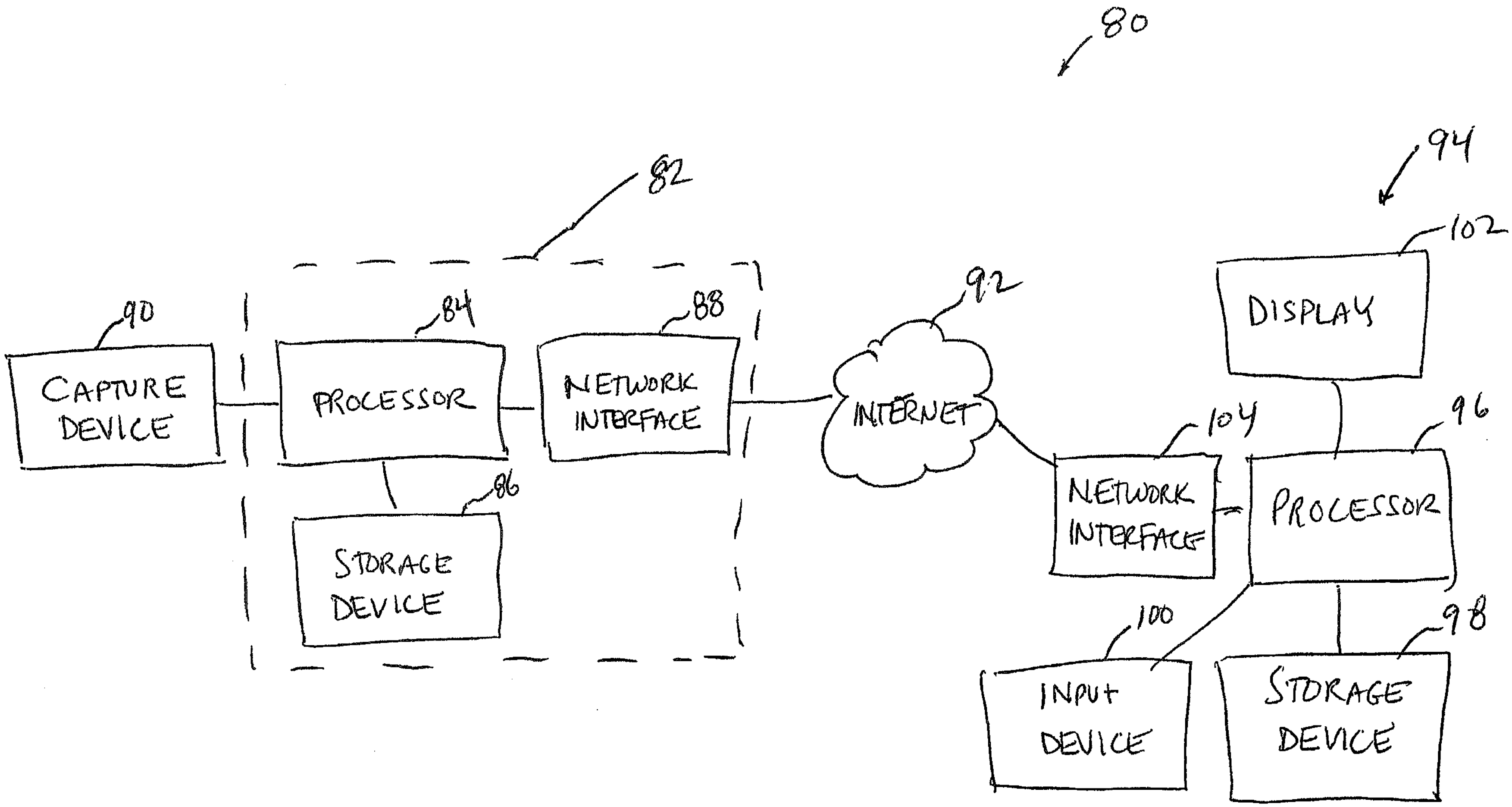
80
82
90
CAPTURE DEVICE
84
PROCESSOR
88
NETWORK INTERFACE
86
STORAGE DEVICE
92
INTERNET
94
102
DISPLAY
104
NETWORK INTERFACE
96
PROCESSOR
100
INPUT DEVICE
98
STORAGE DEVICE

FIG. 3

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APPLICATION NUMBER: ***09/522,721***
FILING DATE: ***March 10, 2000***

By Authority of the
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L. Edelen

L. EDELEN
Certifying Officer

03-13-00

A

jc781 U.S. PTO 03/10/00

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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No.	5865-1
First Inventor or Application Identifier	Eliot I. Bernstein
Title	APPARATUS AND METHOD FOR PRODUCING...
Express Mail Label No.	EL355808767US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
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1. [X] * Fee Transmittal Form (e.g., PTO/SB/17) (Submit an original and a duplicate for fee processing)
2. [X] Specification [Total Pages 15] (preferred arrangement set forth below)
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to Microfiche Appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings (if filed)
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
3. [X] Drawing(s) (35 U.S.C. 113) [Total Sheets 4]
4. Oath or Declaration [Total Pages 2]
   a. [X] Newly executed (original or copy)
   b. [ ] Copy from a prior application (37 C.F.R. § 1.63(d)) (for continuation/divisional with Box 16 completed)
      i. [ ] DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

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5. [ ] Microfiche Computer Program (Appendix)
6. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)
   a. [ ] Computer Readable Copy
   b. [ ] Paper Copy (identical to computer copy)
   c. [ ] Statement verifying identity of above copies

jc678 U.S. PTO 09/522721 03/10/00

ACCOMPANYING APPLICATION PARTS

7. [ ] Assignment Papers (cover sheet & document(s))
8. [ ] 37 C.F.R.§3.73(b) Statement (when there is an assignee) [ ] Power of Attorney
9. [ ] English Translation Document (if applicable)
10. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
11. [ ] Preliminary Amendment
12. [ ] Return Receipt Postcard (MPEP 503) (Should be specifically itemized)
13. [X] * Small Entity Statement(s) (PTO/SB/09-12) [ ] Statement filed in prior application, Status still proper and desired
14. [ ] Certified Copy of Priority Document(s) (if foreign priority is claimed)
15. [ ] Other: ....

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Prior application information: Examiner ______ *Group / Art Unit:* ______

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17. CORRESPONDENCE ADDRESS

[ ] Customer Number or Bar Code Label (Insert Customer No. or Attach bar code label here) or [XX] Correspondence address below

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	Meltzer, Lippe, Goldstein & Schlissel, P.C.				
Address	The Chancery				
	190 Willis Avenue				
City	Mineola	State	New York	Zip Code	11501
Country	USA	Telephone	516-747-0300	Fax	516-747-9363

Name (Print/Type)	Raymond A. Joao	Registration No. (Attorney/Agent)	35,907
Signature	Raymond A. Joao	Date	03/10/00

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Nicole Eliseo-Pinou

Nicole Eliseo-Pinou

Attorney Docket No.: 5865-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: ELIOT I. BERNSTEIN
Serial No.: Please Assign
Filed: Concurrently Herewith
For: **APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES**

Assistant Commissioner for Patents
Box Patent Application
Washington, D.C. 20231

TRANSMITTAL LETTER

Sir:

Please find enclosed herewith for filing the following:

1) Utility Patent Application Transmittal Sheet;
2) Fee Transmittal Sheet (in duplicate);
3) Declaration (signed, faxed copy);
4) Patent Application, including Specification, Claims and Abstract of the Disclosure (15 pages) and Drawings (4 sheets);
5) Check for $354 for the filing fee; and
6) Statement Claiming Small Entity Status (37 CFR 1.9(f) & 1.27(b)) - Independent Inventor
7) Statement Claiming Small Entity Status (37 CFR 1.9(f) & 1.27(c)) - Small Business Concern
8) Return receipt postcard.

It is respectfully requested that the above documents be filed as a Patent Application.

Respectfully submitted,

Raymond A. Joao

Raymond A. Joao
Reg. No. 35,907

March 10, 2000
Meltzer, Lippe, Goldstein & Schlissel, P.C.
190 Willis Avenue
Mineola, NY 11501
(516) 747-0300

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STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) & 1.27(c))--SMALL BUSINESS CONCERN	Docket Number (Optional) 5865-1

Applicant, Patentee, or Identifier: iviewit Holdings, Inc.
Application or Patent No.:
Filed or Issued:
Title: APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

I hereby state that I am
☐ the owner of the small business concern identified below.
☒ an official of the small business concern empowered to act on behalf of the concern identified below.

NAME OF SMALL BUSINESS CONCERN iviewit Holdings, Inc.

ADDRESS OF SMALL BUSINESS CONCERN One Boca Place, 2255 Glades Road, Suite 337 West, Boca Raton, Florida 33431

I hereby state that the above identified small business concern qualifies as a small business concern as defined in 13 CFR Part 121 for purposes of paying reduced fees to the United States Patent and Trademark Office. Questions related to size standards for a small business concern may be directed to: Small Business Administration, Size Standards Staff, 409 Third Street, SW, Washington, DC 20416.

I hereby state that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:

☐ the specification filed herewith with title as listed above.
☒ the application identified above
☐ the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern, or organization having rights in the invention must file separate statements as to their status as small entities, and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

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☐ no such person, concern, or organization exists.
☐ each such person, concern, or organization is listed below.

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NAME OF PERSON SIGNING Brian Utley

* TITLE OF PERSON IF OTHER THAN OWNER President

ADDRESS OF PERSON SIGNING 2255 Glades Road, Suite 337 W. Boca Raton, FL 3343

SIGNATURE [signature] DATE 3/10/2000

PTO/SB/09 (12-97)
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Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) & 1.27(b))--INDEPENDENT INVENTOR	Docket Number (Optional) 5865-1

Applicant, Patentee, or Identifier: Eliot I. Bernstein

Application or Patent No.: ______

Filed or Issued: ______

Title: APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

As a below named inventor, I hereby state that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:

- [x] the specification filed herewith with title as listed above.
- [ ] the application identified above.
- [ ] the patent identified above.

I have not assigned, granted, conveyed, or licensed, and am under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- [ ] No such person, concern, or organization exists.
- [x] Each such person, concern, or organization is listed below.

iviewit Holdings, Inc.

Separate statements are required from each named person, concern, or organization having rights to the invention stating their status as small entities (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

Eliot I. Bernstein		
NAME OF INVENTOR	NAME OF INVENTOR	NAME OF INVENTOR
[signature]		
Signature of inventor	Signature of inventor	Signature of inventor
03/09/00		
Date	Date	Date

Attorney Docket No. 5865-1

APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

FIELD OF THE INVENTION

The present invention is directed to an apparatus and a method for producing enhanced digital images and, in particular, to an apparatus and a method for producing enhanced resolution digital images from a print film image.

BACKGROUND OF THE INVENTION

The fields of telecommunications, multimedia, and related areas, are growing at increasing rates. With this continued growth, the need for high resolution digital imagery, for utilization in conjunction with the corresponding technologies, is becoming greater. Current technologies utilize digital panoramic cameras, as opposed to film or print film cameras. While the utilization of digital cameras may appear to many to be a viable manner by which to obtain digital images, there are, in fact, many disadvantages and shortcomings associated with digital camera images.

Conventional digital technologies typically have very low zoom quality and low image size restrictions or limitations associated therewith. The differences between digital imagery and print film imagery lie in the respective processing technologies and methods which are used in the processing of digital images versus those technologies and methods utilized in the processing of print film images. Generally speaking, print film produces a higher resolution image, and an associated higher resolution scanning quality, which further facilitates an improved enlargement

or reduction of the image for different sizes and different depths, without pixel distortion. Digital photography, and associated images, utilize pixels which typically have a certain size. When enlarged or reduced, these pixels of the digital image become distorted, a feature which typically results in the digital image being fixed to an original size, or being available at very low magnifications, such as, for example, magnifications of from 200 times to 300 times. These digital images are also difficult to enlarge to a full screen size without a tremendous amount of distortion present in the end product.

Currently, panoramic imaging techniques utilize digital images as their starting point. With such associated limitations, the ability to provide enhanced resolution digital images and, especially, an enhanced resolution digital panoramic image, such as those utilized on, or over, the Internet and/or the World Wide Web, has been greatly compromised.

Another major drawback in the current technology lies in the fact that conventional processes often utilize panoramic lenses in order to capture an image. This practice has been criticized as creating distortions in the image immediately upon the image's enlargement or reduction. The conventional techniques associated with the use of panoramic lenses are know to result in image "bending", which further curtails one's ability to obtain realistic views, especially upon performing any associated cropping and/or editing processes. In such instances, the upper end and the lower end of the image must be either erased, or covered, in order to prevent the flaw from being exposed. This typically results in the resulting image having a "fishbowl-type" distortion. In some instances, 32 mm lenses have been utilized in order to obtain enhanced floor to ceiling images without experiencing image bending. In these applications,

PA 1150500

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TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

April 06, 2004

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APPLICATION NUMBER: *09/630,939*
FILING DATE: *August 02, 2000*

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

L. Edelen

L. EDELEN
Certifying Officer

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Atty. Dkt. No. 57103/~~1~~21

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Bernstein et al.

Title: System and Method for Providing an Enhanced Digital Image File

Appl. No.: Unknown

Filing Date: Unknown

Examiner: Unknown

Art Unit: Unknown

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Douglas A. Boehm (Printed Name)

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UTILITY PATENT APPLICATION TRANSMITTAL

Assistant Commissioner for Patents
Box PATENT APPLICATION
Washington, D.C. 20231

Sir:

Transmitted herewith for filing under 37 C.F.R. § 1.53(b) is the nonprovisional utility patent application of:

Eliot I. Bernstein
Brian G. Utley

Enclosed are:

[X] Specification, Claim(s), and Abstract (30 pages).

[X] Informal drawings (7 sheets, Figures 1-7).

[X] Unexecuted Declaration and Power of Attorney (4 pages).

[ ] Assignment of the invention to Iviewit.com, Inc..

[ ] Assignment Recordation Cover Sheet.

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[ ] Information Disclosure Statement.

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Atty. Dkt. No. 57103/~~1~~121

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The filing fee is calculated below:

	Claims as Filed		Included in Basic Fee		Extra Claims		Rate		Fee Totals
Basic Fee							$690.00		$690.00
Total Claims:	31	-	20	=	11	x	$18.00	=	$198.00
Independents:	3	-	3	=	0	x	$78.00	=	$0.00
If any Multiple Dependent Claim(s) present:						+	$0.00	=	$0.00
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[ ] The required filing fees are not enclosed but will be submitted in response to the Notice to File Missing Parts of Application.

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Please direct all correspondence to the undersigned attorney or agent at the address indicated below.

Respectfully submitted,

Date 8/2/00

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Atty. Dkt. No. 57103/121

U.S. PATENT APPLICATION

for

SYSTEM AND METHOD FOR PROVIDING AN ENHANCED DIGITAL IMAGE FILE

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SYSTEM AND METHOD FOR PROVIDING AN ENHANCED DIGITAL IMAGE FILE

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a continuation-in-part of U.S. Patent Application No. 09/522,721, filed March 10, 2000, which claims the benefit of priority from U.S. Provisional Application No. 60/125,824, filed March 24, 1999. The present application also claims the benefit of priority from U.S. Provisional Application Nos. 60/146,726, filed August 2, 1999, 60/149,737, filed August 19, 1999, 60/155,404, filed September 22, 1999, and 60/169,559, filed December 8, 1999.

FIELD OF THE INVENTION

The present invention is directed to a system and a method for producing enhanced digital images and, in particular, to a system and a method for producing enhanced digital images having improved resolution for zooming and/or panning within a single file.

BACKGROUND OF THE INVENTION

In the field of digital imaging, the primary design challenge is that the viewer desires ideal image quality delivered to the viewer's display system. In a limited-bandwidth network, such as the Internet, it is important to transfer the image data in a reasonable amount of time. However, ideal image quality requires an enormous amount of digital data. Today's networks are not capable of transferring an ideal digital image in a reasonable time.

It is known that one can view a digital image on a display screen and "zoom" (i.e., magnify a portion of an image and appearing to move into the image) and "pan" (i.e., move across or around within the plane of that image). However, prior attempts have failed to produce high-quality, high-resolution digital images having the ability to zoom within the image and pan around the image without pixelation. "Pixelation" generally refers to the effect a digital image has when magnified, in which the pixels (i.e., picture elements) comprising the image become readily apparent to the human eye. More specifically, pixelation occurs when more than one pixel of the display monitor is used to represent one pixel of information of the digitized source image. In prior digital image systems, when the image is magnified, pixelation occurs almost immediately and is very noticeable to the user as a substantial degradation in the quality of the image.

As used herein, the term "pixel" refers to the smallest resolvable element of an image, either on a screen or stored in memory. Each pixel in a monochrome image has its own brightness, from 0 for black to the maximum value (e.g., 255 for an eight-bit pixel) for white. In a color image, each pixel has its own brightness and color, usually represented as a triplet of red, green, and blue intensities.

The teaching in the art is to generate a digital image file having the same number of pixels, or less, as the number that can be shown in a target viewing window. This results in a small source image file size, thereby speeding the transmission of the image file across a network. The target viewing window is typically maintained very small, e.g., 160 x 120 pixels, to further limit the number of pixels needed in the digital image file. Thus, the teaching in the art is to reduce the number of pixels in the digital image file to decrease the size of the image file before compression, so that the compressed image file can be more quickly transmitted over a limited-bandwidth network. However, this teaching has been unsatisfactory in providing high-resolution digital images. It has also been unsatisfactory in providing digital images in large viewing screens, such as, for example, full-sized VGA display monitor screens of 640 x 480 pixels.

Another example of prior systems is mapping or travel web sites. A user selects a desired location and the mapping web site responds by downloading map data from a map database. When the user wishes to zoom into or pan around the selected location, the web site retrieves additional source data, e.g., additional new map images, and sends it to the user computer. One drawback of this type of system is that each zoom or pan operation requires the downloading of additional data over the network connection. This method is slow, and does not allow the user to zoom and pan around a set of data unless the network connection is maintained.

Accordingly, there is a need for a system and a method for providing enhanced digital images. Further, there is a need for a system and a method for providing enhanced digital images within which a user can zoom or pan without loss of resolution and without pixelation. Further still, there is a need for a system and method for providing enhanced digital images that can be transmitted over a network in a reasonable amount of time. Further yet, there is a need for a system and a method for producing enhanced digital images suitable for uploading and for downloading to a display. Also, there is a need for a system and method for providing a digital image file suitable for efficient file transfers of high resolution digital images, thereby dispensing with the need to engage in long and slow, conventional file downloads in order to maintain viewing quality.

SUMMARY OF THE INVENTION

According to an exemplary embodiment, a method of providing a digital image file for viewing in a viewing window of a user display, the viewing window having a predetermined size, includes providing a digital image file having an image size comprising a fixed number of pixels representative of an image. The image size to be displayed is greater than that of the predetermined viewing window size. The method further includes the step of associating a user interface with the digital image file. The user interface is configured to display the digital image file in the viewing window and to allow a user to zoom into the image displayed in the viewing window.

According to another exemplary embodiment, a method of providing an enhanced digitized image file to a user includes predefining a viewing window size in which the digitized image file is to be displayed to a user; providing a digitized image file having an image size greater than of the predefined viewing window size; compressing the digitized image file; and providing the compressed image file to a network server.

According to yet another exemplary embodiment, an enhanced digital image file is disclosed. The enhanced digital image file is displayed on a client computer display system having a viewing window, the viewing window having a predetermined frame size. The enhanced digital image file includes digitized image data representative of an image, wherein the digitized image data has a number of pixels sufficient to allow a user to magnify the digitized image in the viewing window by a magnification factor of greater than one without appreciable pixelation. The enhanced digital image file further includes control data associated therewith for permitting the user to control the magnification factor.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will become more fully understood from the following detailed description, taken in conjunction with the accompanying drawings, wherein like reference numerals refer to like parts, in which:

FIG. 1 is a block diagram of a system for providing an enhanced digital image file according to an exemplary embodiment;

FIG. 2 is a flowchart of a method for providing an enhanced digital image file from a print film image according to an exemplary embodiment;

FIG. 3 is a screen print of a display screen on a user display illustrating an enhanced digital image file according to an exemplary embodiment;

FIG. 4 is a screen print of a display screen on a user display illustrating a zoomed view of the enhanced digital image of FIG. 3;

FIG. 5 is a screen print of a display screen on a user display illustrating a panned and zoomed view of the enhanced digital image of FIG. 3;

FIG. 6 is a flowchart of a method for providing an enhanced digital image file from a digital image according to an exemplary embodiment; and

FIG. 7 is an illustration relating a source image, a viewing image, and a viewing window to one another.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 illustrates a system 10 for providing an enhanced digital image file according to an exemplary embodiment. System 10 includes a camera 12 which may be a conventional print film camera, such as, print film cameras manufactured by Nikon, Canon, Hasselblad, Kodak, or other manufacturers, or may alternatively be a digital camera, a digital video recording device (e.g., including 3CCD technology), an analog recording device such as a reel-to-reel recording device, a live video recording system, etc. In the case where camera 12 is a digital camera, camera 12 may further include a solid state storage medium or memory. Camera 12 may be mountable, such as on a tripod or on a stand, hand-held or fixed, and may include a 24-32 mm lens. Camera 12 is utilized to obtain an image of a scene that is being photographed or video recorded. The image may be a print film image (e.g., a high gloss, photographic print), analog image, digital image, negative, transparency, etc.

As a further alternative, system 10 may be utilized in conjunction with any imaging or video recording system, such as, medical imaging equipment. In this case, camera 12 may be an imaging device, such as a magnetic resonance imaging (MRI) device, an X-ray device, a microscope with a camera attached thereto, etc.

In the case where camera 12 is a print film camera, system 10 also includes a developing device 14, which can be any device or collection of devices, for developing the print film image taken by camera 12. In some cases, such as a POLAROID brand camera, developing device 14 is combined with and integral to camera 12. Developing device 14 is not required in an embodiment in which the image is a digital image.

System 10 also includes an enlarging device 16 for enlarging the image which is developed by developing device 14. The image may be photographically enlarged from a print film image, a negative, or other transparency.

The system of FIG. 1 further includes a scanning device 18, for scanning images or photographs in order to obtain a digitized representation of the source image in the form of a digital image file. Any suitable scanning software may be utilized. In an exemplary embodiment, a UMAX Astra scanner is utilized in conjunction with Microsoft Photo Editor software. Scanning device 18 outputs the digital image file in a bitmapped format (e.g., BMP, TIF, GIF, etc.) The device may include compression software to compress the digital image file into a compressed format (e.g., JPEG). Note that, depending upon the specific type of camera 12 and desired processing steps, a print film image from camera 12 may be provided directly to enlarging device 16 or directly to scanning device 18.

If the source image is obtained with a digital camera of sufficient resolution, the digitized image file from camera 12 may be used directly without first creating a print image. On the other hand, a print image may first be obtained from the camera's digitized source image by sending it to a suitable printing device 20. In this manner, the printed image can then be optically enlarged and scanned to provide the enhanced digitized image.

System 10 also includes a computer 22 configured to process the digital image file created by the above-mentioned devices. Computer 22 may be a personal computer, a laptop computer, a mini computer, a microprocessor, a mainframe computer, a network computer, a server computer, or any other suitable computer or computer system. Computer 22 typically includes a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), a display device such as an SVGA display monitor, an input device and/or an output device. Computer 22 may also include any other hardware device, peripheral device, or software necessary to perform the functions described herein. The input device may include a keyboard, a mouse, or other pointing device, or other devices for allowing user input. The output device may include a printer (e.g., a black-and-white or color laser or inkjet printer). Computer 22 also includes an interface circuit for transmitting and/or receiving data over a network or link 24, such as, a local area network (LAN), a wide area network (WAN), an internet protocol network (e.g., the Internet, an intranet), a broadcast network, a satellite or cable television network, a digital video transmission path, etc. Computer 22 may further act as a network server or may be in communication with such a network server. Furthermore, as will be seen below, the function of network 24 may be, in a simple case, performed by other components of the system. In this exemplary embodiment, computer 22 is accessible by the Internet 26 via network 24 (e.g., a local area network).

A user computer 28 is used to access the enhanced digital image file stored in or provided by computer 22 (acting as a network server). Computer 28 may also load the image file to a storage device (e.g., a hard disk drive) to be used for display on a display 30. User computer 28 may operate an Internet browser, such as Netscape Navigator configured to communicate with the Internet 26 or an intranet or other network.

Display 30 may be any type of user display, such as a cathode ray tube (CRT), liquid crystal display (LCD), hand-held personal digital assistant (PDA) display, mobile phone display, etc. Display 30 normally has a predetermined display resolution (e.g., 1,280 x 1,024 pixels, 640 x 480 pixels, 320 x 240 pixels, etc.). Note that user computer 28 may be combined with display 30 in a single, integrated system, such as would be the case for a WebTV brand system, a high-definition television (HDTV), a PDA, etc. The combined user computer and display system may be referred to herein as the display system.

As will be described in more detail below, the computer display system typically has a viewing window on the display for viewing the image in a particular frame. The viewing window may be all or a portion of the total viewing area of display 30. The viewing window parameters, such as the viewing window area size and aspect ratio (i.e., viewing window width divided by viewing window height) may be under the control of user computer 28. In one embodiment, the viewing window area may be no more than 160 x 120 pixels in size, which is just a portion of the display area of an SVGA display monitor at 800 x 600 pixels.

References herein to frame sizes in pixels (such as, 320 x 240 pixels, 640 x 480 pixels, etc.) are intended to include equivalent frame sizes thereto. As an example, when rectangular pixels are used, the exact pixel count differs from the stated frame size. Thus, one equivalent to a 320 x 240 pixel frame size is 352 x 240. Accordingly, references to frame sizes in pixels are intended to included these and other equivalent frame sizes, and the teachings herein include any and all such insubstantial variations.

Referring now to FIGS. 2 and 6, exemplary methods 50 and 100 of providing an enhanced digital image file will be described. The enhanced digital image file can be generated from a print film image or a digital image. The enhanced digital image file is a digitized image acquired with a digital camera, scanner, or other device suitable for digitizing an image into pixels. The method of FIG. 2 is suitable for processing a print film image; the method of FIG. 6 is suitable for processing a digital image.

At step 52 of FIG. 2, an image is photographed or recorded by using camera 12. If camera 12 is a video camera, the video data is captured using a suitable capture device (e.g., an internal or external capture card, a Dazzle LAV-1000S capture device manufactured by Dazzle, Inc. of Fremont, California, etc.). A single captured frame from the video camera may be further processed as a digital image.

At step 54, the image is developed by developing device 14 in order to produce a photographic print, such as a high gloss photographic print. As mentioned, the step of developing may not be necessary in all cases (e.g., where the print film image of camera 12 is in a suitable format for subsequent enlarging or scanning).

At step 56, the developed image is enlarged by enlarging device 16, if needed. In this exemplary embodiment, the developed image can be enlarged to sizes of between 8"x6" and 8"x12", or to any other appropriate size. The developed image is enlarged to provide additional photo information to scanning device 18. The developed image can be enlarged many times before the granularity of the image is visible to the human eye. A photographic enlargement magnification capability of up to 1700 times or more may be attained for most views or scenes. It is, however, recommended that larger enlargement sizes be obtained for smaller developed images. As mentioned, the step of enlarging may not be necessary in all cases (e.g., where the size of the print film image or developed image is large enough to provide sufficient data to scanning device 18).

At step 58, the enlarged image is scanned by scanning device 18 in order to generate a bitmap image file or other digital image file, such as, JPEG, GIF, or other files. Scanning should be performed at a scan density that will provide the requisite number of pixels in the resulting digital image file (e.g., 100 dpi, 200 dpi, 600 dpi, 1400 dpi, etc.) Contrary to the teachings of the prior art, a large number of pixels are provided in the digital image file such as would be within the particular file size and loading time constraints. According to one example, a sufficient number of pixels are provided in the enhanced digital image file to allow a user to magnify the digitized image in the viewing window of display 30 by a magnification factor of greater than one without pixelation. Alternatively, a sufficient number of pixels are provided to allow the user to magnify the digitized image by a magnification factor of 1.5, 5, 10, 20, 100, or more.

According to one exemplary embodiment, the number of pixels provided in the enhanced digital image file is based on a viewing window size and the desired magnification ratio. By providing more pixels in the enhanced digital image file than is required for a full-window view in the viewing window, the user is able to zoom and pan within the digital image during viewing without pixelation.

FIG. 7 illustrates the parametric details and relationships between the different images and viewing window sizes. These parameters and description are for the purpose of creating large, clear, zoomable and pannable images from a variety of photographic, source images. First, a "source image" (si) provides the original source of the graphical image information before it is digitally processed, as opposed to a "target image" (ti) that is the destination image to be transferred to the computer display system. In the analog case, the source image is not yet digitized. In other words, it has not been converted to a bitmapped format. A source image could be a photograph, a handwritten sketch, a computer-generated graphic, etc. In this case, source image is what is fed to the scanning device 18. In the digital case, the source image has already been digitized, such as the digital output of a CCD camera taking a photograph.

The source image (si) has a source image height (sih) and a source image width (siw). The source image aspect ratio (sir) is the width of the image divided by the height of the image, generally in inches:

$$sir = siw/sih$$

The viewing window (vw) is the window, defined in pixels, within which the target image, when scaled to fit, is to be displayed as the viewing image (vi). The viewing window (vw) has a viewing window width (vww) and a viewing window height (vwh), both defined in pixels. Thus, the viewing window aspect ratio (vwr) can be determined as:

$$vwr = vww/vwh$$

Note that the source image (si) may have a different aspect ratio than the viewing window (vw). To place the viewing image (vi) in the viewing window (vw), a subset of pixels from the source image (si) must be selected and scaled. The viewing image height (vih) and viewing image width (viw) within the viewing window (vw) can be determined by comparing the source image aspect ratio (sir) to the viewing window aspect ratio (vwr), as shown:

if sir < vwr then:

vih = vwh

viw = vih * sir

but if sir > = vwr then:

viw = vww

vih = viw / sir

This relationship is illustrated in FIG. 7.

Note that the target image (ti) is created from the source image (si), by scaling the image (si) down to fit within the viewing window (vw). When the target image (ti) is scaled down by the desired maximum magnification factor (mmf) to fit within the viewing window (vw), the scaled target image is called the viewing image (vi).

The maximum magnification factor (mmf) is defined as the ratio of the target image area (tia) to the viewing image area (via). This ratio will determine the amount of zoom available without causing the image to distort due to pixelation, i.e., when fewer pixels are in the viewing image being displayed than available in the viewing window. So:

target image area (tia) = tiw x tih

and since

via = viw x vih

then

tia = via x mmf

To obtain the target image width and height:

tiw = squareroot (tia * sir)

tih = tiw / sir

The relationship between the target image and the viewing image is shown in FIG. 7. The relationship between the target image and the viewing window is also shown. A zoom to the maximum level will be shown in the viewing window as illustrated at representation 120 of FIG. 7. By panning the viewing window, every portion of the target image may be viewed from each level of zooming.

To determine the minimum scan density (msd) to avoid pixelation at the desired maximum magnification factor (mmf):

msd = tih/sih.

EXAMPLE 1

Determine the Target Image Area and dimensions, and minimum scan density for the following case:

Source Image = 5" wide x 4" high

Desired Magnification Factor = 20

Source Image Aspect Ratio = 5 / 4 = 1.25

Define the Viewing Window: assume 480w x 320h pixels

Viewing Window Aspect Ratio = 480 / 320 = 1.5

The Source Image Aspect Ratio is < the Viewing Window Aspect Ratio:

1.25 < 1.5 therefore:

vih = vwh = 320 pixels

viw = vwh * 1.25 =320 * 1.25 = 400 pixels

The Viewing Image Area = vis = 320 x 400 = 128,000 pixels

The Target Image Area = vis x 20 = 128,000 x 20 = 2,560,000 pixels

The Target Image width = 2,560,000 / 0.8 = 1789 pixels

The Target Image height = 1789 x 0.8 = 1431 pixels

The Minimum Scan Density = 1789 / 5 = 358 pixels per inch

The photo scan can be any scan density > 357 pixels per inch

Thus, a 5 x 4" print film image should be scanned at greater than 357 pixels per inch to allow magnification/zoom up to 20 times in a viewing window of 320 x 240 pixels. An enhanced digital image file having 2,560,000 pixels provides a sufficient number of pixels for this example.

EXAMPLE 2

Determine the Target Image Area and dimensions, and minimum scan density for the following case:

Source Image = 5" x 4"

Desired Maximum Magnification Factor = 20

Source Image Aspect Ratio = 5 / 4 = 1.25

Define the Viewing Window: assume 400w x 360h pixels

Viewing Window Aspect Ratio = 400 / 360 = 1.11

The Source Image Aspect Ratio is > the Viewing Window Aspect Ratio:

1.25 > 1.11 therefore:

viw = vww = 400 pixels

vih = viw / 1.25 = 400 / 1.25 = 320 pixels

The Viewing Image Area = via = 400 x 320 = 128,000 pixels

The Target Image Area = via x 20 = 128,000 x 20 = 2,560,000 pixels

The Target Image width = 2,560,000 * 1.25 = 1789 pixels

The Target Image height = 1789 / 1.25 = 1431 pixels

The Minimum Scan Density = 1431 / 4 = 358 pixels per inch

The photo scan can be any scan density > 357 pixels per inch

EXAMPLE 3

Determine the Target Image Area and dimensions, and minimum scan density for the following case:

Source Image = 4" wide x 5" high (portrait orientation)

Desired Magnification Factor = 20

Source Image Aspect Ratio = 4 / 5 = 0.8

Define the Viewing Window: assume 400w x 360w pixels

Viewing Window Aspect Ratio = 400 / 360 = 1.11

The Source Image Aspect Ratio is < the Viewing Window Aspect Ratio:

0.8 < 1.11 therefore:

vih = vwh = 360 pixels

viw = vih * 0.8 = 360 * 0.8 = 288 pixels

The Viewing Image area = via = 360 x 288 = 103,680 pixels

The Target Image area = via x 20 = 103,680 x 20 = 2,073,600 pixels

The Target Image width = 2,073,600 * 0.8 = 1288 pixels

The Target Image height = 1288 / 0.8 = 1610 pixels

The Minimum Scan Density = 1610 / 5 = 322 pixels per inch

The photo scan can be any scan density > 321 pixels per inch

Returning now to FIG. 2, at step 60, the enhanced digital image file is provided to computer 22 in a digitized format, i.e., pixel-based, bitmapped, etc. (as opposed to vector graphics based format), such as in either in a bitmap BMP format or a compressed JPEG format. Computer 22 performs a touch-up operation on the scanned image in order to make refinements or enhancements thereto. This touch-up operation is accomplished by utilizing imaging software. Touch-up steps may include cleaning the edges of the image, adjusting lighting, adjusting colors, etc. Adobe PhotoShop software, manufactured by Adobe Systems Inc., San Jose, California, can be used as the imaging software for touching up the images.

According to one example, multiple images can be stitched together after scanning, and before or after compression, thereby creating a panoramic scene or image, or simply a scene requiring a plurality of photographs. This stitching operation can be performed by utilizing photo stitching software such as, for example, Photo Vista software by Live Picture, Live Picture Reality Studio or Live Picture Object Modeler. Stitching may comprise sufficient photos for a 360 degree panoramic image of a scene. If images are stitched, they may be touched-up at step 60.

At step 62, if desired, and if the enhanced digital image file has not yet been compressed (e.g., by scanning device 18 or the touch-up software), the image is then converted from a bitmap file format (e.g., BMP) to a compressed file format (e.g., JPEG). Other compression algorithms are contemplated. Adobe Image Ready software is utilized to perform the BMP-to-JPEG file conversion in this exemplary embodiment. The compression is set to a very high compression factor, such as, 70% to 90%, but may alternatively be set to other compression factors. The target image area be set as one of the parameters for compression, thus ensuring an optimum compressed file size.

At step 64, user interface or control data is associated with the enhanced digital image file. The user interface data is a program or code segment (e.g., a Java applet) that provides a graphic user interface on display 30 upon loading of the image. The user interface program is associated with the enhanced digital image file such that the combined file or files can automatically launch the graphic user interface, decompress the digital image data, and display at least a portion of the digital image data within a viewing window having a predetermined viewing size on display 30.

The user interface data may alternatively be a plug-in, applet, or other software program, such as, Photo Vista, Reality Studio, or Object Modeler manufactured by Live Picture Inc., San Francisco, California, or an Ipix plug-in manufactured by Internet Pictures Corporation of Oak Ridge, Tennessee. The user interface data may be either associated with the enhanced digital image file such that it is downloaded with the enhanced digital image data, or it may be launched independently from the enhanced digital image data as, for example, an applet or plug-in on user computer 28. If the user interface data is launched independently of the image data, it may either be first opened by the user before downloading the enhanced digital image file, or it may be automatically opened by the enhanced digital image file, such as, via a script or other code segment within the enhanced digital image file.

Referring to FIG. 3, an exemplary screen print 80 from display 30 is shown illustrating the graphical user interface 82 generated by the user interface program. User interface 82 includes a viewing window or frame 84 for displaying the digital image data 86. User interface 82 further includes zoom buttons 88 for allowing the user to zoom into and out of digital image data 86. By actuating one of zoom buttons 88, user interface program resizes digital image data 86 within viewing frame 84. User interface 82 further includes panning buttons 90 to allow the user to pan up, down, left, and right within image data 86.

Once the user interface program is associated with the enhanced digital image data, the resulting image is ready for providing to a network server, projection from a projector, display system, posting, or playback, to or from a host computer, a Web server, a Web site, or a Web page. At step 66, the enhanced digital image is uploaded to a network server. In the instance where the enhanced digital image is posted to an Internet Web server, the upload from computer 22 to the respective server can be performed by utilizing file uploading software, such as, Web FTP (file transfer protocol) Pro software, manufactured by Ipswitch, Inc., Lexington, Massachusetts.

Referring now to FIGS. 3, 4, and 5, exemplary print screens are shown illustrating the result of an upload or download of the enhanced digital image file to user computer 28 for display on display 30. In FIG. 3, digital image data 86 of a collectible stamp image is shown within a viewing window 84. Although viewing window 84 is slightly smaller than the full-screen size of display 30 (e.g., 640 x 480 pixels in this example), viewing window 84 can alternatively be configured for full-screen display, or display in other sizes or resolutions. As shown, digital image data 86 shows no sign of pixelation.

In FIG. 4, a user has actuated zoom buttons 88 to zoom-in to the digital image. In response, the user interface program provides additional digital image data from the enhanced digital image file stored in a memory (e.g., a hard drive) of user computer 28, to provide a zoomed view of the digital image. Thus, the view of FIG. 4 also shows little sign of pixelation even though the image has been magnified many times.

In FIG. 5, a user has actuated pan buttons 90 to display the lower left-hand corner of the digital image data within viewing window 84. The user has also actuated zoom buttons 88 to zoom-in to the digital image data. Again, little pixelation is visible.

As mentioned, the principles described herein are also operable with a digital image taken by a digital camera. Referring now to FIG. 6, a method 100 of providing an enhanced digital image file utilizing a digital camera is shown. At step 102, the digital camera is configured to acquire a digital image. In this step, the camera is set with a high resolution to acquire at least enough pixels for a magnification of two times the size of the viewing window provided on display 30, though higher numbers of pixel data may also be acquired.

Again referring to FIG. 7 and the corresponding description hereinabove, with a digital source image, the maximum magnification factor (mmf) should not produce a target image larger than the source image in pixels because of the pixel distortion or pixelation effect, i.e., distortion due to fewer pixels in the image being displayed than available in the viewing window. Since:

target image area (tia) = tiw x tih = via x mmf

then to obtain the target image width and height:

tiw =   tia * sir

tih = tiw / sir

If tih > sih then set tih = sih and tiw = siw

EXAMPLE 4

Determine the Target Image size and dimensions, and minimum scan density for the following case:

Source Image = 1600 x 1200 pixels

Desired Magnification Factor = 20

Source Image Aspect Ratio = 1600 / 1200 = 1.33

Define the Viewing Window: assume 480w x 360h pixels

Viewing Window Aspect Ratio = 480 / 360 = 1.33

The Source Image Aspect Ratio is = the Viewing Window Aspect Ratio:

0.75 = 0.75 therefore:

vih = vwh = 360 pixels

viw = vih * 1.33 = 360 * 1.33 = 480 pixels

The Viewing Image area = via = 480 x 360 = 172,800 pixels

The Target Image area = via x 20 = 172,800 x 20 = 3,456,000 pixels

The Target Image width = 3,456,000 * 1.33 = 2147 pixels

The Target Image height = 2147 / 1.33 = 1610 pixels

But tih of 1610 pixels is > 1200 pixels therefore:

tih = 1200 pixels

tiw = 1600 pixels

tia = 1200 x 1600 = 1,920,000 pixels

Effective Maximum Magnification Factor = tia / via

= 1,920,000 / 172,800 = 11.1

The Minimum Scan Density = N/A

Steps 104 (touch-up image), 106 (compress file), 108 (associate user interface data), and 110 (upload file) may proceed as described with reference to FIG. 2 in the print film image exemplary method.

The above method can be repeated using different depth images or digital photographs for the images in order to create areas of higher resolution or "hot spots" within an image for detailed close-up inspection or viewing. These depth images can be linked to the respective image or image segment. The above method can be utilized in order to create higher zoom capabilities with each new depth layer of an image.

The above method can be utilized for applications including single images, single panoramic images, stitched images, non-stitched images or any other suitable image type.

The system and method of the present invention can also be utilized in conjunction with three-dimensional images in order to produce high resolution, three-dimensional digital images and 3-D texturings.

The resulting images which are obtained via the exemplary system and method are characterized by a high definition resolution and are suitable for high definition television, Web television, and large, panoramic or object models, Internet applications, which preserve resolution upon image magnification or reduction. The exemplary embodiment also dispenses with the need for plug-in software during download or file transfer operations.

EXAMPLE 5

A variety of photographs were taken using several different types of cameras. A digital camera was used to take several digital images. A Hasselblad camera was used to take several print film images, some of which were 2 ¼" square and others of which were 4 x 5" square. The print film images were taken to a film developing center to be enlarged to 8 x 12" pictures.

The enlarged pictures were scanned with UMAX Astra scanner using Adobe Photo Editor. Some bitmap files were created and some JPEG files were created. In spite of conventional teaching to the contrary, the scanner was set for a high resolution: 600 dpi. For the JPEG files, compression was set to 30:1.

Some of the images were stitched together using Photo Vista. The stitched images were then compressed at a high ratio of compression to generate JPEG files. The compressed files were touched up using Adobe Photo Editor and then uploaded to an Internet server. The uploaded files were then downloaded from the Internet server. The download took only a short time. The images were observed to have exceptionally high quality.

In review, a method is disclosed of providing a digital image file for viewing in a viewing window of a user display, the viewing window having a predetermined size. The method includes providing a digital image having an image size comprising a fixed number of pixels representative of an image, the image size being greater than the predetermined viewing window size. The digital image file is associated with a user interface that is configured to display the digital image in the viewing window and to allow a user to zoom into and pan around in the image displayed in the viewing window while maintaining high image quality.

While the exemplary embodiments illustrated in the FIGS. and described above are presently preferred, it should be understood that these embodiments are offered by way of example only. For example, the specific pixel counts and display sizes disclosed herein are merely exemplary and are used to illustrate the pertinent principles. Also, not all of the steps of the exemplary embodiments need be performed in all embodiments, nor need they be performed in the specific order recited. Accordingly, the present invention is not limited to a particular embodiment, but extends to various modifications that nevertheless fall within the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A method of providing a digital image file for viewing on a user display in a viewing window having a predetermined size, the method comprising:

providing a digital image file having an image size comprising a fixed number of pixels representative of an image, wherein the image size is greater than that of the predetermined viewing window size.

2. The method of claim 1, further comprising providing a user interface for the digital image file, the user interface configured to display the digital image file in the viewing window and to allow a user to zoom into the image displayed in the viewing window,

3. The method of claim 1, wherein the image size is at least ten times that of the predetermined viewing window size.

4. The method of claim 1, wherein the user interface is configured to allow the user to pan across the image.

5. The method of claim 1, wherein the user interface prevents the user from zooming into the image to the point of pixelation.

6. The method of claim 1, wherein the digital image file includes the user interface in a single data file.

7. The method of claim 1, wherein the user interface is an application program applet.

8. The method of claim 1, wherein the user interface is an application program controlled by the user's computer.

9. The method of claim 1, further comprising compressing the digital image file.

10. The method of claim 1, further comprising uploading the digital image file to a network server.

11. The method of claim 1, wherein the digital image file is generated from a print film image.

12. The method of claim 1, wherein the digital image file is acquired with a digital camera.

13. The method of claim 1, wherein the predetermined size represents a full-screen size of the user display.

14. A method of providing an enhanced digitized image file to a user, comprising:

providing a viewing window size in which the digitized image file is to be displayed to a user;

providing a digitized image file having an image size greater than that of the predefined viewing window size;

compressing the digitized image file; and

providing the compressed image file to a network server.

15. The method of claim 13, further comprising:

under user control, transmitting the compressed image file over the network;

displaying the transmitted image file to the user in a viewing window having the predefined viewing window size; and

under user control, magnifying the displayed image within the viewing window.

16. The method of claim 14, further comprising, under user control, moving the displayed image in the predefined viewing window size.

17. The method of claim 14, further comprising providing the user with a plurality of selectable magnification levels to view the displayed image within the viewing window.

18. The method of claim 14, wherein the resolution of the digitized image is greater than that of the image displayed to the user in the predefined viewing window size without image magnification.

19. The method of claim 16, wherein the selectable magnification levels are limited such that no more than one pixel of the user display can display one pixel of the digitized image.

20. The method of claim 13, wherein the digitized image file is compressed to a JPEG format.

21. The method of claim 13, wherein the step of generating includes enlarging and scanning a print film image to provide the digitized image file.

22. The method of claim 19, wherein the print film image is scanned with a density of at least 100 dots per inch.

23. The method of claim 13, wherein the step of generating includes acquiring the digitized image file with a digital camera.

24. The method of claim 13, wherein the compressed image file is accessible via the Internet.

25. The method of claim 14, wherein magnifying the displayed image does not degrade the image quality.

26. An enhanced digital image file downloadable to a client computer having a viewing window on a display, the viewing window having a predetermined frame size, the digital image file comprising:

digitized image data representative of an image, wherein the digitized image data has a number of pixels sufficient to allow a user to magnify the digitized image in the viewing window by a magnification factor of at least two without pixelation; and

control data to allow the user to control the magnification factor.

27. The enhanced digital image file of claim 25, wherein the digitized image data is compressed.

28. The enhanced digital image file of claim 25, wherein the control data is configured to provide zoom buttons and pan buttons to a user.

29. The enhanced digital image file of claim 27, wherein the control data includes a Java applet.

30. The enhanced digital image file of claim 25, wherein the digitized image data has a number of pixels sufficient to allow a user to magnify the digitized image in the viewing window by a magnification factor of at least ten without pixelation.

31. The enhanced digital image file of claim 25, wherein the digitized image data has a number of pixels sufficient to allow a user to magnify the digitized image in the viewing window by a magnification factor of at least one hundred without pixelation.

32. The enhanced digital image file of claim 25, wherein the control data is configured to prevent the user from magnifying the digitized image to the point of pixelation.

ABSTRACT OF THE DISCLOSURE

A method of providing a digital image file for viewing in a viewing window of a user display, the viewing window having a predetermined size. The method includes providing a digital image having an image size comprising a fixed number of pixels representative of an image, the image size being greater than the predetermined viewing window size. The digital image file is associated with a user interface that is configured to display the digital image in the viewing window and to allow a user to zoom into and pan around in the image displayed in the viewing window while maintaining high image quality.

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I HEREBY DECLARE:

THAT my residence, post office address, and citizenship are as stated below next to my name;

THAT I believe I am the original, first, and sole inventor (if only one inventor is named below) or an original, first, and joint inventor (if plural inventors are named below or in an attached Declaration) of the subject matter which is claimed and for which a patent is sought on the invention entitled

System and Method for Providing an Enhanced Digital Image File

(Attorney Docket No. 57103/121)

the specification of which (check one)

X is attached hereto.

____ was filed on _______ as United States Application Number or PCT International Application Number ______ and was amended on ______ (if applicable).

THAT I do not know and do not believe that the same invention was ever known or used by others in the United States of America, or was patented or described in any printed publication in any country, before I (we) invented it;

THAT I do not know and do not believe that the same invention was patented or described in any printed publication in any country, or in public use or on sale in the United States of America, for more than one year prior to the filing date of this United States application;

THAT I do not know and do not believe that the same invention was first patented or made the subject of an inventor's certificate that issued in any country foreign to the United States of America before the filing date of this United States application if the foreign application was filed by me (us), or by my (our) legal representatives or assigns, more than twelve months (six months for design patents) prior to the filing date of this United States application;

THAT I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment specifically referred to above;

THAT I believe that the above-identified specification contains a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention, and sets forth the best mode contemplated by me of carrying out the invention; and

THAT I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I HEREBY CLAIM foreign priority benefits under Title 35, United States Code §119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number	Country	Foreign Filing Date	Priority Claimed?	Certified Copy Attached?

I HEREBY CLAIM the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

U.S. Provisional Application Number	Filing Date
60/125,824	3/24/1999
60/146,726	8/2/1999
60/149,737	8/19/1999
60/155,404	9/22/1999
60/169,559	12/8/1999

I HEREBY CLAIM the benefit under Title 35, United States Code, §120 of any United States application(s), or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Application Number	Parent Filing Date	Parent Patent Number
09/522,721		3/10/2000	

I HEREBY APPOINT the following registered attorneys and agents of the law firm of FOLEY & LARDNER to have full power to prosecute this application and any continuations, divisions, reissues, and reexaminations thereof, to receive the patent, and to transact all business in the United States Patent and Trademark Office connected therewith:

RUSSELL J. BARRON	Reg. No. 29,512
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DOUGLAS A. BOEHM	Reg. No. 32,014

JOHN C. COOPER III	Reg. No.	26,416
JEFFREY N. COSTAKOS	Reg. No.	34,144
WILLIAM J. DICK	Reg. No.	22,205
BARRY L. GROSSMAN	Reg. No.	30,844
PAUL S. HUNTER	Reg. No.	44,787
KATHERINE D. LEE	Reg. No.	44,865
KEITH D. LINDENBAUM	Reg. No.	40,365
DAVID G. LUETTGEN	Reg. No.	39,282
RICHARD J. MC KENNA	Reg. No.	35,610
JAMES G. MORROW	Reg. No.	32,505
RICHARD B. O'PLANICK	Reg. No.	29,096
TODD A. RATHE	Reg. No.	38,276
MICHAEL D. RECHTIN	Reg. No.	30,128
CHRISTOPHER M. TUROSKI	Reg. No.	44,456
JAMES A. WILKE	Reg. No.	34,279
JOSEPH N. ZIEBERT	Reg. No.	35,421
WALTER E. ZIMMERMAN	Reg. No.	40,883

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Telephone: (414) 297-5718
Facsimile: (414) 297-4900

I UNDERSTAND AND AGREE THAT the foregoing attorneys and agents appointed by me to prosecute this application do not personally represent me or my legal interests, but instead represent the interests of the legal owner(s) of the invention described in this application.

I FURTHER DECLARE THAT all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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Inventor's signature	
Date	

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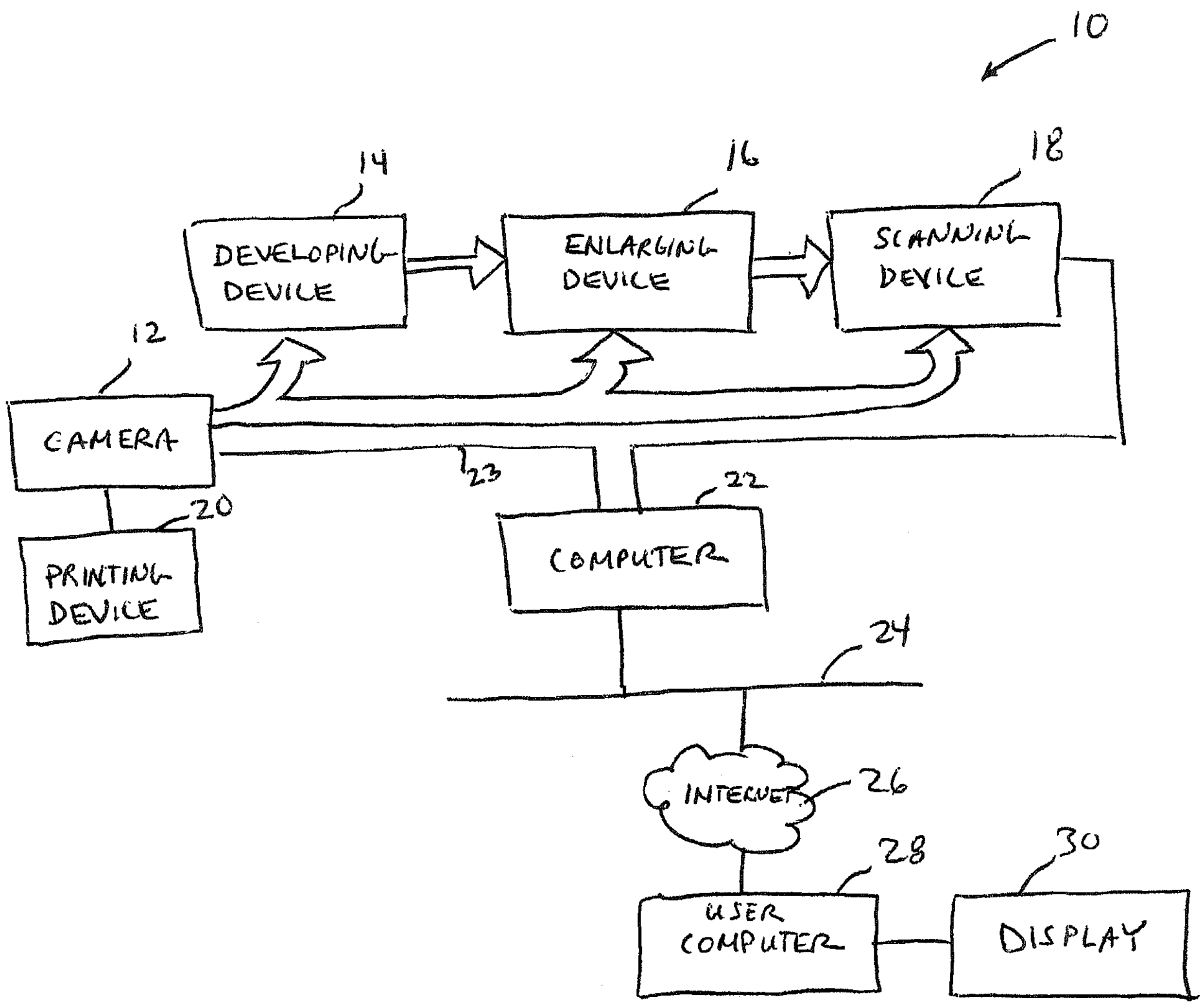
Residence	Boca Raton, Florida
Citizenship	USA
Post Office Address	1930 S.W. 8th Street, Boca Raton, Florida 33486
Inventor's signature	
Date	


10
14
16
18
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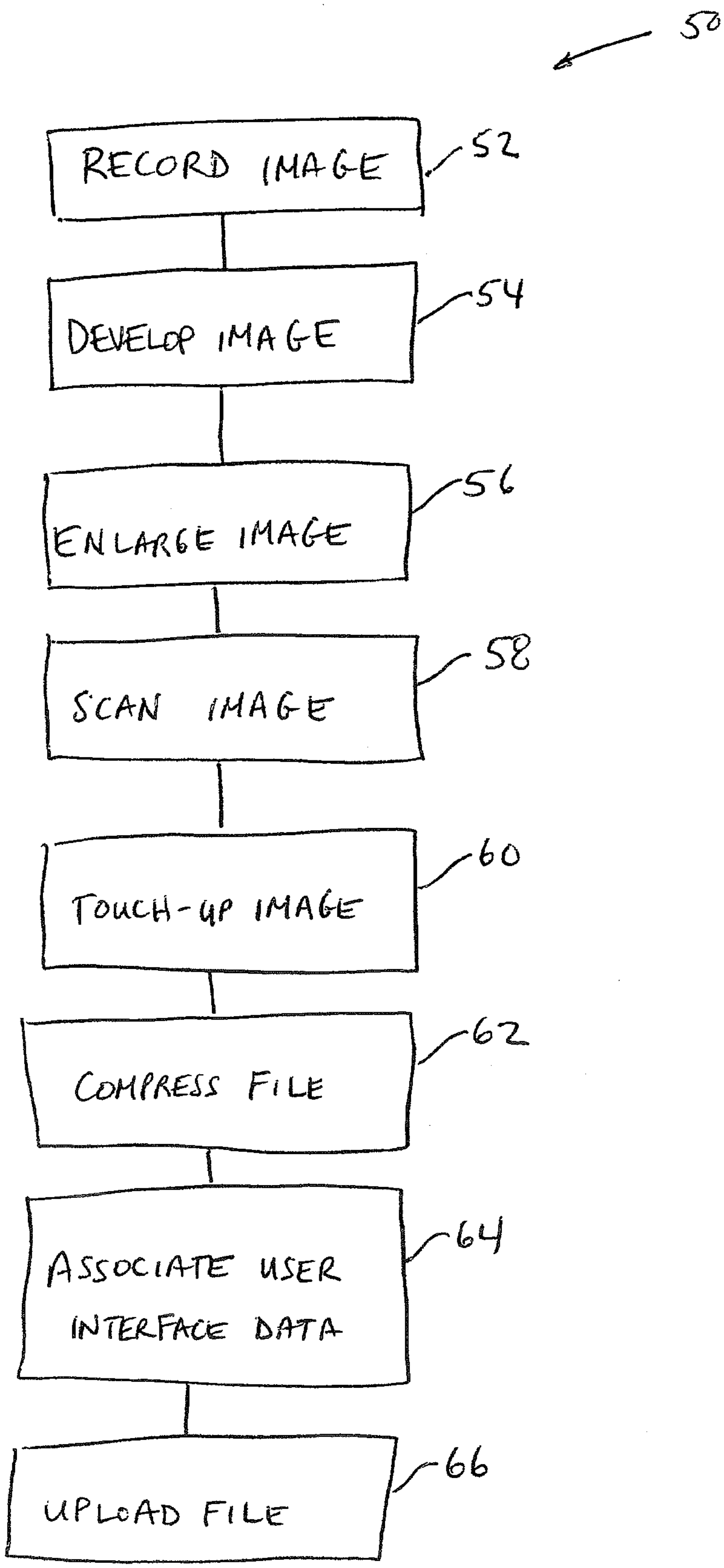
ENLARGING DEVICE
SCANNING DEVICE
12
CAMERA
23
22
20
PRINTING DEVICE
COMPUTER
24
INTERNET
26
28
30
USER COMPUTER
DISPLAY

FIG. 1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DEVELOP IMAGE
54
ENLARGE IMAGE
56
SCAN IMAGE
58
TOUCH-UP IMAGE
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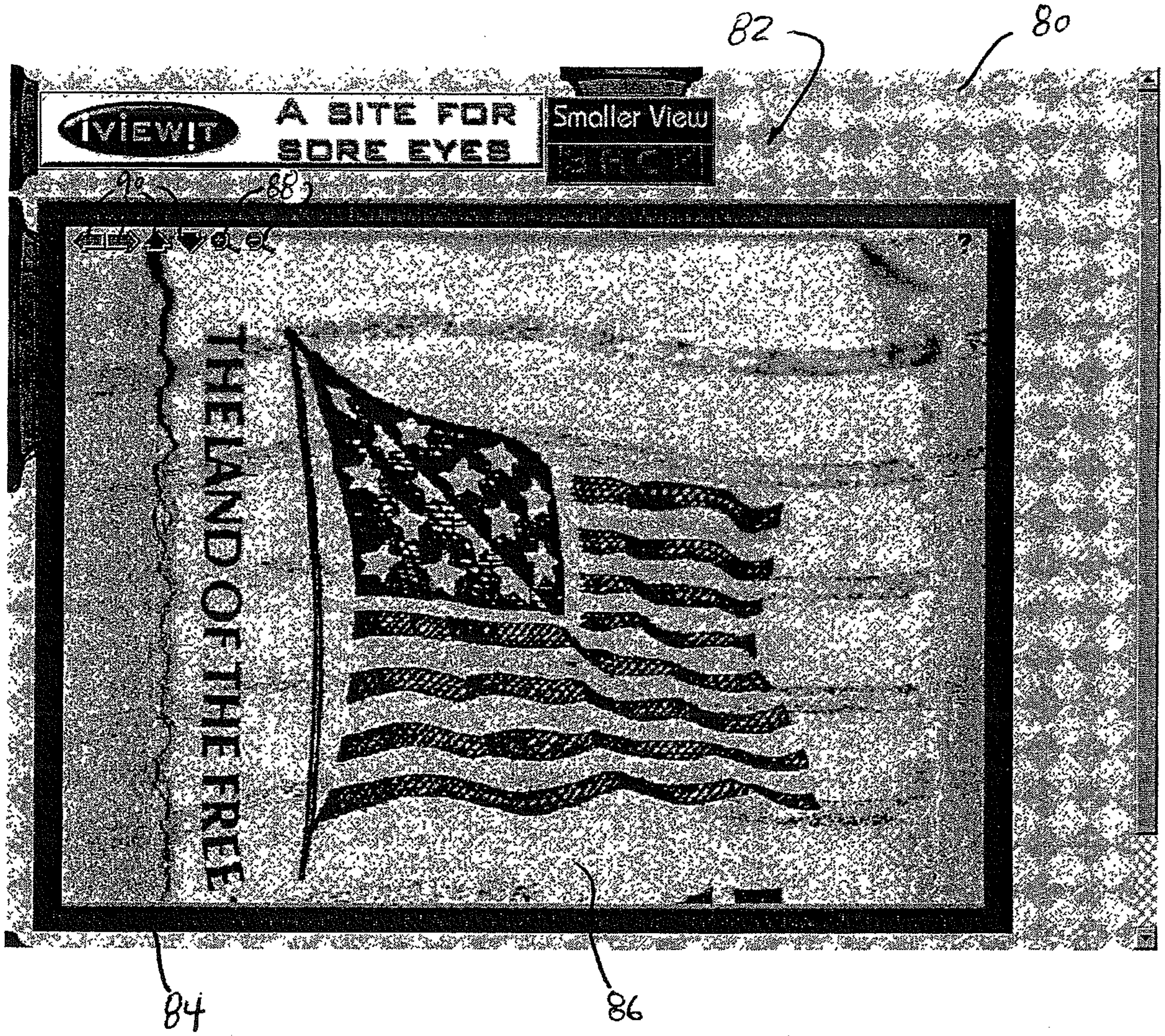
COMPRESS FILE
62
ASSOCIATE USER INTERFACE DATA
64
UPLOAD FILE
66

FIG. 2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80
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SORE EYES
Smaller View
BACK
90
88
THE LAND OF THE FREE
84
86

FIG. 3

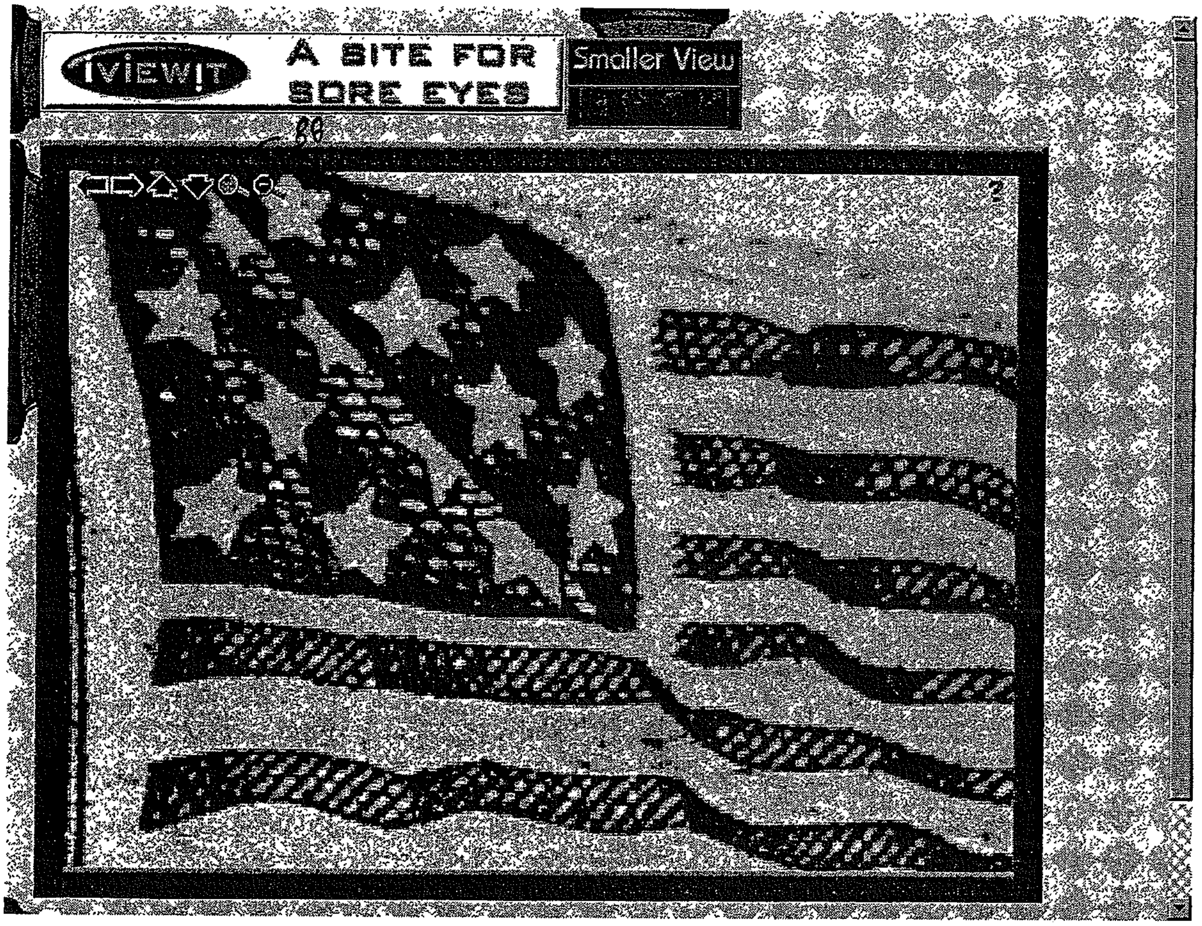

FIG. 4

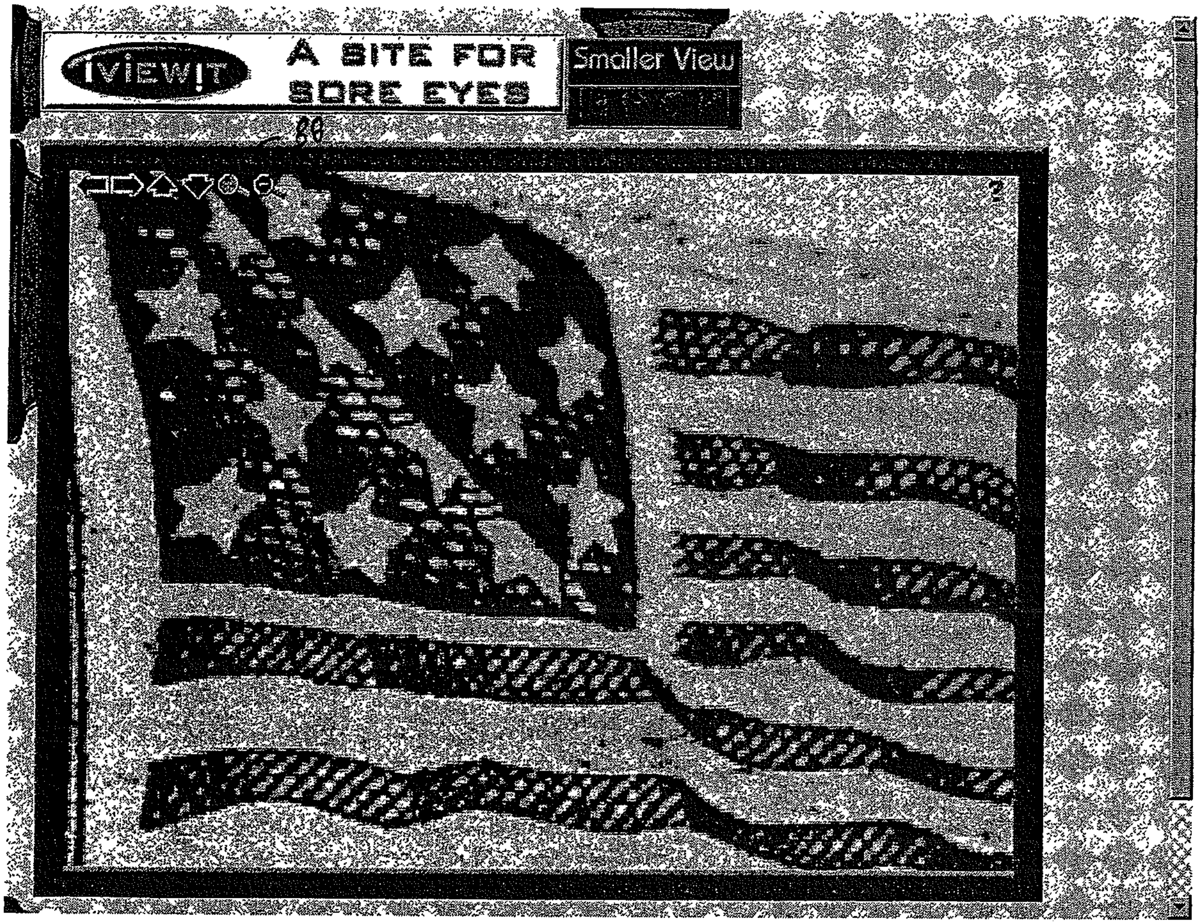

FIG. 4

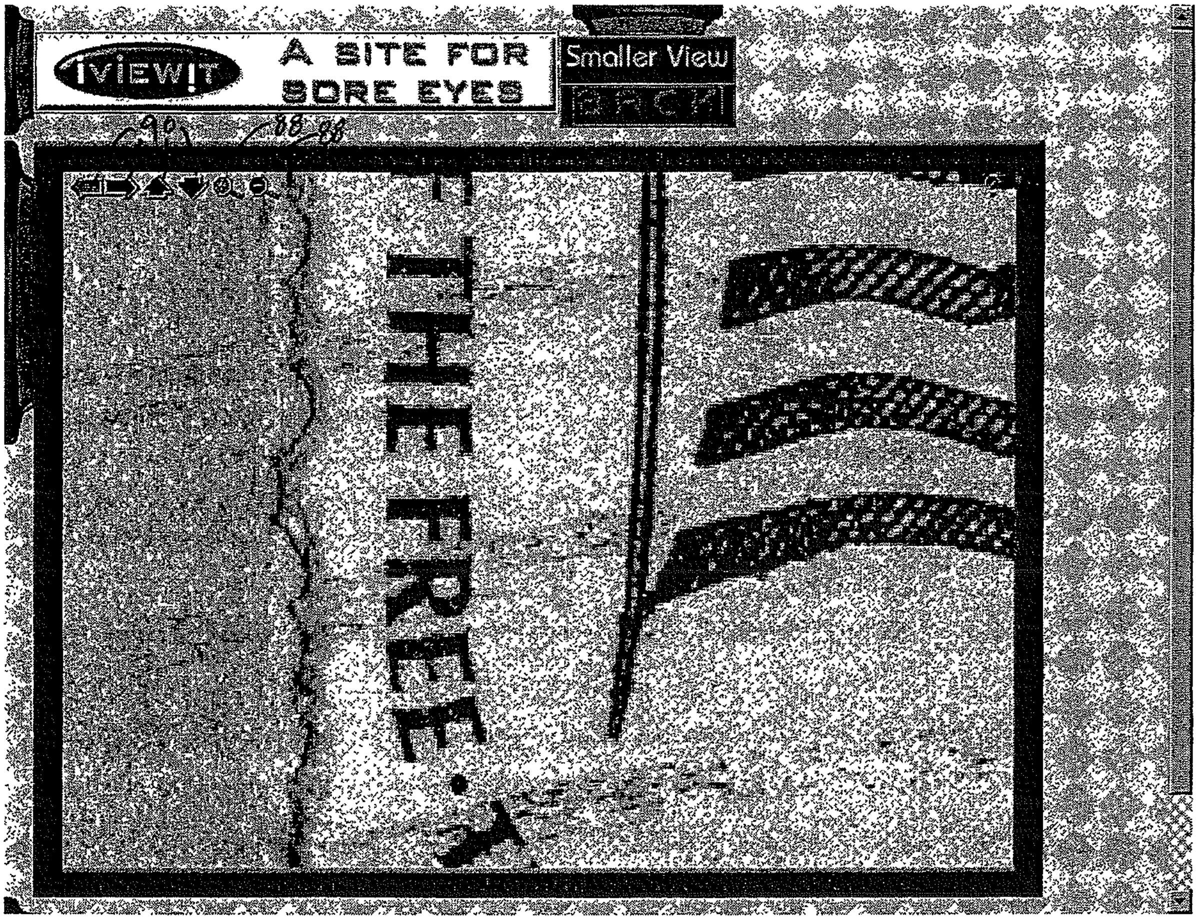

FIG. 5

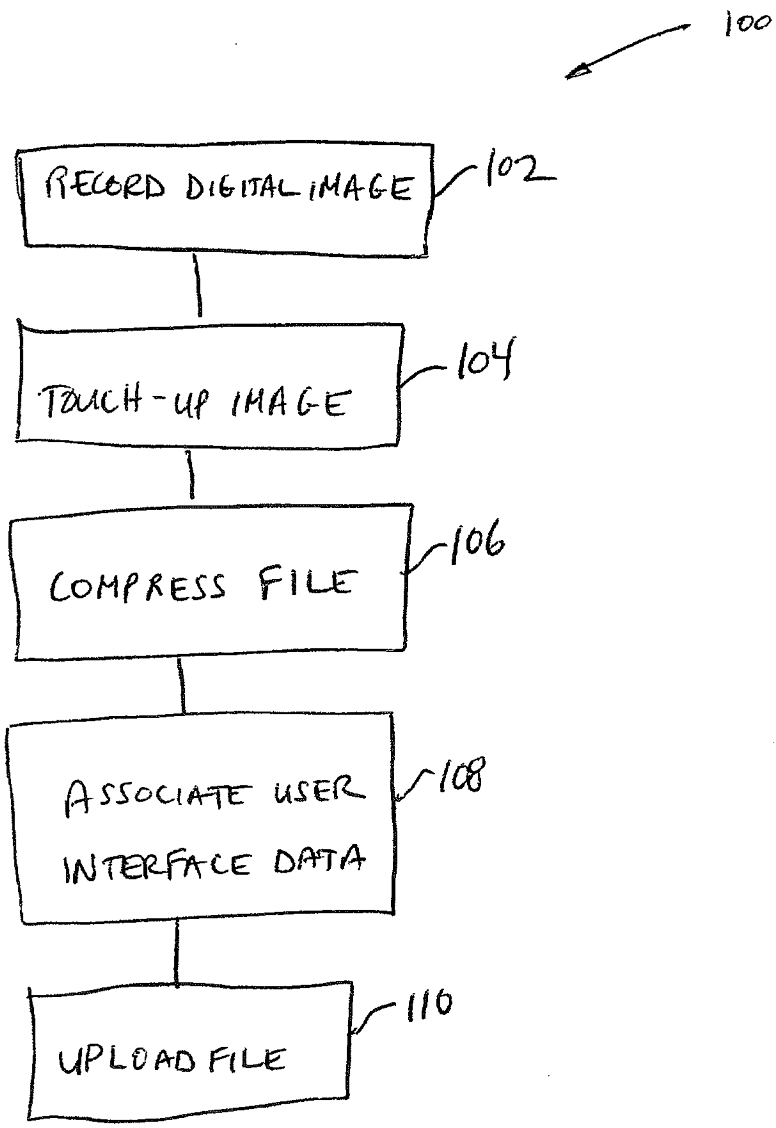
100
RECORD DIGITAL IMAGE
102
TOUCH-UP IMAGE
104
COMPRESS FILE
106
ASSOCIATE USER INTERFACE DATA
108
UPLOAD FILE
110

FIG. 6

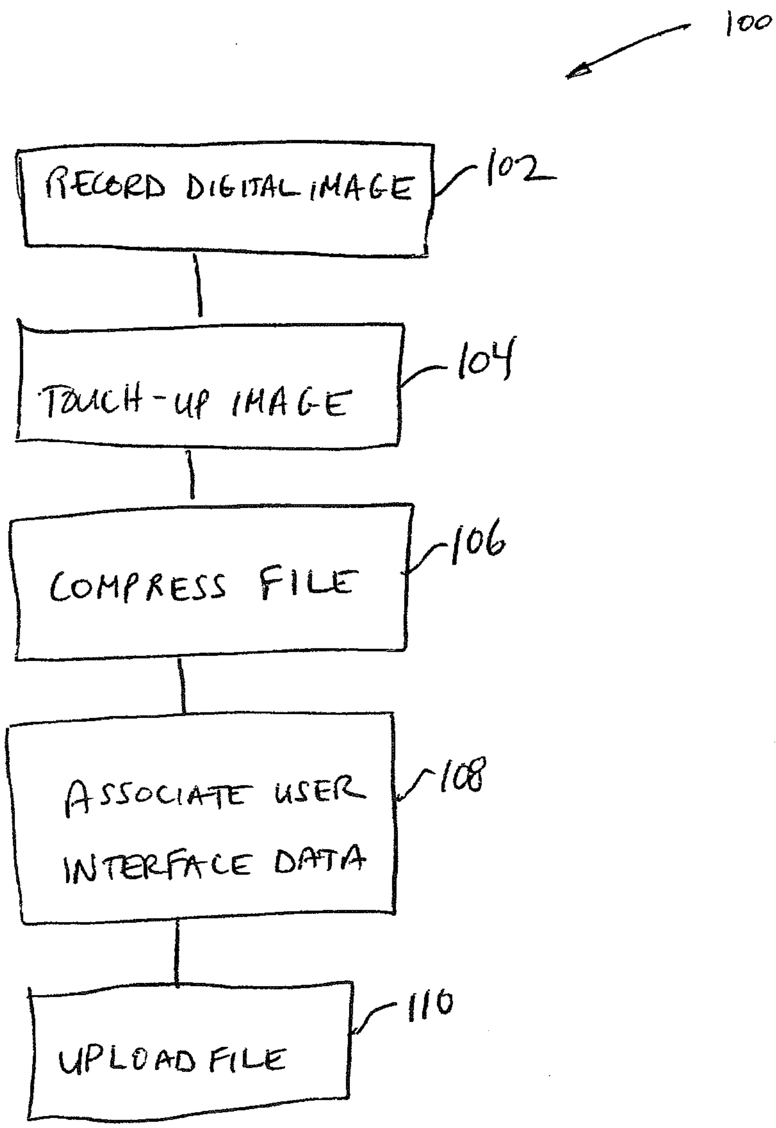
100
RECORD DIGITAL IMAGE
102
TOUCH-UP IMAGE
104
COMPRESS FILE
106
ASSOCIATE USER INTERFACE DATA
108
UPLOAD FILE
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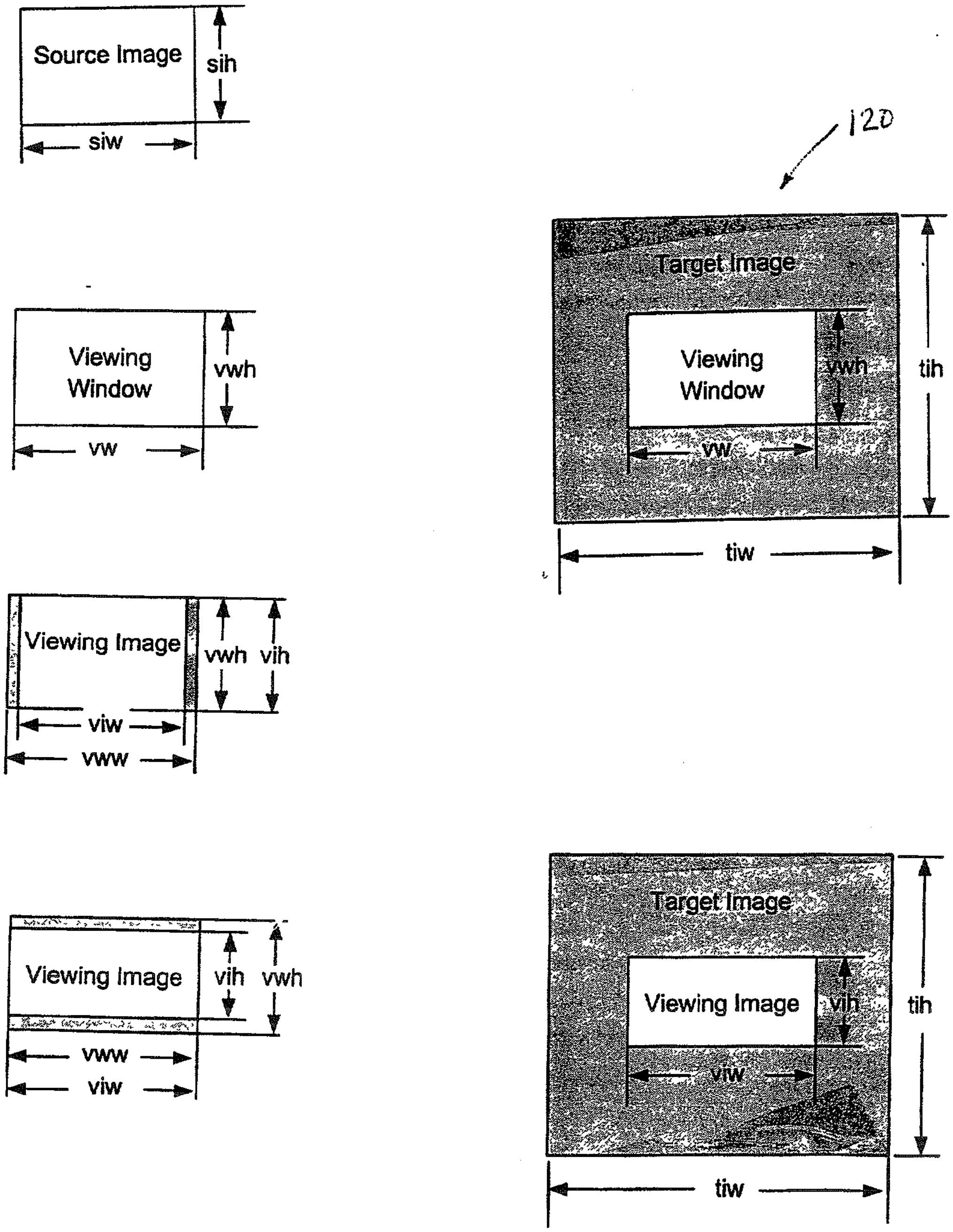
FIG. 6



Source Image
sih
siw
Viewing Window
vwh
vw
Viewing Image
vwh
vih
viw
vww
Viewing Image
vih
vwh
vww
viw
120
Target Image
Viewing Window
vwh
vw
tih
tiw
Target Image
Viewing Image
vih
viw
tih
tiw

FIG. 7

PA 1150500

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United States Patent and Trademark Office

April 05, 2004

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: ***60/125,824***
FILING DATE: ***March 24, 1999***

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

M. Sias

M. SIAS
Certifying Officer

Approv.

Attorney Docket No.: 5865-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Eliot I. Bernstein
Serial No.:	Please assign
Filed on:	March 24, 1999
Title:	APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

Box Provisional Application
Assistant Commissioner for Patents
Washington, D.C. 20231

PROVISIONAL PATENT APPLICATION TRANSMITTAL LETTER

Sir:

Please find transmitted herewith for filing the following:

(1) Provisional Application for Patent Cover Sheet;

(2) Provisional Patent Application including Specification, Claims and Abstract of the Disclosure, 15 pages, and Drawings (4 sheets);

(3) Verified Statement Claiming Small Entity Status;

(4) Check in the amount of $75.00 for the filing fee; and

(5) Power of Attorney form; and

(6) Return Receipt Postcard.

It is respectfully requested that the above papers be filed as a Provisional Patent Application.

Respectfully submitted,
MELTZER, LIPPE, GOLDSTEIN,
WOLF & SCHLISSEL, P.C.

By: ______________________
Raymond A. Joao
Reg. No. 35,907

March 24, 1999

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Tel. No.: (516) 747-0300
Fax No.: (516) 747-9363

"Express Mail" mailing label number ______________

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1 10 on the date indicated below and is addressed to. Box Provisional Application, Assistant Commissioner for Patents, Washington, D C. 20231

Date of Deposit: March 24, 1999

(Signature): ______________________

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PTO/SB/16 (2-98)
Approved for use through 01/31/2001. OMB 0651-0037
Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Eliot I.	Bernstein	500 S.E. Mizner Blvd. Suite 102 Boca Raton, FL 33432-6080

☐ *Additional inventors are being named on the ___ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (280 characters max)

APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

CORRESPONDENCE ADDRESS

Direct all correspondence to:

☐ Customer Number [ ] *Type Customer Number here* → *Place Customer Number Bar Code Label here*

OR

[X] Firm *or* Individual Name	Raymond A. Joao, Esq.				
Address	~~Meltzer, Lippe, Goldstein, et al.~~				
Address	190 Willis Avenue				
City	Mineola	State	NY	ZIP	11501
Country	U.S.A.	Telephone	516-747-0300	Fax	516-747-9363

ENCLOSED APPLICATION PARTS *(check all that apply)*

[X] Specification *Number of Pages* 15 — [X] Small Entity Statement

[X] Drawing(s) *Number of Sheets* 4 — ☐ Other (specify)

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

[X] A check or money order is enclosed to cover the filing fees

☐ The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: [ ]

FILING FEE AMOUNT ($): 75.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

[XX] No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: ____________

Respectfully submitted,

SIGNATURE [signature]

Date 3/24/99

TYPED or PRINTED NAME Raymond A. Joao

REGISTRATION NO. *(if appropriate)* 35,907

TELEPHONE 516-747-0300, XTN 240

Docket Number: 5865-1

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STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) & 1.27(b))--INDEPENDENT INVENTOR

Docket Number (Optional) 5865-1

Applicant, Patentee, or Identifier: Eliot I. Bernstein

Application or Patent No.: Please Assign

Filed or Issued:

Title: APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

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Eliot I. Bernstein		
NAME OF INVENTOR	NAME OF INVENTOR	NAME OF INVENTOR
[signature]		
Signature of inventor	Signature of inventor	Signature of inventor
3/23/99		
Date	Date	Date

60125824.032459

Attorney Docket No. 5865-1

APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

FIELD OF THE INVENTION

The present invention is directed to an apparatus and a method for producing enhanced digital images and, in particular, to an apparatus and a method for producing enhanced resolution digital images from a print film image.

BACKGROUND OF THE INVENTION

The fields of telecommunications, multimedia, and related areas, are growing at increasing rates. With this continued growth, the need for high resolution digital imagery, for utilization in conjunction with the corresponding technologies, is becoming greater. Current technologies utilize digital panoramic cameras, as opposed to film or print film cameras. While the utilization of digital cameras may appear to many to be a viable manner by which to obtain digital images, there are, in fact, many disadvantages and shortcomings associated with digital camera images.

Conventional digital technologies typically have very low zoom quality and low image size restrictions or limitations associated therewith. The differences between digital imagery and print film imagery lie in the respective processing technologies and methods which are used in the processing of digital images versus those technologies and methods utilized in the processing of print film images. Generally speaking, print film produces a higher resolution image, and an associated higher resolution scanning quality, which further facilitates an improved enlargement

or reduction of the image for different sizes and different depths, without pixel distortion. Digital photography, and associated images, utilize pixels which typically have a certain size. When enlarged or reduced, these pixels of the digital image become distorted, a feature which typically results in the digital image being fixed to an original size, or being available at very low magnifications, such as, for example, magnifications of from 200 times to 300 times. These digital images are also difficult to enlarge to a full screen size without a tremendous amount of distortion present in the end product.

Currently, panoramic imaging techniques utilize digital images as their starting point. With such associated limitations, the ability to provide enhanced resolution digital images and, especially, an enhanced resolution digital panoramic image, such as those utilized on, or over, the Internet and/or the World Wide Web, has been greatly compromised.

Another major drawback in the current technology lies in the fact that conventional processes often utilize panoramic lenses in order to capture an image. This practice has been criticized as creating distortions in the image immediately upon the image's enlargement or reduction. The conventional techniques associated with the use of panoramic lenses are know to result in image "bending", which further curtails one's ability to obtain realistic views, especially upon performing any associated cropping and/or editing processes. In such instances, the upper end and the lower end of the image must be either erased, or covered, in order to prevent the flaw from being exposed. This typically results in the resulting image having a "fishbowl-type" distortion. In some instances, 32 mm lenses have been utilized in order to obtain enhanced floor to ceiling images without experiencing image bending. In these applications,

however, the ability of the lens to capture optimal images varies depending upon the scene or image being photographed.

SUMMARY OF THE INVENTION

The present invention provides an apparatus and a method for producing digital images which overcomes the shortcomings of the prior art. The apparatus includes a camera, which can be a conventional print film camera, a developing device, which can by any device or collection of devices for developing the image taken by the camera, into a print film image, and an enlarging device, for enlarging the print film image. A digital camera can also be utilized to obtain the image. If the image is taken with a digital camera, a print image is obtained from the digital image. The print image can then be enlarged.

The apparatus also includes a computer and associated peripheral devices for performing the various processing routines of the method of the present invention. The apparatus also includes a scanning device, for scanning the print film image or photograph in order to obtain a digital image representation of same.

The print film image, which is obtained by the camera, can be developed by the developing device, and enlarged by the enlarger. The image print can then be scanned by the scanner in order to generate a digital file or other high quality image extension file. A plurality of these digital files can then be stitched together thereby creating a panoramic scene or image.

The computer may be utilized in order to perform touch-up operations on the obtained image or image collection in order to make refinements and/or enhancements thereto. The image can then be converted from a high resolution image compression extension file to a low resolution graphic or video image extension file.

The resulting file may then be processed so that the image represented therein can be displayed and/or posted for display to a host computer or other suitable device.

The above process can be repeated using different photo depths for any of the obtained images, or portions thereof, in order to create areas of higher resolution for closer inspections of these areas at different image depths.

Accordingly, it is an object of the present invention to provide an apparatus and a method for providing enhanced digital images from print film images.

It is another object of the present invention to provide an apparatus and a method for producing digital images, from print film images, which have improved and enhanced resolution.

It is still another object of the present invention to provide an apparatus and a method for producing digital images, from print film images, which are suitable for display and/or downloading in a digital computer and/or in a telecommunications environment.

It is still another object of the present invention to provide an apparatus and a method for providing a digital image which is characterized by effective image compression subsequent to a stitching operation, thereby avoiding any dramatic loss in image quality.

It is yet another object of the present invention to provide an apparatus and a method for producing digital images which are characterized by high definition resolution, and which are suitable for high definition television, Web television and large, full screen, panoramic internet applications, without loss of resolution upon image magnification or reduction.

It is another object of the present invention to provide an apparatus and a method for producing and transmitting digital images in a network environment which dispenses with the need for plug-in software.

It is still another object of the present invention to provide an apparatus and a method for producing digital images which facilitates high speed file transfer in a network environment and/or in a computer environment.

Other objects and advantages of the present invention will be apparent to those skilled in the art upon a review of the Description of the Preferred Embodiment taken in conjunction with the Drawings which follow.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings:

Figure 1 illustrates the apparatus of the present invention, in block diagram form; and

Figures 2A, 2B and 2C illustrate the method of the present invention, in flow diagram form.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention provides an apparatus and a method for providing enhanced digital images which can be utilized and which can be easily managed, when displayed, projected, or posted to an Internet Web server, Web site or Web page. In particular, the present invention provides an apparatus and a method for producing an enhanced digital image from a print film image, or from a photographic image, which is taken with a print film camera. The digital images which are produced by the apparatus and method of the present invention have improved and enhanced resolution and require far less effort in the associated maintenance and management of same. The digital images, which are produced by the apparatus and method of the present invention, can be utilized and displayed on computers, projection devices, and, as noted above, can be posted to an Internet Web server, a Web site, and/or a Web page.

The present invention, in a preferred embodiment, is utilized to produce enhanced images for posting and/or for downloading, to a digital display medium, which in the preferred embodiment, is an Internet and/or a World Wide Web server, a Web site, or Web page. In this manner, enhanced digital images can be produced from print film images, with the resulting digital images having enhanced resolution. This resolution is unaffected by the typical resolution limiting parameters and phenomena which are associated with conventional digital image processing equipment, techniques and methods.

Figure 1 illustrates the apparatus of the present invention which is denoted generally by the reference numeral 100, in block diagram form. With reference to Figure 1, the apparatus 100 includes a camera 105 which, in the preferred embodiment, is a conventional print film camera, such as those cameras manufactured by Nikon, Canon, Hasselblad, or any other manufacturer. A digital camera may also be utilized to obtain the image. In the preferred embodiment, the camera 105 contains a 24-32 mm lens and can be a hand-held camera, a fixed camera, or a camera which is mountable, such as on a tripod or on a stand. The camera 105 is utilized to obtain the print film image of the image or scene which is being photographed.

The apparatus 100 also includes a developing device 110 which can be any device or collection of devices for developing the film print image which is taken by the camera 105 into a film print image. The apparatus 100 also includes an enlarging device 115 for enlarging the film print image.

The apparatus 100 also includes a computer 120, for performing the various processing routines of the method of the present invention. The computer 120 may be a personal computer, a laptop computer, a mini-computer, a microcomputer, a mainframe computer, or any other suitable computer or computer system. The computer 120 includes a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), a display device, an input device and an output device. The computer 120 may also include any other hardware or software needed to perform any of the processing tasks described herein. The input device may include a keyboard, a mouse, or other pointing device, for allowing for data and/or command input by a user. The output device may include a printer and, in the preferred embodiment, the printer may be a color laser printer or a color inkjet printer.

The apparatus 100 also includes a scanning device 125, for scanning the print film image or photograph in order to obtain a digital image representation of same. Any suitable computer or scanner and any suitable scanning software may be utilized in conjunction with the present invention. In a preferred embodiment, a UMAX™ Astra scanner is utilized in conjunction with Microsoft® Photo Editor software.

Figures 2A, 2B and 2C illustrate the method of the present invention, in flow diagram form. With reference to Figures 2A, 2B and 2C, the method of the present invention commences at step 200. At step 201, a scene or image is photographed by using the print film camera 105.

At step 202, the print film image, which is obtained by the camera 105, is developed by the developing device 110 in order to produce a high gloss photographic image print. If the image is obtained with a digital camera, a print image should be obtained from the digital image. In this manner, the higher resolution print image can then be enlarged and scanned. At step 203, the image print is enlarged by the enlarger 115. In the preferred embodiment, the image prints are enlarged to sizes of between 8"x6" to 8"x12". Although enlargement to any size may be obtained and utilized, the aforementioned sizes represent the respective lower end and upper end limits for the print sizes which provide optimal magnification capability in the preferred embodiment. In the preferred embodiment, a magnification capability of up to 1700 times may be attained for most views or scenes. It is, however, recommended that larger enlargement sizes be obtained for smaller object images.

At step 204, the image print, obtained at step 203, is scanned by the scanner 125 in order to generate a bitmap image file or other high quality image extension file. At step 205, a plurality of bit map files, which are obtained for the image prints, can be stitched together by the scanner 125, thereby creating a panoramic scene or image, or simply a scene requiring a plurality of photographs. This stitching operation is performed by utilizing photo stitching software such as, for example, Photo Vista software by Live Picture, Live Picture Reality Studio, and/or Live Picture Object Modeler and/or Photo Vista software.

At step 206, the computer 120 performs a touch-up operation on the scanned image or stitched image collection in order to make refinements and/or enhancement thereto. This touch-up operation is accomplished by utilizing imaging software. In the preferred embodiment, Adobe Photoshop software is used as the imaging software for touching up the images. At step 207, the image is then converted from a bitmap file, or any other suitable high resolution image compression extension file, to a JPEG file or other suitable low resolution graphic or video image extension file. In the preferred embodiment, Adobe Image Ready software is utilized to perform the bitmap to JPEG file conversion. The bitmap to JPEG file conversion, which is performed at step 207, serves to preserve video image quality and resolution, thereby providing an optimum video image. At step 208, the JPEG file of the image is compressed by utilizing image compression software, such as Adobe Image Ready software. The compressed image is, thereafter, ready for display and/or posting to a host computer, a Web server, a Web site, or a Web page.

The above process can be repeated using different depth photos for any of the images obtained in order to create areas of higher resolution or "hot spots", for closer inspections of these areas at different depths. These depth photos can also be stitched into the respective image or image portion by using the stitching techniques described above, which are hereby incorporated by reference herein. The above process can be utilized in order to create higher zoom capabilities with each new depth layer of an image.

At step 208, a determination is made as to whether different depth photographs are desired. If different depth photographs are desired, the method repeats steps 201 through 207 to obtain the desired image. If no additional depth photographs are desired, the method proceeds to step 209.

At step 209, the resulting digital image can be displayed on a digital display device, projected from a projection device, or posted to a host computer, a Web server, a Web site, or a Web page. In the instance where the image is posted to an Internet Web server, Web site, or

Web page, the upload from the computer 120, to the respective server, site, or page, can be performed by utilizing file uploading software, such as WFTP Pro software. The image can then be viewed at reasonable speeds. Upon completion of the file upload at Step 209, the method ceases operation at Step 210.

The processing steps described herein provide for the production of digital images which have enhanced resolution and which can be easily and effectively managed in applications involving the display of same, or the posting of same, to a host computer, a Web server, a Web site, a Web page, a computer display, and/or a full screen projection display. Further, the method of the present invention provides for effective image compression after a requisite stitching operation, thereby preserving image quality. The apparatus and method of the present invention provides images which have enhanced resolution and quality while requiring less file management efforts.

The resulting images are characterized by a high definition resolution and are suitable for high definition television, Web television, and large, full screen, panoramic internet applications, such as those involving displaying video images, while preserving resolution upon image magnification or reduction. The present invention also dispenses with the need for plug-in software during download and/or file transfer operations. Further, a zoom capacity of up to 1700 times or greater may be easily obtained with the present invention. The present invention also facilitates high speed file transfers of high resolution digital images thereby dispensing with the need to engage in long and slow conventional file downloads and/or file transfers.

The digital images obtained with the present invention can be utilized for any digital or projection application, including full screen display and/or projection applications.

While the present invention has been described and illustrated in various preferred embodiments, such descriptions are merely illustrative of the present invention and are not to be construed to be limitations thereof. In this regard, the present invention encompasses any and all modifications, variations, and/or alternate embodiments, with the scope of the present invention being limited only by the claims which follow.

CLAIMS

What Is Claimed Is:

1. An apparatus for producing a digital image, comprising:

a device for generating a digital signal file from a print film image; and

a processor for processing said digital signal file and for generating an image file,

wherein said processor generates a first signal file from said digital signal file, and further wherein said processor processes said first signal file and generates said image file.

2. The apparatus of claim 1, further comprising:

a camera for obtaining a photographic representation of an image.

3. The apparatus of claim 2, further comprising:

a developing device for developing said photographic representation and for generating said print film image.

4. The apparatus of claim 3, further comprising:

an enlarging device for enlarging said print film image.

5. The apparatus of claim 4, further comprising:

a scanning device for generating said digital signal file from said print film image.

6. The apparatus of claim 1, wherein said first signal file is a bitmap file.

7. The apparatus of claim 1, wherein said image file is a JPEG file.

8. An apparatus for producing a digital image, comprising:

means for generating a digital signal file from a print film image file; and

means for processing said digital signal file and for generating an image file, wherein said processing means generates a first signal file from said digital signal file, and further wherein said processing means processes said first signal file and generates said image file.

9. The apparatus of claim 8, further comprising:

means for obtaining a photographic representation of an image.

10. The apparatus of claim 9, further comprising:

means for developing said photographic representation and for generating said print film image.

11. The apparatus of claim 10, further comprising:

means for enlarging said print film image.

12. The apparatus of claim 11, further comprising:

means for generating said digital signal file from said print film image.

13. The apparatus of claim 8, wherein said image file is a bitmap file.

14. The apparatus of claim 8, wherein said image file is a JPEG file.

15. A method for producing a digital image, comprising:

generating a digital signal file from a print film image;

processing said digital signal file; and

generating an image file, wherein said processing operation further comprises:

generating a first signal file from said digital signal file; and

processing said first signal file and generating said image file.

16. The method of claim 15, further comprising:

obtaining a photographic representation of an image.

17. The method of claim 16, further comprising:

developing said photographic representation; and

generating said print film image.

18. The method of claim 18, further comprising:

enlarging said print film image.

19. The method of claim 18, further comprising:

generating said digital signal file from said print film image.

20. The apparatus of claim 15, wherein said first signal file is a bitmap file.

21. The apparatus of claim 15, wherein said image file is a JPEG file.

ABSTRACT OF THE DISCLOSURE

An apparatus and a method for producing a digital image, which includes a device for generating a digital signal file from a print film image, and a processor for processing the digital signal file and for generating an image file. The processor generates a first signal file from the digital signal file. The processor processes the first signal file and generates the image file.

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Attorney Docket No.: 5865-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

POWER OF ATTORNEY

Application of:	Eliot I. Bernstein
Serial No.:	Please assign
Filed on:	March 24, 1999
Title:	APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

RAYMOND A. JOAO, Reg. No. 35,907

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190 Willis Avenue
Mineola, New York 11501

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of the sole inventor (given name, family name): ELIOT I. BERNSTEIN	
Inventor's signature: >	Date: > 3.24.99
Residence: 500 S.E. Mizner Boulevard, Suite 102, Boca Raton, FL 33432-6080	Citizenship: U.S.A.
Post Office Address: SAME AS ABOVE	

59125004128

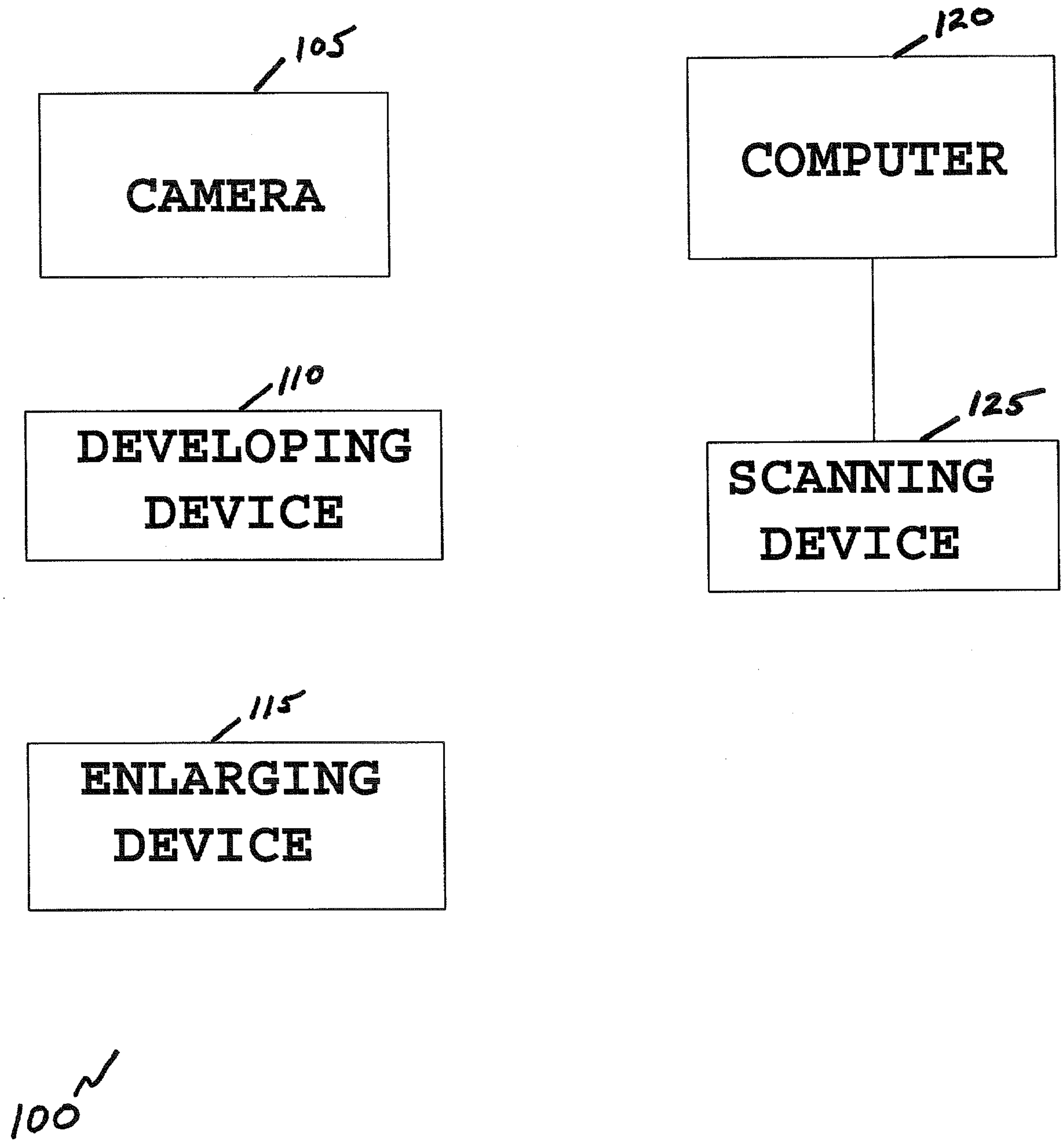
105
CAMERA
110
DEVELOPING DEVICE
115
ENLARGING DEVICE
120
COMPUTER
125
SCANNING DEVICE
100

FIG. 1

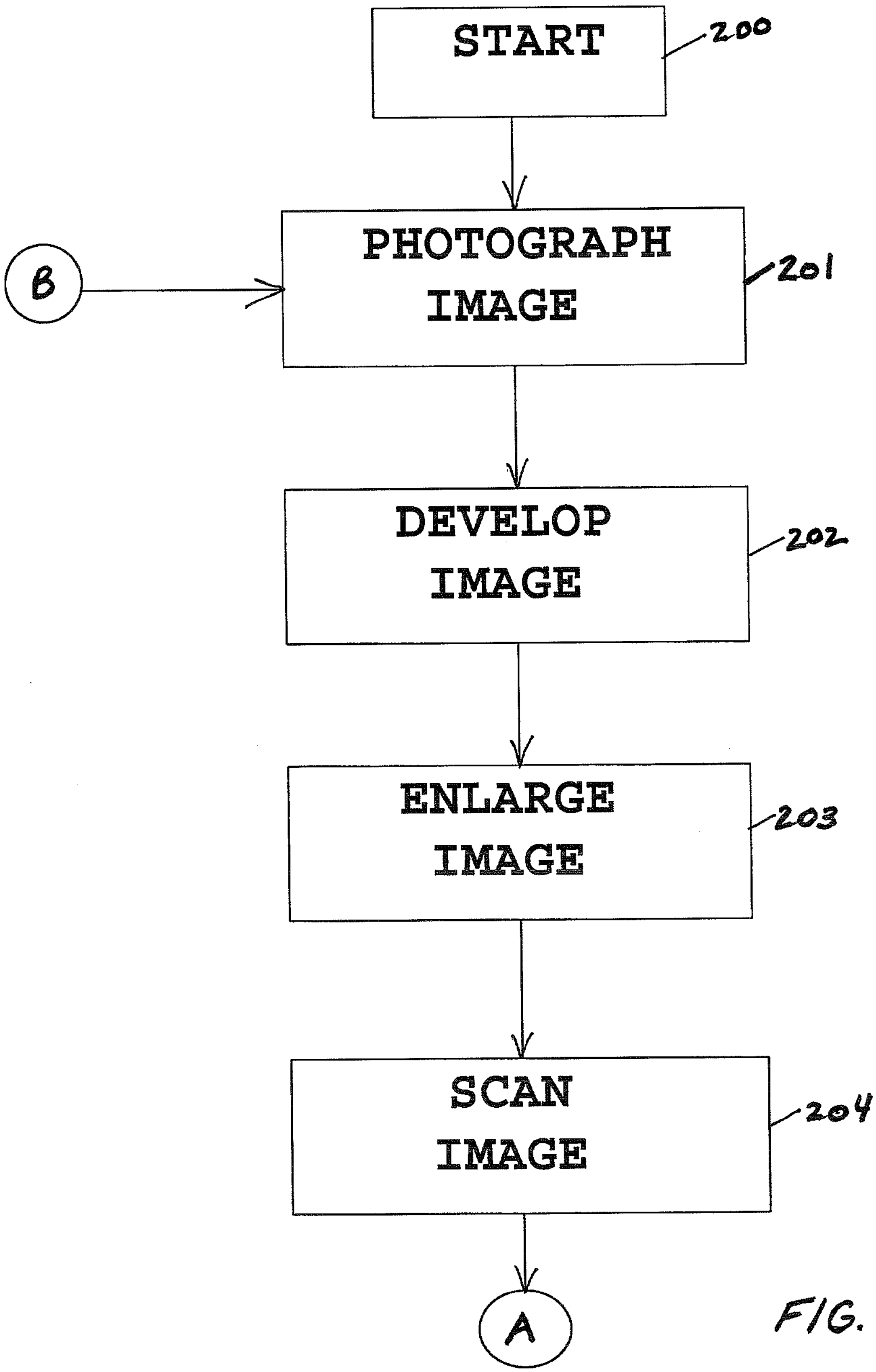
START
200
PHOTOGRAPH IMAGE
201
B
DEVELOP IMAGE
202
ENLARGE IMAGE
203
SCAN IMAGE
204
A

FIG. 2A

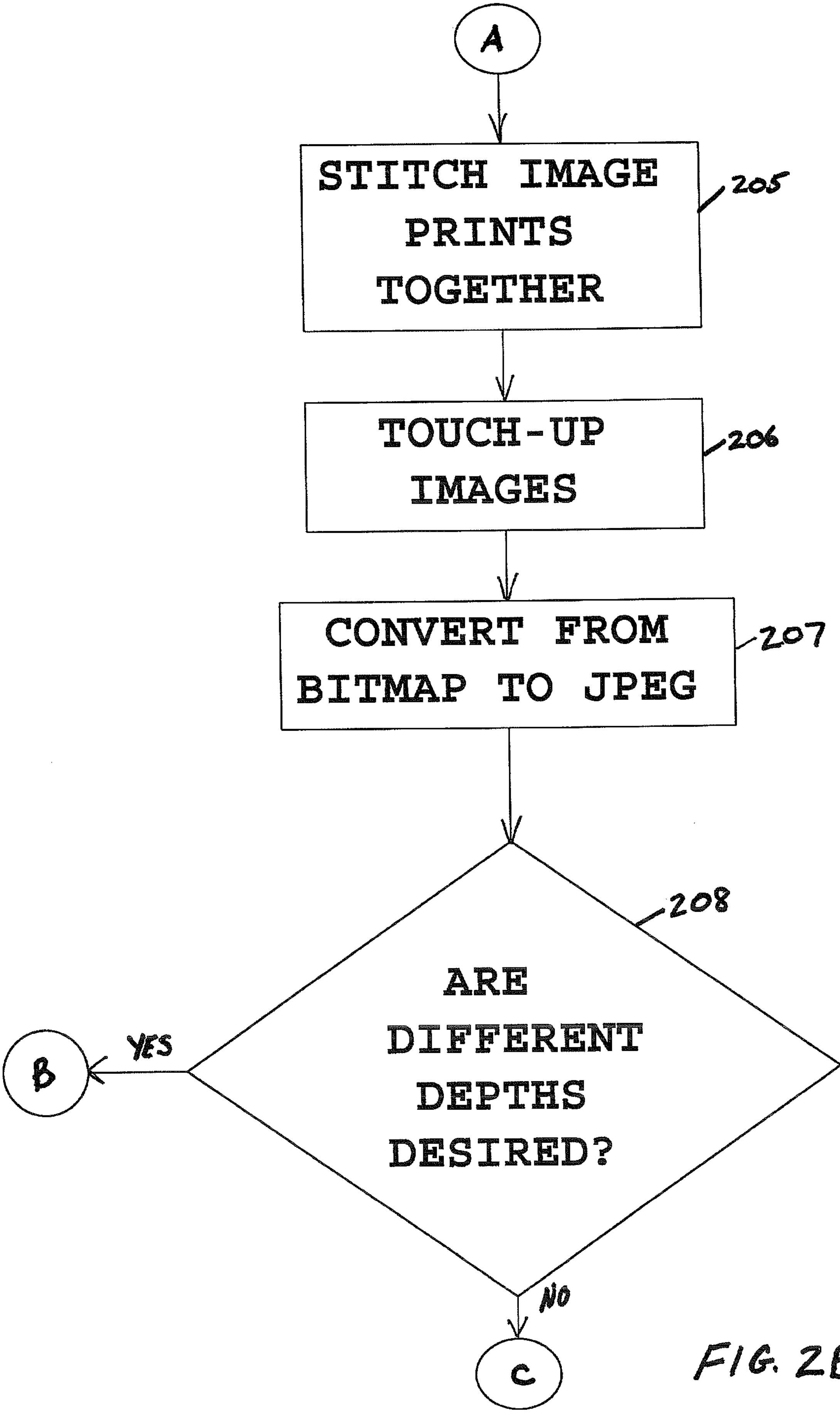
A
STITCH IMAGE PRINTS TOGETHER
205
TOUCH-UP IMAGES
206
CONVERT FROM BITMAP TO JPEG
207
ARE DIFFERENT DEPTHS DESIRED?
208
YES
B
NO
C

FIG. 2B

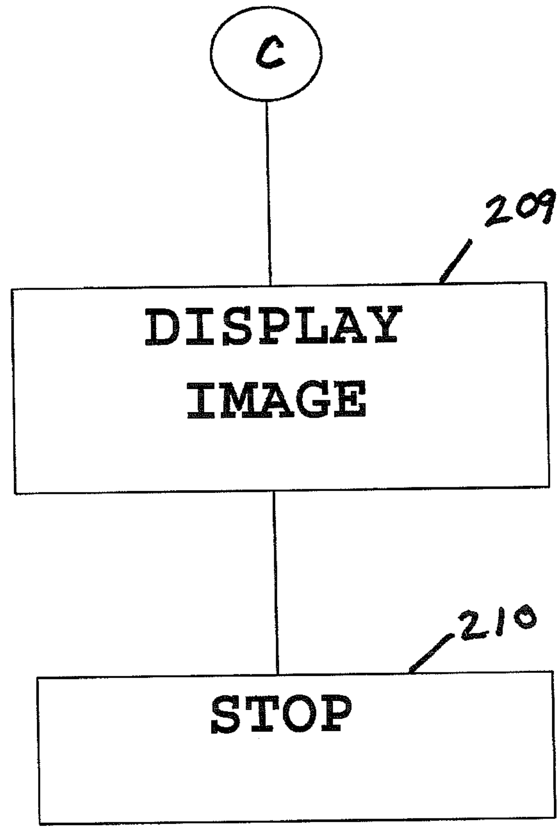

FIG. 2C

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APPLICATION NUMBER: *60/137,297*
FILING DATE: *June 03, 1999*

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L. EDELEN
Certifying Officer

JC586 U.S. PTO
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60/137297
06/03/99

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Eliot	Bernstein	500 S.E. Mizner Road Suite 102 Boca Raton, FL 33432

☐ *Additional inventors are being named on the ___ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (280 characters max)

APPARATUS AND METHOD FOR PRODUCING ENHANCED VIDEO IMAGES

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Type Customer Number here

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ENCLOSED APPLICATION PARTS *(check all that apply)*

[X] Specification *Number of Pages* one [X] Small Entity Statement

☐ Drawing(s) *Number of Sheets* ☐ Other (specify)

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

[X] A check or money order is enclosed to cover the filing fees

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FILING FEE AMOUNT ($): $75.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☐ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: ____________

Respectfully submitted,

SIGNATURE Raymond A. Joao

Date 6 / 3 / 99

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Docket Number: 5865-3

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

Attorney Docket No.: 5865-3

A/PRO

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Eliot I. Bernstein
Serial No.:	Please assign
Filed on:	Concurrently herewith
Title:	APPARATUS AND METHOD FOR PRODUCING ENHANCED VIDEO IMAGES

Box Provisional Application
Assistant Commissioner for Patents
Washington, D.C. 20231

PROVISIONAL PATENT APPLICATION TRANSMITTAL LETTER

Sir:

Please find transmitted herewith for filing the following:

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(2) Provisional Patent Application including Specification - 1 page

(3) Verified Statement Claiming Small Entity Status;

(4) Check in the amount of $75.00 for the filing fee; and

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(6) Return Receipt Postcard.

It is respectfully requested that the above papers be filed as a Provisional Patent Application.

Respectfully submitted,
MELTZER, LIPPE, GOLDSTEIN,
WOLF & SCHLISSEL, P.C.

By: Raymond A. Joao
Reg. No. 35,907

June 3, 1999

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Attorney Docket No. 5865-3

APPARATUS AND METHOD FOR PRODUCING ENHANCED VIDEO IMAGES

The present invention is directed to an apparatus and a method for producing enhanced video images. A preferred embodiment of the invention is described in the following manner.

Step 1. Record the video under any format, i.e., beta, VHS, digital, and/or any of the standard file formats, including, but not limited to, *.AVI, *.MOV, *.MPEG, etc., by utilizing an appropriate recording device such as a video camera, a film camera, a reel-to-reel recording device, and/or a live video recording device.

Step 2. After the video is shot, the second step is to capture the video using any capture device such as a capture card or capture hardware, such as provided by Dazzle, and also by using capture software such as Adobe Premier version 5.1 or Real Producer G2.

Step 3. Edit the video, if necessary, by using any standard video editing tools, such as, for example, Adobe Premier 5.1.

Step 4. Convert the data and/or information obtained to a real video format such as, but not limited to, a *.RM format.

Step 5. Manually set the size of the video within the HTML code to a 640 x 480 frame resolution, or any other suitable resolution, such as, but not limited to, 800 x 600, 1024 x 768, 1280 x 1024, 1600 x 1200.

Step 6. Post the obtained file to a Web page, Web site and/or to the Web, by using any Web FTP software, such as, but not limited to, WS FTP PRO.

Step 7. Generate or write an ASCII file that calls the real video to stream. This results in streaming real video at full screen with very good clarity and quality. Under Step 7 a separate ASCII file is written and saved as an *.RPM file, or other suitable format, that will call the original real video file. This script is included in the HTML codes. For MPEG videos, Steps 1 through 3 are followed as described above. In Step 4, the file is converted, if not previously converted, to an MPEG format. Next, the video is inserted into the HTML codes and expanded to a 640 by 480 resolution, or higher resolution. Then the video file is uploaded to the Web page Web site, and/or the Web in Step 6. Thereafter, at Step 7, the MPEG file is played from the Web page, Web site and/or from the Web, by first downloading a small portion of the file and playing the file through a suitable player which supports AVI, MPEG-type, etc., video formats and/or other suitable formats.

Attorney Docket No.: 5865-3

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

POWER OF ATTORNEY

Application of:	Eliot I. Bernstein
Serial No.:	Please assign
Filed on:	Concurrently herewith
Title:	APPARATUS AND METHOD FOR PRODUCING ENHANCED VIDEO IMAGES

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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Mineola, New York 11501

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor's signature: >	**Date:** > 6/3/99
Residence: **500 S.E. Mizner Boulevard Suite 102 Boca Raton, FL 33432-6080**	**Citizenship:** **U.S.A.**
Post Office Address: **SAME AS ABOVE**	

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PTO/SB/09 (12-97)
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Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) & 1.27(b))--INDEPENDENT INVENTOR	Docket Number (Optional) 5865-3

Applicant, Patentee, or Identifier: Eliot Bernstein

Application or Patent No.: ______

Filed or Issued: Concurrently

Title: APPARATUS AND METHOD FOR PRODUCING ENHANCED VIDEO IMAGES

As a below named inventor, I hereby state that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:

- [X] the specification filed herewith with title as listed above.
- [ ] the application identified above.
- [ ] the patent identified above.

I have not assigned, granted, conveyed, or licensed, and am under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- [X] No such person, concern, or organization exists.
- [ ] Each such person, concern, or organization is listed below.

Separate statements are required from each named person, concern, or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

Eliot Bernstein		
NAME OF INVENTOR	NAME OF INVENTOR	NAME OF INVENTOR
[signature]		
Signature of Inventor	Signature of inventor	Signature of inventor
6-3-99		
Date	Date	Date

ORDER NUMBER	1150500
REFERENCE ORDER NUMBER	0
BIN NUMBER	0

DELIVERY INSTRUCTIONS

ORDER DATE/TIME	PALM NUMBER	CUSTOMER NUMBER	CONTACT PHONE NUMBER	PAYMENT METHOD	TOTAL COST OF ORDER
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UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

April 06, 2004

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: ***60/141,440***
FILING DATE: ***June 29, 1999***

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

L. Edelen

L. EDELEN
Certifying Officer

06/29/99 JC553 U.S. PTO

A/PR

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JC541 U.S. PTO 60/141440 06/29/99

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Eliot	Bernstein	500 S.E. Mizner Road Suite 102 Boca Raton, FL 33432

☐ *Additional inventors are being named on the ___ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (280 characters max)

APPARATUS AND METHOD FOR PROVIDING AND/OR FOR TRANSMITTING VIDEO DATA AND/OR INFORMATION IN A COMMUNICATION NETWORK

Direct all correspondence to: **CORRESPONDENCE ADDRESS**

☐ Customer Number [ ] → *Place Customer Number Bar Code Label here*

Type Customer Number here

OR

☐ Firm *or* Individual Name	Raymond A. Joao, Esq.				
Address	Meltzer, Lippe, Goldstein & Schlissel, P.C.				
Address	190 Willis Avenue				
City	Mineola	State	NY	ZIP	11501
Country	USA	Telephone	516-747-0300	Fax	516-747-9363

ENCLOSED APPLICATION PARTS *(check all that apply)*

[X] Specification *Number of Pages* 25 [X] Small Entity Statement

[X] Drawing(s) *Number of Sheets* 2 [X] Other (specify) Power of Attorney

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

[X] A check or money order is enclosed to cover the filing fees

☐ The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: [ ]

FILING FEE AMOUNT ($) $75.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

[X] No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: ______

Respectfully submitted,

SIGNATURE Raymond A Joao

Date 6/29/99

TYPED or PRINTED NAME Raymond A. Joao

REGISTRATION NO. *(if appropriate)* 35,907

TELEPHONE 516-747-0300, X-240

Docket Number: 5865-4.1

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

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STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) & 1.27(b))—INDEPENDENT INVENTOR	Docket Number (Optional) 5865-4.1

Applicant, Patentee, or Identifier: Eliot Bernstein

Application or Patent No.: ____________

Filed or Issued: Concurrently herewith

Title: APPARARTUS AND METHOD FOR PROVIDING AND/OR FOR TRANSMITTING VIDEO DATA AND/OR INFORMATION IN A COMMUNICATION NETWORK

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- [ ] the application identified above.
- [ ] the patent identified above.

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Eliot Bernstein NAME OF INVENTOR	NAME OF INVENTOR	NAME OF INVENTOR
[signature] Signature of Inventor	Signature of inventor	Signature of Inventor
6/29/99 Date	Date	Date

Attorney Docket No.: 5865-4.1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Eliot I. Bernstein
Serial No.:	Please assign
Filed on:	Concurrently herewith
Title:	APPARATUS AND METHOD FOR PROVIDING AND/OR FOR TRANSMITTING VIDEO DATA AND/OR INFORMATION IN A COMMUNICATION NETWORK

Box Provisional Application
Assistant Commissioner for Patents
Washington, D.C. 20231

PROVISIONAL PATENT APPLICATION TRANSMITTAL LETTER

Sir:

Please find transmitted herewith for filing the following:

(1) Provisional Application for Patent Cover Sheet;

(2) Provisional Patent Application including Specification, claim and Abstract (25 pages) and Drawings (2 sheets)

(3) Verified Statement Claiming Small Entity Status;

(4) Check in the amount of $75.00 for the filing fee; and

(5) Power of Attorney form; and

(6) Return Receipt Postcard.

It is respectfully requested that the above papers be filed as a Provisional Patent Application.

Respectfully submitted,
MELTZER, LIPPE, GOLDSTEIN,
WOLF & SCHLISSEL, P.C.

By: ______________________
Raymond A. Joao
Reg. No. 35,907

June 29, 1999

MELTZER, LIPPE, GOLDSTEIN,
WOLF & SCHLISSEL, P.C.
190 Willis Avenue
Mineola, New York 11501

Tel. No.: (516) 747-0300
Fax No.: (516) 747-9363

"Express Mail" mailing label number EL263520011US

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated below and is addressed to: Box Provisional Application, Assistant Commissioner for Patents, Washington, D C. 20231

Date of Deposit: June 29, 1999

(Signature): ______________________

Attorney Docket No. 5865-4.1

APPARATUS AND METHOD FOR PROVIDING AND/OR FOR TRANSMITTING VIDEO DATA AND/OR INFORMATION IN A COMMUNICATION NETWORK

FIELD OF THE INVENTION

The present invention is directed to an apparatus and a method for providing and/or for transmitting video data and/or information in a communication network and, in particular, to an apparatus and a method for providing and/or for transmitting video data and/or information on, over, and/or across, a computer communication network.

BACKGROUND OF THE INVENTION

The widespread and ever-growing use of communication networks, such as the Internet, the World Wide Web, and/or other computer to computer communication networks, for the dissemination of information, has fueled the need to provide for the transmission of enhanced resolution video information on, over and/or across, computer communication networks. Currently, video transmission over communication networks, such as the Internet and/or the World Wide Web has been less than optimal, given current bandwidth and technology constraints. These constraints have impeded the ability to offer enhanced resolution and/or full motion video information over these networks.

Enhanced resolution and/or high definition video information is desired and needed in order to provide enhanced resolution and, hence, precise representations of video images, objects and/or events. Conventional computer network video transmission techniques which involve playing, transmitting or "streaming" video on, over, and/or across, the network under conditions which have been dictated by and, thus, limited by the bandwidth and other technological constraints of the network, the transmission medium and equipment, as well as the computers operating in conjunction therewith.

Given the bandwidth and other technological constraints, video information has traditionally been compressed to varying extents in order to facilitate its transmission over the respective networks. This compression has resulted in less than optimal quality video information which has typically been characterized as being grainy, blurry, and/or severely distorted.

Further, the ability to increase the screen size to a full screen viewing of the video information has also typically been accompanied by severe distortion and/or by reduced resolution. As a result, there is a need for an apparatus and method to provide and/or to transmit enhanced resolution video information on, over, and/or across a

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United States Patent and Trademark Office

April 07, 2004

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APPLICATION NUMBER: ***60/137,921***
FILING DATE: ***June 07, 1999***

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

L. Edelen

L. EDELEN
Certifying Officer

A/PROV

Jc672 U.S. PTO 06/07/99

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PTO/SB/16 (2-98)
Approved for use through 01/31/2001. OMB 0651-0037
Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Jc542 U.S. PTO 60/137921 06/07/99

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Eliot	Bernstein	500 S.E. Mizner Road Suite 102 Boca Raton, FL 33432

☐ *Additional inventors are being named on the ___ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (280 characters max)

APPARATUS AND METHOD FOR PLAYING VIDEO FILES ACROSS THE INTERNET

CORRESPONDENCE ADDRESS

Direct all correspondence to:

☐ Customer Number [ ] → *Place Customer Number Bar Code Label here*

Type Customer Number here

OR

[XX] Firm *or* Individual Name	Raymond A. Joao, Esq.				
Address	Meltzer, Lippe, Goldstein, Wolf & Schlissel, P.C.				
Address	190 Willis Avenue				
City	Mineola	State	NY	ZIP	11501
Country	USA	Telephone	516-747-0300	Fax	516-747-9363

ENCLOSED APPLICATION PARTS *(check all that apply)*

[X] Specification *Number of Pages*	one	[X] Small Entity Statement	
☐ Drawing(s) *Number of Sheets*		☐ Other (specify)	

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

[X] A check or money order is enclosed to cover the filing fees

☐ The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: [ ]

FILING FEE AMOUNT ($): $75.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☐ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: ______

Respectfully submitted,

SIGNATURE [signature] Date 6/7/99

TYPED or PRINTED NAME Raymond A. Joao

REGISTRATION NO. *(if appropriate)* 35,907

Docket Number: 5865-4

TELEPHONE ______

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

Attorney Docket No.: 5865-4

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Eliot I. Bernstein
Serial No.:	Please assign
Filed on:	Concurrently herewith
Title:	APPARATUS AND METHOD FOR PLAYING VIDEO FILES ACROSS THE INTERNET

Box Provisional Application
Assistant Commissioner for Patents
Washington, D.C. 20231

PROVISIONAL PATENT APPLICATION TRANSMITTAL LETTER

Sir:

Please find transmitted herewith for filing the following:

(1) Provisional Application for Patent Cover Sheet;

(2) Provisional Patent Application including Specification - 1 page

(3) Verified Statement Claiming Small Entity Status;

(4) Check in the amount of $75.00 for the filing fee; and

(5) Power of Attorney form; and

(6) Return Receipt Postcard.

It is respectfully requested that the above papers be filed as a Provisional Patent Application.

Respectfully submitted,
MELTZER, LIPPE, GOLDSTEIN,
WOLF & SCHLISSEL, P.C.

By: Raymond A. Joao
Raymond A. Joao
Reg. No. 35,907

June 7, 1999

MELTZER, LIPPE, GOLDSTEIN,
WOLF & SCHLISSEL, P.C.
190 Willis Avenue
Mineola, New York 11501

Tel. No.: (516) 747-0300
Fax No.: (516) 747-9363

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Date of Deposit: June 7, 1999
(Signature) Nicole Eliseo Pinou

P:\PUBLIC\PATENT\BERNSTEI\5865-3.XMT

Attorney Docket No.: 5865-4

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

POWER OF ATTORNEY

Application of:	Eliot I. Bernstein
Serial No.:	Please assign
Filed on:	Concurrently herewith
Title:	APPARATUS AND METHOD FOR PLAYING VIDEO FILES ACROSS THE INTERNET

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

RAYMOND A. JOAO, Reg. No. 35,907

Address all telephone calls to Raymond A. Joao at telephone number: **(516) 747-0300**
Address all correspondence to **Meltzer, Lippe, Goldstein, Wolf and Schlissel, P.C.**
190 Willis Avenue
Mineola, New York 11501

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of the sole inventor (given name, family name): **ELIOT I. BERNSTEIN**	
Inventor's signature: >	**Date: >** 6-7-99
Residence: **500 S.E. Mizner Boulevard** **Suite 102** **Boca Raton, FL 33432-6080**	**Citizenship:** **U.S.A.**
Post Office Address: **SAME AS ABOVE**	

P:\PUBLIC\PATENT\BERNSTEI\5865-4 POA

Attorney Docket No. 5865-4

APPARATUS AND METHOD FOR PLAYING VIDEO FILES ACROSS THE INTERNET

The present invention is directed to an apparatus and a method for an apparatus and method for playing video files across the internet. A preferred embodiment of the invention is described in the following manner.

Step 1. Record the video using any recording device (video camera, VCR, BETA, film) and save it to any media format (DVD, CD, tape, etc.).

Step 2. Hook playback device (digital camera, analog camera, tape deck, DVD ROM, etc.) to computer system.

Step 3. Have the playback device initialized through the Web server via a script.

Step 4. Using any video conference type software program, connect to the third party.

Step 5. Begin play of the recorded media directly from the playback device, and share this material across the network.

This process allows any media to be streamed across the Internet without the need for saving the file or compressing the video and allows perfect playback to net users.

STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(b))--INDEPENDENT INVENTOR

Docket Number (Optional)
5865-4

Applicant, Patentee, or Identifier: Eliot Bernstein

Application or Patent No.: ______

Filed or Issued: Concurrently herewith

Title: APPARATUS AND METHOD FOR PLAYING VIDEO FILES ACROSS THE INTERNET

As a below named inventor, I hereby state that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:

- [x] the specification filed herewith with title as listed above.
- [ ] the application identified above.
- [ ] the patent identified above.

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Eliot Bernstein		
NAME OF INVENTOR	NAME OF INVENTOR	NAME OF INVENTOR
Signature of inventor	Signature of inventor	Signature of inventor
6-7-99		
Date	Date	Date

ORDER NUMBER	1150500
REFERENCE ORDER NUMBER	0
BIN NUMBER	0
DELIVERY INSTRUCTIONS	

ORDER DATE/TIME	PALM NUMBER	CUSTOMER NUMBER	CONTACT PHONE NUMBER	PAYMENT METHOD	TOTAL COST OF ORDER
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IVIEWIT@ADELPHIA.NET

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United States Patent and Trademark Office

April 07, 2004

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APPLICATION NUMBER: *60/137,297*
FILING DATE: *June 03, 1999*

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

L. Edelen

L. EDELEN
Certifying Officer

PA 1150500

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APPLICATION NUMBER: *60/141,440*
FILING DATE: *June 29, 1999*

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L. Edelen

L. EDELEN
Certifying Officer

06/29/99 Jc553 U.S. PTO

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Jc541 U.S. PTO 60/141440 06/29/99

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

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INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Eliot	Bernstein	500 S.E. Mizner Road Suite 102 Boca Raton, FL 33432

☐ *Additional inventors are being named on the ___ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (280 characters max)

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Country	USA	Telephone	516-747-0300	Fax	516-747-9363

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Respectfully submitted,

SIGNATURE Raymond A. Joao

Date 6/29/99

TYPED or PRINTED NAME Raymond A. Joao

REGISTRATION NO. *(if appropriate)* 35,907

TELEPHONE 516-747-0300, X-240

Docket Number: 5865-4.1

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is used by the public to file (and by the PTO to process) a provisional application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the complete provisional application to the PTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, D.C., 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Box Provisional Application, Assistant Commissioner for Patents, Washington, D.C., 20231.

60141440 .062999

STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) & 1.27(b))—INDEPENDENT INVENTOR	Docket Number (Optional): 5865-4.1

Applicant, Patentee, or Identifier: Eliot Bernstein

Application or Patent No.: ____________________

Filed or Issued: Concurrently herewith

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Eliot Bernstein		
NAME OF INVENTOR	NAME OF INVENTOR	NAME OF INVENTOR
[signature]		
Signature of Inventor	Signature of inventor	Signature of Inventor
6/29/99		
Date	Date	Date

Attorney Docket No.: 5865-4.1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: Eliot I. Bernstein

Serial No.: Please assign

Filed on: Concurrently herewith

Title: APPARATUS AND METHOD FOR PROVIDING AND/OR FOR TRANSMITTING VIDEO DATA AND/OR INFORMATION IN A COMMUNICATION NETWORK

Box Provisional Application
Assistant Commissioner for Patents
Washington, D.C. 20231

PROVISIONAL PATENT APPLICATION TRANSMITTAL LETTER

Sir:

Please find transmitted herewith for filing the following:

(1) Provisional Application for Patent Cover Sheet;

(2) Provisional Patent Application including Specification, claim and Abstract (25 pages) and Drawings (2 sheets)

(3) Verified Statement Claiming Small Entity Status;

(4) Check in the amount of $75.00 for the filing fee; and

(5) Power of Attorney form; and

(6) Return Receipt Postcard.

It is respectfully requested that the above papers be filed as a Provisional Patent Application.

Respectfully submitted,
MELTZER, LIPPE, GOLDSTEIN,
WOLF & SCHLISSEL, P.C.

By: ______________________
Raymond A. Joao
Reg. No. 35,907

June 29, 1999

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Date of Deposit: June 29, 1999

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P:\PUBLIC\PATENT\BERNSTEI\5865-4\5865-41X

Attorney Docket No. 5865-4.1

APPARATUS AND METHOD FOR PROVIDING AND/OR FOR TRANSMITTING VIDEO DATA AND/OR INFORMATION IN A COMMUNICATION NETWORK

FIELD OF THE INVENTION

The present invention is directed to an apparatus and a method for providing and/or for transmitting video data and/or information in a communication network and, in particular, to an apparatus and a method for providing and/or for transmitting video data and/or information on, over, and/or across, a computer communication network.

BACKGROUND OF THE INVENTION

The widespread and ever-growing use of communication networks, such as the Internet, the World Wide Web, and/or other computer to computer communication networks, for the dissemination of information, has fueled the need to provide for the transmission of enhanced resolution video information on, over and/or across, computer communication networks. Currently, video transmission over communication networks, such as the Internet and/or the World Wide Web has been less than optimal, given current bandwidth and technology constraints. These constraints have impeded the ability to offer enhanced resolution and/or full motion video information over these networks.

Enhanced resolution and/or high definition video information is desired and needed in order to provide enhanced resolution and, hence, precise representations of video images, objects and/or events. Conventional computer network video transmission techniques which involve playing, transmitting or "streaming" video on, over, and/or across, the network under conditions which have been dictated by and, thus, limited by the bandwidth and other technological constraints of the network, the transmission medium and equipment, as well as the computers operating in conjunction therewith.

Given the bandwidth and other technological constraints, video information has traditionally been compressed to varying extents in order to facilitate its transmission over the respective networks. This compression has resulted in less than optimal quality video information which has typically been characterized as being grainy, blurry, and/or severely distorted.

Further, the ability to increase the screen size to a full screen viewing of the video information has also typically been accompanied by severe distortion and/or by reduced resolution. As a result, there is a need for an apparatus and method to provide and/or to transmit enhanced resolution video information on, over, and/or across a communication network, in order to overcome the shortcomings of the prior art.

SUMMARY OF THE INVENTION

The present invention is directed to an apparatus and a method for providing and/or for transmitting video data and/or information in a communication network and, in particular, to an apparatus and a method for transmitting video data and/or information on, over, and/or across, a computer communication network such as the Internet, the World Wide Web, and/or any other computer to computer network. The present invention provides an apparatus and a method for transmitting enhanced quality and high resolution video data and/or information in real-time on, over, and/or across, a communication network, while using low or no compression and/or to otherwise alter the video data and/or information.

The apparatus includes a central processing computer and any number of user computers. The central processing computer can perform various data processing functions as well as transmit video data and/or information to the various user computers. The video data and/or information transmission may be provided and/or transmitted on demand from a user and/or at the initiation of, and/or the under control of, the central processing computer.

The apparatus and method of the present invention can be utilized on, over and/or across, any suitable communication network. The central processing computer can be any suitable computer, computer system and/or network of computers, while the user computer can also be any suitable computer, computer system, and/or communication device.

The apparatus also includes a video recording device for recording video data and/or information. Any suitable video recording device can be utilized in conjunction with the apparatus of the present invention. The respective video recording device will record and/or store the video data and/or information on any suitable storage medium, such as, for example, film, tape, diskette, compact disk, digital video disk, etc.

The apparatus also includes a video player device for playing back the video data and/or information which is recorded by the video recording device. The video player device is any suitable device for playing the video data and/or information which is recorded by the video recording device.

The central processing computer can include and/or utilize any and all necessary and/or suitable hardware and software deemed necessary and/or desirable for performing any of the processing and/or operational functions described herein.

The apparatus and method of the present invention can be utilized in order to provide and/or to transmit video data and/or information on, over, and/or across, a communication network such as, but not limited to, the Internet and/or the World Wide Web. The present invention provides an apparatus and a method for providing for the real-time transmission and/or "streaming" of high resolution, quality video information, including video information at fullscreen on, over, and/or across, a communication network.

The video data and/or information can be recorded by utilizing the video recording device. The recorded video data and/or information can then be stored in any suitable storage medium and/or in any corresponding storage format.

The stored video data and/or information can be transferred to and stored in the video player device which is operatively connected with the central processing computer. The video player device can be any suitable device for playing the video data and/or information which has been previously stored. It is understood that the central processing computer and/or the video player device can include any and all necessary interfacing hardware and/or software. The video player device can be initialized via the central processing computer. The central processing computer can initialize the video player device via any suitable program software and/or a script.

The central processing computer can connect to a user computer(s). The connection to the central processing computer can be performed via the initiation of a third party user via a user computer and/or via initiation from the central processing computer. Regardless of the nature of the initiation, the connection between the central processing computer and the user computer can be accomplished by utilizing any suitable video playback software, playback software, and/or conferencing software.

The central processing computer can then activate the video player device and begin to transmit the video data and/or information from the video playback device, on, over, and/or across, the communication network to the user computer.

The apparatus and method of the present invention provides for the real-time transmission and/or for the "streaming" of video data and/or information on,over, and/or across, any communication network and/or computer communication network.

The present invention dispenses with the need for data compression and over data manipulation of the video data and/or information, which compression and/or other data manipulation typically results in decreased resolution and definition. The present invention also dispenses with the need to save compressed filed files of video data and/or information and, further, provides for an enhanced playback of video data and/or information to users in the communication network.

Accordingly, it is an object of the present invention to provide an apparatus and a method for providing and/or for transmitting video data and/or information on, over, and/or across, a communication network.

It is another object of the present invention to provide an apparatus and a method for providing and/or for transmitting video data and/or information on, over, and/or across, a computer communication network.

It is still another object of the present invention to provide an apparatus and a method for providing and/or for transmitting video data and/or information on, over, and/or across, the Internet, the World Wide Web, and/or a computer to computer communication network.

It is yet another object of the present invention to provide an apparatus and a method for providing and/or for transmitting enhanced resolution video data and/or information on, over, and/or across, a communication network.

It is another object of the present invention to provide an apparatus and a method for providing enhanced resolution real-time video data and/or information on, over, and/or across, a communication network.

It is still another object of the present invention to provide an apparatus and a method for providing enhanced resolution "streaming" video data and/or information on, over, and/or across, a communication network.

It is yet another object of the present invention to provide an apparatus and a method for providing and/or for transmitting video data and/or information on, over, and/or across, a communication network which dispenses, entirely or in part, with the need to compress video data and/or information.

It is still another object of the present invention to provide an apparatus and a method for providing and/or for transmitting video data and/or information upon the initiation of a remote user and/or upon the initiation of a central processing computer.

It is yet another object of the present invention to provide an apparatus and a method for providing and/or for transmitting video data and/or information from any video storage media.

It is still another object of the present invention to provide an apparatus and a method for providing and/or for transmitting video data and/or information where the apparatus is an integrated device which is programmed for operation.

It is yet another object of the present invention to provide an apparatus and a method for providing video data and/or information which provides enhanced resolution three-dimensional video data and/or information.

Other objects and advantages of the present invention will be apparent to those skilled in the art upon a review of the Description of the Preferred Embodiment taken in conjunction with the Drawings which follow.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings:

Figure 1 illustrates the apparatus of the present invention, in block diagram form; and

Figure 2 illustrates a flowchart of a preferred embodiment operation and method of use of the apparatus of Figure 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is directed to an apparatus and a method for providing and/or for transmitting video data and/or information in a communication network and, in particular, to an apparatus and a method for transmitting video data and/or information on, over, and/or across, a computer communication network. In a preferred embodiment, the present invention can be utilized to provide and/or to transmit video data and/or information on, over, and/or across, the Internet, the World Wide Web, and/or a computer to computer communication network.

The present invention provides an apparatus and a method for transmitting enhanced quality, high resolution video data and/or information, in real-time, on, over, and/or across, a communication network. In the preferred embodiment, the communication network can include, but not be limited to, the Internet, the World Wide Web, computer to computer communication networks, internets, intranets, local area networks (LANS), Wide Area Networks (WANS) and/or any other suitable computer communication network.

Figure 1 illustrates the apparatus of the present invention, in block diagram form. The apparatus of Figure 1 is denoted generally by the reference numeral 100. With reference to Figure 1, the apparatus 100 includes a central processing computer 10 and any number of user computers 20. The user computer(s) 20 is linked to the central processing computer 10 via the respective communication network. The central processing computer 10, as described herein, performs various data processing functions as well as transmits video data and/or information to the various user computers 20. The video data and/or information transmission may be transmitted on demand from a user and/or upon the initiation and/or under the control of the central processing computer 10.

In the preferred embodiment, the apparatus and method of the present invention is utilized over a computer communication network such as, but not limited to, the Internet and/or the World Wide Web. In this regard, the central processing computer 10 can serve as a server computer and the user computers 20 can serve as client computers.

The central processing computer can be any suitable computer, computer system, and/or network of computers, and may be a network computer, a server computer, a mainframe computer, a personal computer, and/or any other suitable computer, computer system and/or network of computers. The user computer can be any suitable computer and/or communication device which may be utilized in conjunction with the present invention and can include a personal computer, a home computer, a personal digital assistant, a hand-held computer, a palm top computer, a video telephone, and/or any other suitable computer and/or communication device.

The apparatus 100 also includes a video recording device 30 for recording video data and/or information. Any suitable video recording device can be utilized in conjunction with the apparatus of the present invention. In the preferred embodiment, the video recording device 30 can be a video camera, a Beta video recorder, an 8mm film camera/recorder, a 32mm film camera/recorder, a Beta SP recorder, a VHS recording device, and/or any other suitable video recording device. The respective video recording device will record and/or store the video data and/or information on any suitable storage medium, such as, for example, film, tape, diskette, compact disk, digital video disk, etc.

The apparatus 100 also includes a video player device 40 for playing back the video data and/or information which is recorded by the video recording device. The video player device 40 can be any suitable device for playing the video data and/or information which is recorded by the video recording device 30. In this regard, the video player device 40 can be a digital camera, an analog camera, a tape deck, a VCR, a VHS system, a Beta system, a compact disk player, a video disk player, and/or any other suitable device for playing video data and/or information.

The central processing computer 10, in the preferred embodiment will include and/or utilize any all necessary and/or suitable hardware and software, including interfacing hardware and/or software, which is deemed necessary and/or desirable for performing any of the processing and/or operating functions described herein. In this regard, the central processing computer 10 will include program and/or script software and any associated video playing software, video playback software, playback software, video conferencing software, and/or any other suitable or appropriate software. The central processing computer 10 and/or the video player device 40 can also include any necessary interfacing hardware and/or software for effecting the necessary interfacing of the respective devices.

As described above, the apparatus and method of the present invention can be utilized in order to transmit video data and/or information on, over, and/or across, a communication network. In the preferred embodiment, the present invention is utilized in order to transmit video data and/or information on, over, and/or across, the Internet and/or the World Wide Web. The present invention provides an apparatus and a method for providing for the real-time transmission and/or for the "streaming" of enhanced resolution video data on, over, and/or across, a communication network.

Figure 2 illustrates a preferred embodiment operation of the apparatus and method of the present invention. With reference to Figure 2, the operation of the apparatus commences at step 200. At step 201, video data and/or information is recorded by utilizing the video recording device 30. At step 202, the recorded video data and/or information, obtained via the video recording device 30 is stored in any suitable storage medium and/or in a corresponding storage format. In the preferred embodiment, wherein the video recording device is a video recorder, the obtained video data and/or information can be stored on a tape, film, a diskette, a compact disk, and/or on a digital video disk.

At step 203, the stored video data and/or information is transferred to and stored in the video player device 40. The video player device is operatively connected with the central processing computer 10. In the preferred embodiment, the video player device 40 can be any suitable device for playing the video data and/or information which has been previously stored. For example, if the video data and/or information has been recorded with a video camera and transferred to, and stored on, a compact disk, the video player device 40 can be any suitable compact disk player. At step 204, the video player device 40 can be initialized via the central processing computer 10. The central processing computer 10 can initialize the video player device 40 via any suitable program software and/or a suitable script.

At step 205, the central processing computer 10 will link to a user computer(s) 20. The connection to the central processing computer may result from an initiation of a third party user via a user computer 20 and/or via initiation via the central processing computer 10. Regardless of the nature of the initiation, the connection or link between the central processing computer 10 and the user computer 20 can be accomplished by utilizing any suitable video playback software, playback software, and/or conferencing software.

At step 206, the central processing computer 10 will activate the video player device 40 and begin to transmit the video data and/or information from the video playback device 40, on, over, and/or across, the communication network to the user computer 20. In this manner, the apparatus and method of the present invention provides for the transmission of real-time and enhanced resolution video data and/or information on, over, and/or across, a communication network. Thereafter, the apparatus will cease operation at step 207.

The apparatus and method of the present invention provides for the real-time transmission and/or for the "streaming" of enhanced resolution video data and/or information on, over and/or across, any communication network and computer communication network. The present invention dispenses with the need for data compression and/or other data manipulation, which may typically be required in such applications, thereby maintaining enhanced resolution in the delivered video data and/or information. The present invention also dispenses with the need to save compressed files of video data and/or information and, further, provides for an enhanced playback of video data and/or information to users of the communication network.

The enhanced resolution video data and/or information can be made available at each user computer 20 and/or at the central processing computer 10.

In another preferred embodiment, the present invention can dispense with either or both of the initialization steps which are described in connection with the description of step 204 and/or the connection step which is described in connection with the description of step 205.

The present invention can be utilized in order to provide enhanced resolution, real-time and/or "streaming", video data and/or information which may be utilized in any suitable application(s) which may involve the transmission of enhanced real-time and/or "streaming" video in a network environment.

In another preferred environment, the functional and processing steps described herein for the video recording device 30, the central processing computer 10, and the video player device 40 can be combined into and performed by an integrated device with the operation of said integrated device being programmed for operation as described herein.

In another preferred environment, the video data and/or information description herein can be combined with three-dimensional video data and/or information so as to provide enhanced resolution three-dimensional video data and/or information in a network environment.

While the present invention has been described and illustrated in various preferred and alternate embodiments, such descriptions are merely illustrative of the present invention and are not to be construed to be limitations thereof. In this regard, the present invention encompasses any and all modifications, variations, and/or alternate embodiments, with the scope of the present invention being limited only by the claims which follow.

CLAIMS

What Is Claimed Is:

1. An apparatus for providing video information in a network environment, comprising:

a video playing device, wherein said video playing device one of plays and transmits video information; and

a central processing device, wherein said central processing device provides control over said video playing device, and further wherein said central processing device further comprises:

a transmitter for transmitting said video information one of on, over, and across, a communication network.

2. The apparatus of claim 1, further comprising:

a video recording device for recording said video information.

3. The apparatus of claim 1, further comprising:

a communication device for receiving said transmitted video information, wherein said communication device is one of linked and connected to said central processing device via a communication network.

4. The apparatus of claim 2, wherein said video recorder device is one of a video camera, a Beta video recorder, an 8mm

film camera, a 32mm film camera, a Beta SP recorder, and a VHS recording device.

5. The apparatus of claim 1, wherein said video playing device is one of a digital camera, an analog camera, a tape deck, a VCR, a VHS system, a Beta system, a compact disk player, and a video disk player.

6. The apparatus of claim 1, wherein said central processing device further comprises:

means for one of playing and scripting said video information.

7. The apparatus of claim 1, wherein said central processing device further comprises:

means for initializing said video playing device.

8. The apparatus of claim 1, wherein said central processing device one of initializes said video playing device and controls the playing of said video information.

9. An apparatus for providing video information in a network environment, comprising:

means for playing said video information;

means for controlling the playing of said video information; and means for transmitting said video information one of on, over, and across, a communication network.

10. The apparatus of claim 9, further comprising:
means for recording said video information.

11. The apparatus of claim 9, further comprising:
means for storing said video information.

12. The apparatus of claim 9, further comprising:
means for transferring said video information to said video playing means.

13. The apparatus of claim 9, further comprising:
means for initializing said video playing means.

14. The apparatus of claim 9, further comprising:
means for one of connecting and linking said controlling means to a communication device one of on, over, and across, a communication network.

15. The apparatus of claim 9, further comprising:
means for activating said video playing means.

16. A method for providing video information in a computer network environment, comprising:
controlling a video playing device;

one of playing and transmitting said video information; and

transmitting said video information one of on, over, and across, a computer communication network.

17. The method of claim 16, further comprising:

recording said video information.

18. The method of claim 16, further comprising:

receiving said transmitted video information one of on, over, and across, said computer communication network.

19. The method of claim 17, wherein said recording is performed in conjunction with one of a video camera, a Beta video recorder, an 8mm film camera, a 32mm film camera, a Beta SP recorder, and a VHS recording device.

20. The apparatus of claim 16, wherein said one of playing and transmitting is performed in conjunction with one of a digital camera, an analog camera, a tape deck, a VCR, a VHS system, a Beta system, a compact disk player, and a video disk player.

21. The method of claim 16, further comprising:

one of playing and scripting said video information.

22. The method of claim 16, further comprising:

initializing a video playing device.

23. A method for providing video information in a network environment, comprising:

controlling a playing of said video information;

playing said video information; and

transmitting said video information one of on, over, and across, a computer communication network.

24. The method of claim 23, further comprising:

recording said video information.

25. The apparatus of claim 23, further comprising:

storing said video information.

26. The method of claim 23, further comprising:

transferring said video information to a video playing device.

27. The method of claim 23, further comprising:

initializing a video playing device.

28. The method of claim 23, further comprising:

one of connecting and linking to a communication device one of on, over, and across, a communication network.

29. The method of claim 23, further comprising:

activating a video playing means.

ABSTRACT OF THE DISCLOSURE

An apparatus and a method for providing video information in a network environment which includes a video playing device wherein the video playing device one of plays and transmits video information, a central processing device, wherein the central processing device provides control over the video playing device, and further wherein the central processing device further includes a transmitter for transmitting the video information one of on, over, and across, a communication network. An apparatus and a method for providing video information in a network environment, which includes means for playing the video information, means for controlling the playing of the video information, and means for transmitting the video information one of on, over, and across, a communication network.

Attorney Docket No.: 5865-4.1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

POWER OF ATTORNEY

Application of:	Eliot I. Bernstein
Serial No.:	Please assign
Filed on:	Concurrently herewith
Title:	APPARATUS AND METHOD FOR PROVIDING AND/OR FOR TRANSMITTING VIDEO DATA AND/OR INFORMATION IN A COMMUNICATION NETWORK

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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Address all correspondence to

Meltzer, Lippe, Goldstein and Schlissel, P.C.
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Mineola, New York 11501

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of the sole inventor (given name, family name): ELIOT I. BERNSTEIN	
Inventor's signature: [signature]	Date: 6/29/99
Residence: 500 S.E. Mizner Boulevard, Suite 102, Boca Raton, FL 33432-6080	Citizenship: U.S.A.
Post Office Address: SAME AS ABOVE	

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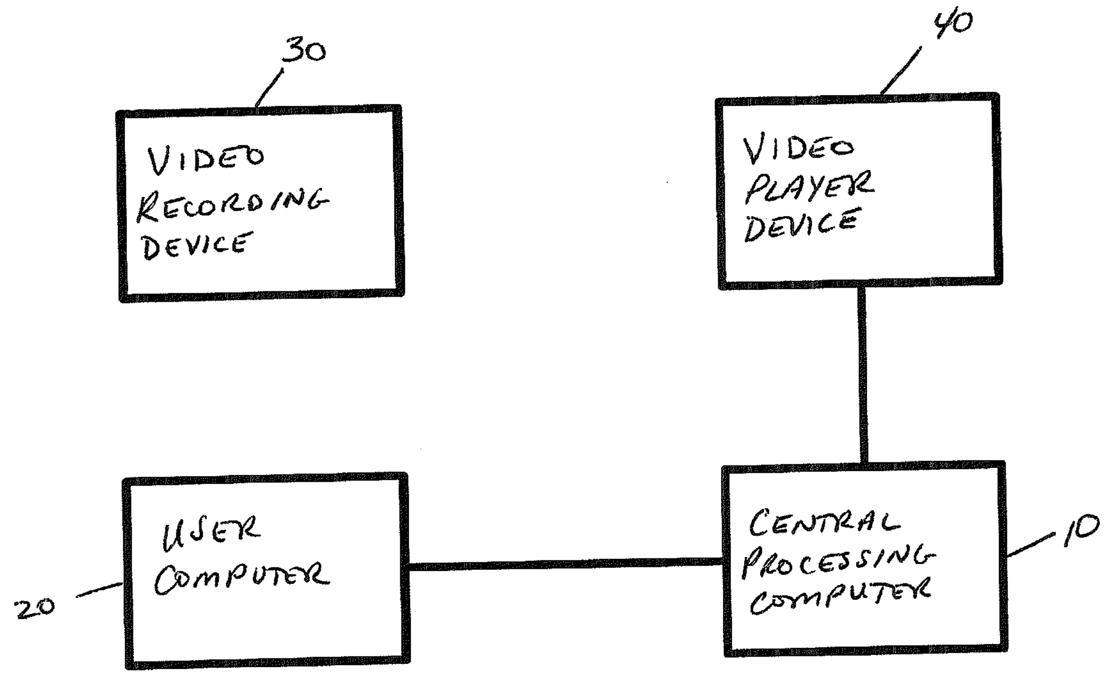
30
VIDEO
RECORDING
DEVICE
40
VIDEO
PLAYER
DEVICE
20
USER
COMPUTER
CENTRAL
PROCESSING
COMPUTER
10

FIG. 1

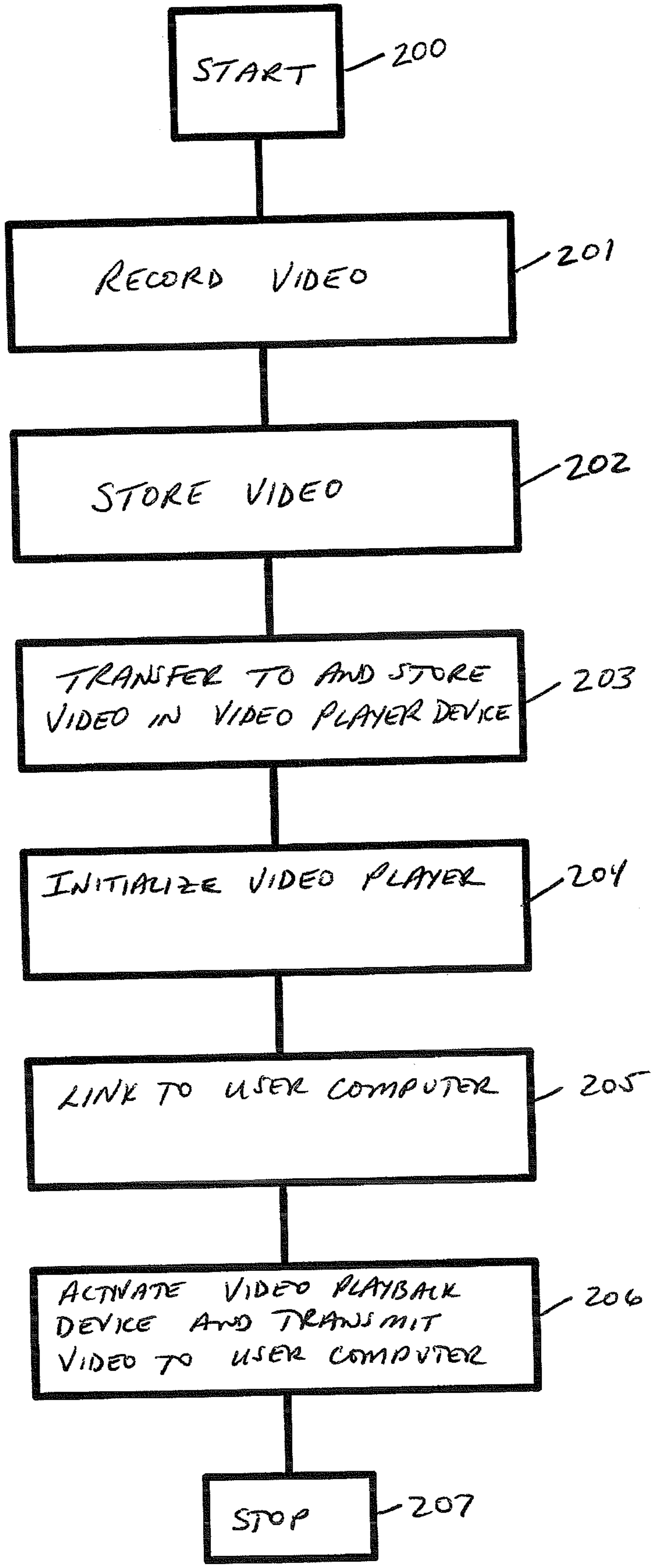
START
200
RECORD VIDEO
201
STORE VIDEO
202
TRANSFER TO AND STORE VIDEO IN VIDEO PLAYER DEVICE
203
INITIALIZE VIDEO PLAYER
204
LINK TO USER COMPUTER
205
ACTIVATE VIDEO PLAYBACK DEVICE AND TRANSMIT VIDEO TO USER COMPUTER
206
STOP
207

FIG. 2

PA 1150500

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April 06, 2004

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APPLICATION NUMBER: *60/146,726*
FILING DATE: *August 02, 1999*

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

L. Edelen

L. EDELEN
Certifying Officer

A /Prov

08/02/99 jc960 U.S. PTO

jc526 U.S. PTO 60/146726 08/02/99

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Approved for use through 01/31/2001. OMB 0651-0037
Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Eliot I.	Bernstein	500 S.E. Mizner Blvd. Suite 102 Boca Raton, FL 33432-6080

☐ *Additional inventors are being named on the ___ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (280 characters max)

APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

CORRESPONDENCE ADDRESS

Direct all correspondence to:

☐ Customer Number ______ *Type Customer Number here* → *Place Customer Number Bar Code Label here*

OR

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Country	USA	Telephone	516-747-0300	Fax	516-747-9363

ENCLOSED APPLICATION PARTS ***(check all that apply)***

[X] Specification *Number of Pages* 18 — [X] Small Entity Statement

[X] Drawing(s) *Number of Sheets* 4 — [X] Other (specify) Power of Atty.

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

[X] A check or money order is enclosed to cover the filing fees

☐ The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: ______

FILING FEE AMOUNT ($): $75.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

[X] No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: ______

Respectfully submitted,

SIGNATURE Raymond A. Joao

Date 8/2/99

TYPED or PRINTED NAME Raymond A. Joao

REGISTRATION NO. *(if appropriate)* 35,907

TELEPHONE 516-747-0300, 240

Docket Number: 5865-6

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

Attorney Docket No.: 5865-6

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Eliot I. Bernstein
Serial No.:	Please assign
Filed on:	Concurrently herewith
Title:	**APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES**

Box Provisional Application
Assistant Commissioner for Patents
Washington, D.C. 20231

PROVISIONAL PATENT APPLICATION TRANSMITTAL LETTER

Sir:

Please find transmitted herewith for filing the following:

(1) Provisional Application for Patent Cover Sheet;

(2) Provisional Patent Application including Specification - 18 pages, 4 sheets of drawings.

(3) Verified Statement Claiming Small Entity Status;

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(6) Return Receipt Postcard.

It is respectfully requested that the above papers be filed as a Provisional Patent Application.

Respectfully submitted,
MELTZER, LIPPE, GOLDSTEIN,
WOLF & SCHLISSEL, P.C.

By: Raymond A. Joao
Raymond A. Joao
Reg. No. 35,907

August 2, 1999

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Date of Deposit: **August 2, 1999**

(Signature) Nicole Eliseo-Pinon

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VERIFIED STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) & 1.27(b))--INDEPENDENT INVENTOR	**Attorney Docket No.: 5865-6**

Applicant or Patentee: Eliot I. Bernstein

Serial or Patent No.: Please assign

Filed or Issued: Concurrently herewith

Title: APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:

X the specification filed herewith with title as listed above.
__ the application identified above.
__ the patent identified above.

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X No such person, concern, or organization exists.
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Separate verified statements are required from each named person, concern or organization having the rights to the invention averring to their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

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8/2/99
DATE

Attorney Docket No. 5865-6

APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

FIELD OF THE INVENTION

The present invention is directed to an apparatus and a method for producing enhanced digital images and, in particular, to an apparatus and a method for producing enhanced resolution digital images from an enlarged print, negative, or digital image.

BACKGROUND OF THE INVENTION

The fields of telecommunications, multimedia, and related areas, are growing at increasing rates. With this continued growth, the need for high resolution digital imagery, for utilization in conjunction with the corresponding technologies, is becoming greater. Current technologies utilize digital panoramic cameras, as opposed to film or print film cameras.

Conventional digital technologies typically have very low zoom quality and low image size restrictions or limitations associated therewith. Generally speaking, enlarged images produce a higher resolution image, and an associated higher resolution scanning quality, which further facilitates an improved enlargement or reduction of the image for different sizes and different depths, without pixel distortion. Photographs, and associated images, utilize pixels which typically have a certain size. When enlarged or reduced, these pixels of the image become distorted, a feature which typically results in the image being fixed to an original size, or being available at very low magnifications, such as, for example, magnifications of from 200 times to 300 times. These images are also difficult to enlarge to a full screen size without a tremendous amount of distortion present in the end product.

Currently, panoramic imaging techniques utilize non-enlarged images as their starting point. With such associated limitations, the ability to provide enhanced resolution digital images and, especially, an enhanced resolution digital panoramic image, such as those utilized on, or over, the Internet and/or the World Wide Web, has been greatly compromised.

Another major drawback in the current technology lies in the fact that conventional processes often utilize panoramic lenses in order to capture an image. This practice has been criticized as creating distortions in the image immediately upon the image's enlargement or reduction. The conventional techniques associated with the use of panoramic lenses are know to result in image "bending", which further curtails one's ability to obtain realistic views, especially upon performing any associated cropping and/or editing processes. In such instances, the upper end and the lower end of the image must be either erased, or covered, in order to prevent the flaw from being exposed. This typically results in the resulting image having a "fishbowl-type" distortion. In some instances, 32 mm lenses have been utilized in order to obtain enhanced floor to ceiling images without experiencing image bending. In these applications, however, the ability of the lens to capture optimal images varies depending upon the scene or image being photographed.

SUMMARY OF THE INVENTION

The present invention provides an apparatus and a method for producing digital images which overcomes the shortcomings of the prior art. The apparatus includes a camera, which can be a conventional print film camera, a digital camera and/or digital recording device, a developing device, which can be any device or collection of devices for developing the image taken by the camera, into an enlarged print film image or a digital image, and an enlarging device, for enlarging the image. If the image is taken with a digital camera, a print image may be obtained from the digital image. The image may be enlarged either digitally and/or from a print film image, a negative, or a digital image, depending upon the application.

The apparatus also includes a computer and associated peripheral devices for performing the various processing routines of the method of the present invention. The apparatus also includes a scanning device, for scanning the print film image or photograph in order to obtain a digital image representation of same.

The print film or digital image, which is obtained with the camera, can be developed by the developing device, and enlarged by the enlarger. The image print may then be scanned by the scanner in order to generate a digital file or other high quality image extension file. A plurality of these digital files can then be stitched together thereby creating a panoramic scene or image.

The computer may be utilized in order to perform touch-up operations on the obtained image or image collection in order to make refinements and/or enhancements thereto. The image may then be converted from a high resolution image compression extension file to a low resolution graphic or video image extension file. This compression step may be optional, depending upon the speed of the video or image.

The resulting file may then be processed so that the image represented therein can be displayed and/or posted for display to a host computer or other suitable device.

The above process can be repeated using different photo depths for any of the obtained images, or portions thereof, in order to create areas of higher resolution for closer inspections of these areas at different image depths.

Accordingly, it is an object of the present invention to provide an apparatus and a method for providing enhanced digital images from print film images, analog images, or digital images.

It is another object of the present invention to provide an apparatus and a method for producing digital images, from images, which have improved and enhanced resolution.

It is still another object of the present invention to provide an apparatus and a method for producing digital images, from print film images, and/or analog images which are suitable for display and/or downloading to a digital computer, a television, a telecommunications environment, and/or any other communications environment.

It is still another object of the present invention to provide an apparatus and a method for providing a digital image which is characterized by effective image compression subsequent to a stitching operation, thereby avoiding any dramatic loss in image quality.

It is another object of the present invention to provide an apparatus and a method for providing an enhanced digital image which dispenses with the need to compress the image data.

It is yet another object of the present invention to provide an apparatus and a method for producing digital images which are characterized by high definition resolution, and which are suitable for high definition television, Web television and large, full screen, panoramic internet applications, without loss of resolution upon image magnification or reduction.

It is another object of the present invention to provide an apparatus and a method for producing and transmitting digital images in a network environment which dispenses with the need for plug-in software.

It is still another object of the present invention to provide an apparatus and a method for producing digital images which facilitates high speed file transfer in a network environment and/or in a computer environment.

Other objects and advantages of the present invention will be apparent to those skilled in the art upon a review of the Description of the Preferred Embodiment taken in conjunction with the Drawings which follow.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings:

Figure 1 illustrates the apparatus of the present invention, in block diagram form; and

Figures 2A, 2B and 2C illustrate the method of the present invention, in flow diagram form.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention provides an apparatus and a method for providing enhanced digital images which can be utilized and which can be easily managed, when displayed, projected, or posted to an Internet Web server, Web site or Web page and/or in other networks and/or communications environments. In particular, the present invention provides an apparatus and a method for producing an enhanced digital image from an image which can be taken by any type of camera or recorder, a print film image, a negative, a transparency, a photograph, or a digital image, and/or otherwise. The digital images which are produced by the apparatus and method of the present invention have improved and enhanced resolution and require far less effort in the associated maintenance and management of same. The digital images, which are produced by the apparatus and method of the present invention, can be utilized and displayed on computers, projection devices, and, as noted above, can be posted to an Internet Web server, a Web site, and/or a Web page and/or which can be downloaded to a computer, a television and/or any other suitable communication device.

The present invention, in a preferred embodiment, is utilized to produce enhanced images for posting and/or for downloading, to a digital display medium, which in the preferred embodiment, is an Internet and/or a World Wide Web server, a Web site, or Web page. In this manner, enhanced digital images can be produced from enlarged images, with the resulting digital images having enhanced resolution. This resolution is unaffected by the typical resolution limiting parameters and phenomena which are associated with conventional digital image processing equipment, techniques and methods.

Figure 1 illustrates the apparatus of the present invention which is denoted generally by the reference numeral 100, in block diagram form. With reference to Figure 1, the apparatus 100 includes a camera 105 which, in the preferred embodiment, is a conventional print film camera, such as those cameras manufactured by Nikon, Canon, Hasselblad, or any other manufacturer. A digital camera may also be utilized to obtain the image. In the preferred embodiment, the camera 105 contains a 24-32 mm lens and can be a hand-held camera, a fixed camera, a camera, a recorder, and/or a camcorder, which is mountable, such as on a tripod or on a stand. The camera 105 is utilized to obtain the image of the image or scene which is being photographed.

The apparatus 100 also includes a developing device 110 which can be any device or collection of devices for developing the film print image which is taken by the camera 105 into a film print image. The apparatus 100 also includes an enlarging device 115 for enlarging either the print film or the digital image.

The apparatus 100 also includes a computer 120, for performing the various processing routines of the method of the present invention. The computer 120 may be a personal computer, a laptop computer, a mini-computer, a microcomputer, a mainframe computer, or any other suitable computer or computer system. The computer 120 includes a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), a display device, an input device and an output device. The computer 120 may also include any other hardware or software needed to perform any of the processing tasks described herein. The input device may include a keyboard, a mouse, or other pointing device, for allowing for data and/or command input by a user. The output device may include a printer and, in the preferred embodiment, the printer may be a color laser printer or a color inkjet printer.

The apparatus 100 also includes a scanning device 125, for scanning the print film image, negative, transparency, or photograph, in order to obtain a digital image representation of same. Any suitable computer or scanner and any suitable scanning software may be utilized in conjunction with the present invention. In a preferred embodiment, a UMAX™ Astra scanner is utilized in conjunction with Microsoft® Photo Editor software.

Figures 2A, 2B and 2C illustrate the method of the present invention, in flow diagram form. With reference to Figures 2A, 2B and 2C, the method of the present invention commences at step 200. At step 201, a scene or image is photographed by using the camera 105.

At step 202, the print film image, which is obtained by the camera 105, is developed by the developing device 110 in order to produce a high gloss photographic print or digital image. If the image is obtained with a digital camera, a print image should be obtained from the digital image. In this manner, the higher resolution print image can then be enlarged and scanned. At step 203, the image print, analog image, or digital image, is enlarged by the enlarger 115. In the preferred embodiment, the image prints are enlarged to sizes of between 8"x6" to 8"x12". Although enlargement to any size may be obtained and utilized, the aforementioned sizes represent the respective lower end and upper end limits for the print sizes which provide optimal magnification capability in the preferred embodiment. In the preferred embodiment, a magnification capability of up to 1700 times may be attained for most views or scenes. It is, however, recommended that larger enlargement sizes be obtained for smaller object images.

At step 204, the image print, obtained at step 203, is scanned by the scanner 125 in order to generate a bitmap image file or other high or low quality image extension file. At step 205, a plurality of bit map, JPEG, gif, etc. files, which are obtained for the image prints, can be stitched together by the scanner 125, thereby creating a panoramic scene or image, or simply a scene requiring a plurality of photographs. This stitching operation is performed by utilizing photo stitching software such as, for example, Photo Vista software by Live Picture, Live Picture Reality Studio, and/or Live Picture Object Modeler and/or Photo Vista software.

At step 206, the computer 120 performs a touch-up operation on the scanned image or stitched image collection in order to make refinements and/or enhancement thereto. This touch-up operation is accomplished by utilizing imaging software. In the preferred embodiment, Adobe Photoshop software is used as the imaging software for touching up the images. At step 207, the image is then converted from a bitmap file, or any other suitable high resolution image compression extension file, to a JPEG file or other suitable low resolution graphic or video image extension file. Step 207 is performed only if the file is not already in a low resolution format, such as, for example, a JPEG format. In the preferred embodiment, Adobe Image Ready software is utilized to perform the bitmap to JPEG file conversion. The bitmap to JPEG file conversion, which is performed at step 207, serves to preserve image quality and resolution, thereby providing an optimum image. At step 208, the JPEG file of the image is compressed by utilizing image compression software, such as Adobe Image Ready software. Step 208 may be optional, especially if the image is not in a JPEG format. The compressed image is, thereafter, ready for display and/or posting to a host computer, a Web server, a Web site, or a Web page. Either or both of the conversion step performed at step 207 and/or the compression step performed at step 208 may be optional and may be dispensed with depending upon the application.

The above process can be repeated using different depth photos for any of the images obtained in order to create areas of higher resolution or "hot spots", for closer inspections of these areas at different depths. These depth photos can also be stitched into the respective image or image portion by using the stitching techniques described above, which are hereby incorporated by reference herein. The above process can be utilized in order to create higher zoom capabilities with each new depth layer of an image.

At step 208, a determination is made as to whether different depth photographs are desired. If different depth photographs are desired, the method repeats steps 201 through 207 to obtain the desired image. If no additional depth photographs are desired, the method proceeds to step 209.

At step 209, the resulting digital image can be displayed on a digital display device, projected from a projection device, or posted to a host computer, a Web server, a Web site, or a Web page. In the instance where the image is posted to an Internet Web server, Web site, or Web page, the upload from the computer 120, to the respective server, site, or page, can be performed by utilizing file uploading software, such as WFTP Pro software. The image can then be viewed at reasonable speeds. Upon completion of the file upload at Step 209, the method ceases operation at Step 210.

The processing steps described herein provide for the production of digital images which have enhanced resolution and which can be easily and effectively managed in applications involving the display of same, or the posting of same, to a host computer, a Web server, a Web site, a Web page, a computer display, a television, and/or a full screen projection display. Further, the method of the present invention provides for effective image compression after a requisite stitching operation, thereby preserving image quality. Low speed uses of high speed access data would typically dispense with the need for data compression. The apparatus and method of the present invention provides images which have enhanced resolution and quality while requiring less file management efforts.

The resulting images are characterized by a high definition resolution and are suitable for high definition television, Web television, and large, full screen, panoramic internet applications, such as those involving displaying video images, while preserving resolution upon image magnification or reduction. The present invention also dispenses with the need for plug-in software during download and/or file transfer operations. Further, a zoom capacity of up to 1700 times or greater may be easily obtained with the present invention. The present invention also facilitates high speed file transfers of high resolution digital images thereby dispensing with the need to engage in long and slow conventional file downloads and/or file transfers.

The apparatus and method of the present invention can be utilized in conjunction with three-dimensional image technology in order to provide enhanced resolution three-dimensional digital images. The apparatus and method of the present invention can also provide three-dimensional graphics which provides for enhanced mapping of the depth of two-dimensional images for use in three-dimensional image modeling applications.

The digital images obtained with the present invention can be utilized for any digital or projection application, including full screen display and/or projection applications.

While the present invention has been described and illustrated in various preferred embodiments, such descriptions are merely illustrative of the present invention and are not to be construed to be limitations thereof. In this regard, the present invention encompasses any and all modifications, variations, and/or alternate embodiments, with the scope of the present invention being limited only by the claims which follow.

CLAIMS

What Is Claimed Is:

1. An apparatus for producing a digital image, comprising:

   a device for generating a digital signal file from one of an enlarged analog image and an enlarged digital image; and

   a processor for processing said digital signal file and for generating an image file,

   wherein said processor generates a first signal file from said digital signal file, and further wherein said processor processes said first signal file and generates said image file.

2. The apparatus of claim 1, further comprising:

   one of a camera and a recording device for obtaining an image.

3. The apparatus of claim 2, further comprising:

   a developing device for developing said image.

4. The apparatus of claim 3, further comprising:

   an enlarging device for enlarging an image.

5. The apparatus of claim 4, further comprising:

a scanning device for generating said digital signal file from said one of a print film image, an analog image and a digital image.

6. The apparatus of claim 1, wherein said first signal file is an image file.

7. The apparatus of claim 1, wherein said image file is an image file.

8. An apparatus for producing a digital image, comprising:

means for generating a digital signal file from an image file; and

means for processing said digital signal file and for generating an image file,

wherein said processing means generates a first signal file from said digital signal file, and further wherein said processing means processes said first signal file and generates said image file.

9. The apparatus of claim 8, further comprising:

means for obtaining a photographic representation of an image.

10. The apparatus of claim 9, further comprising:

means for one of developing and generating said image.

11. The apparatus of claim 10, further comprising:

means for enlarging said image.

12. The apparatus of claim 11, further comprising:

means for generating said digital signal file from said image.

13. The apparatus of claim 8, wherein said image file is a bitmap file.

14. The apparatus of claim 8, wherein said image file is a JPEG file.

15. A method for producing a digital image, comprising:

generating a digital signal file from an image;

processing said digital signal file; and

generating an image file, wherein said processing operation further comprises:

generating a first signal file from said digital signal file; and

processing said first signal file and generating said image file.

16. The method of claim 15, further comprising:

obtaining a photographic representation of an image.

17. The method of claim 16, further comprising:

developing said photographic representation; and

generating said image.

18. The method of claim 18, further comprising:

enlarging said image.

19. The method of claim 18, further comprising:

generating said digital signal file from said image.

20. The apparatus of claim 15, wherein said first signal file is an image file.

21. The apparatus of claim 15, wherein said image file is one of a bitmap file and a JPEG file.

ABSTRACT OF THE DISCLOSURE

An apparatus and a method for producing a digital image, which includes a device for generating a digital signal file from an image, and a processor for processing the digital signal file and for generating an image file. The processor generates a first signal file from the digital signal file. The processor processes the first signal file and generates the image file.

Attorney Docket No.: 5865-6

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

POWER OF ATTORNEY

Application of:	Eliot I. Bernstein
Serial No.:	Please assign
Filed on:	Concurrently herewith
Title:	APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

RAYMOND A. JOAO, Reg. No. 35,907

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Mineola, New York 11501

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of the sole inventor (given name, family name): ELIOT I. BERNSTEIN	
Inventor's signature:	Date: 8/2/99
Residence: 500 S.E. Mizner Boulevard, Suite 102, Boca Raton, FL 33432-6080	Citizenship: U.S.A.
Post Office Address: SAME AS ABOVE	

P:\PUBLIC\PATENT\BERNSTEI\5865-6

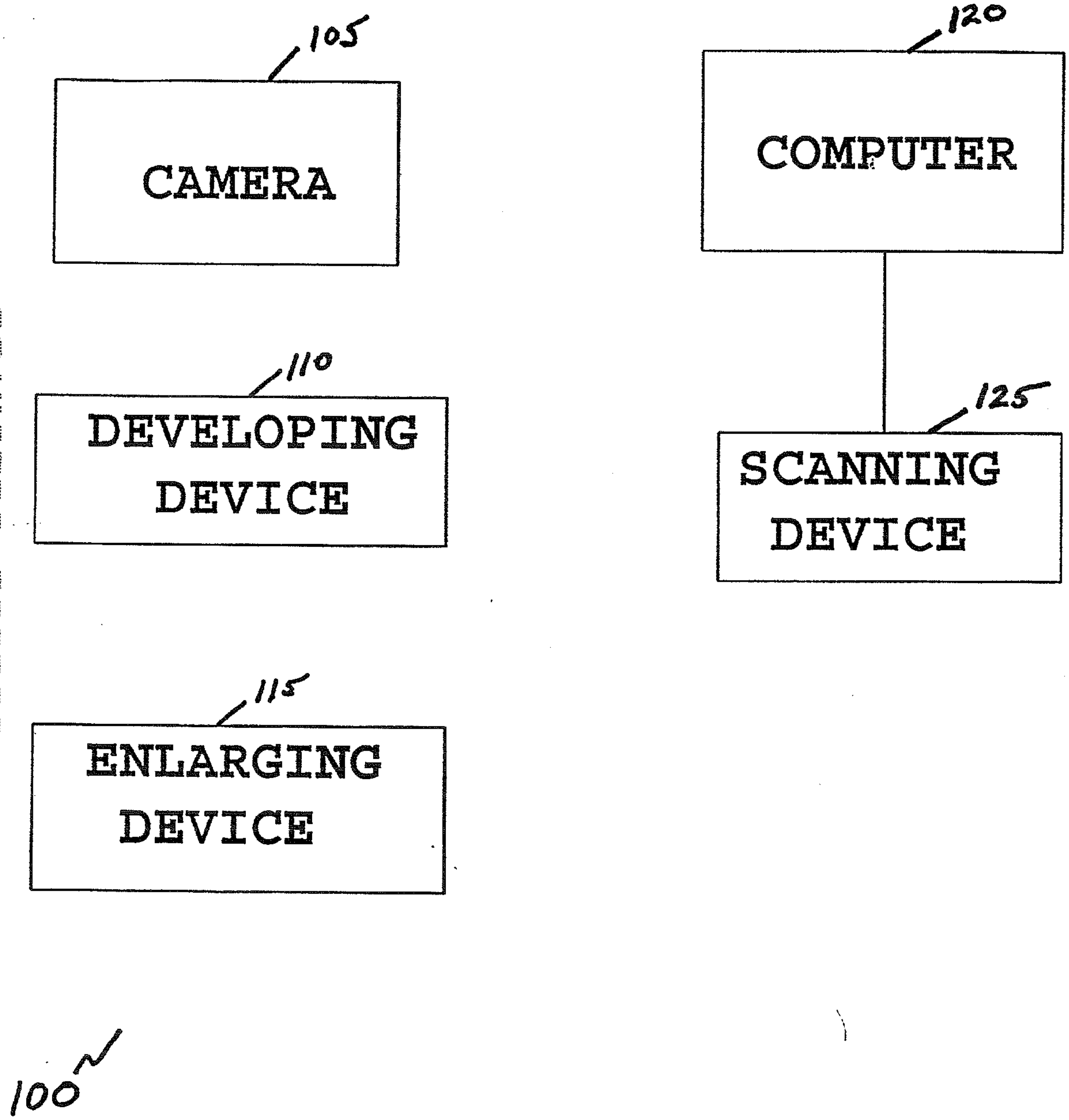
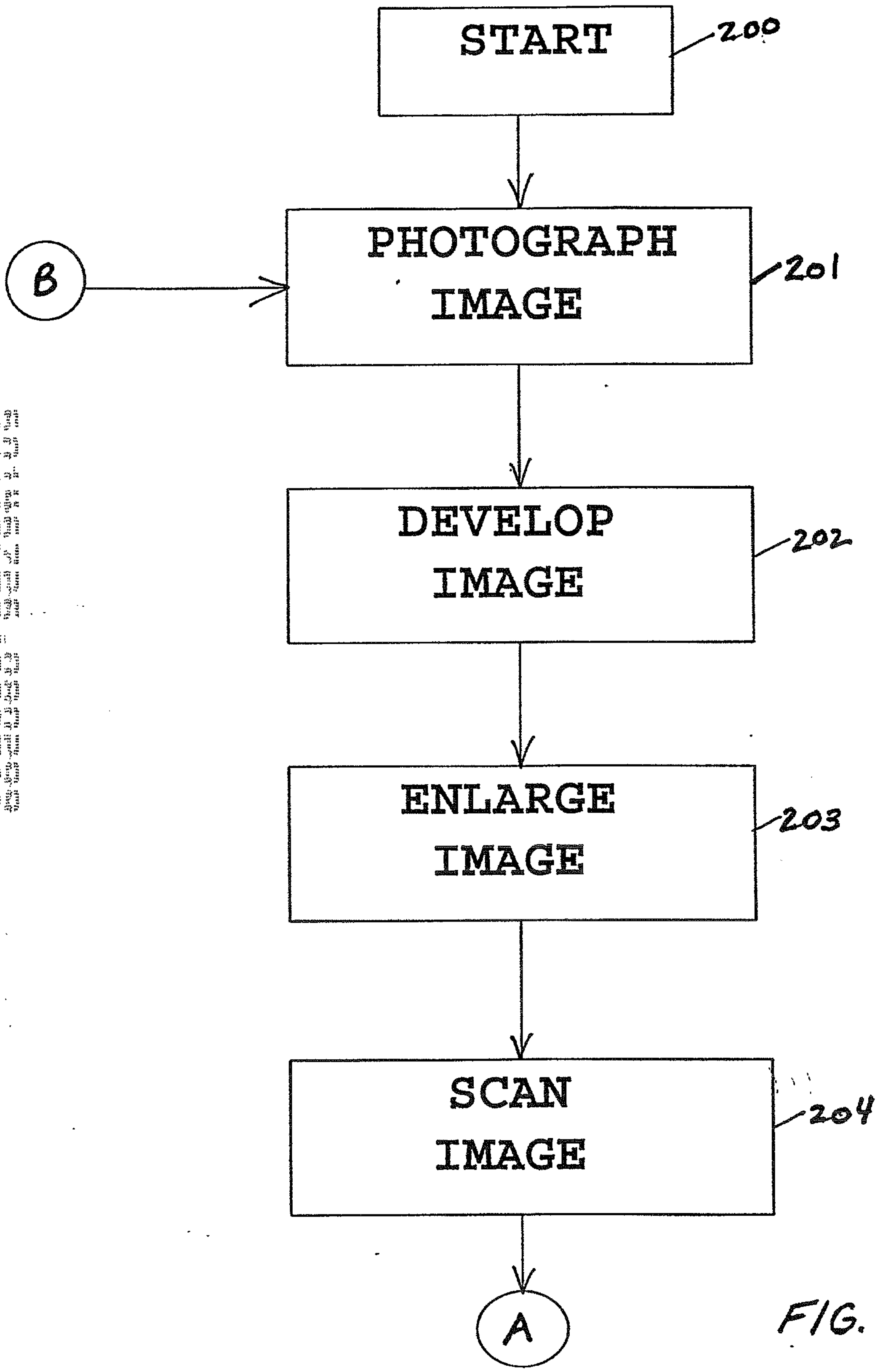

105
CAMERA
110
DEVELOPING DEVICE
115
ENLARGING DEVICE
120
COMPUTER
125
SCANNING DEVICE
100

FIG. 1


START
200
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201
B
DEVELOP IMAGE
202
ENLARGE IMAGE
203
SCAN IMAGE
204
A

FIG. 2A

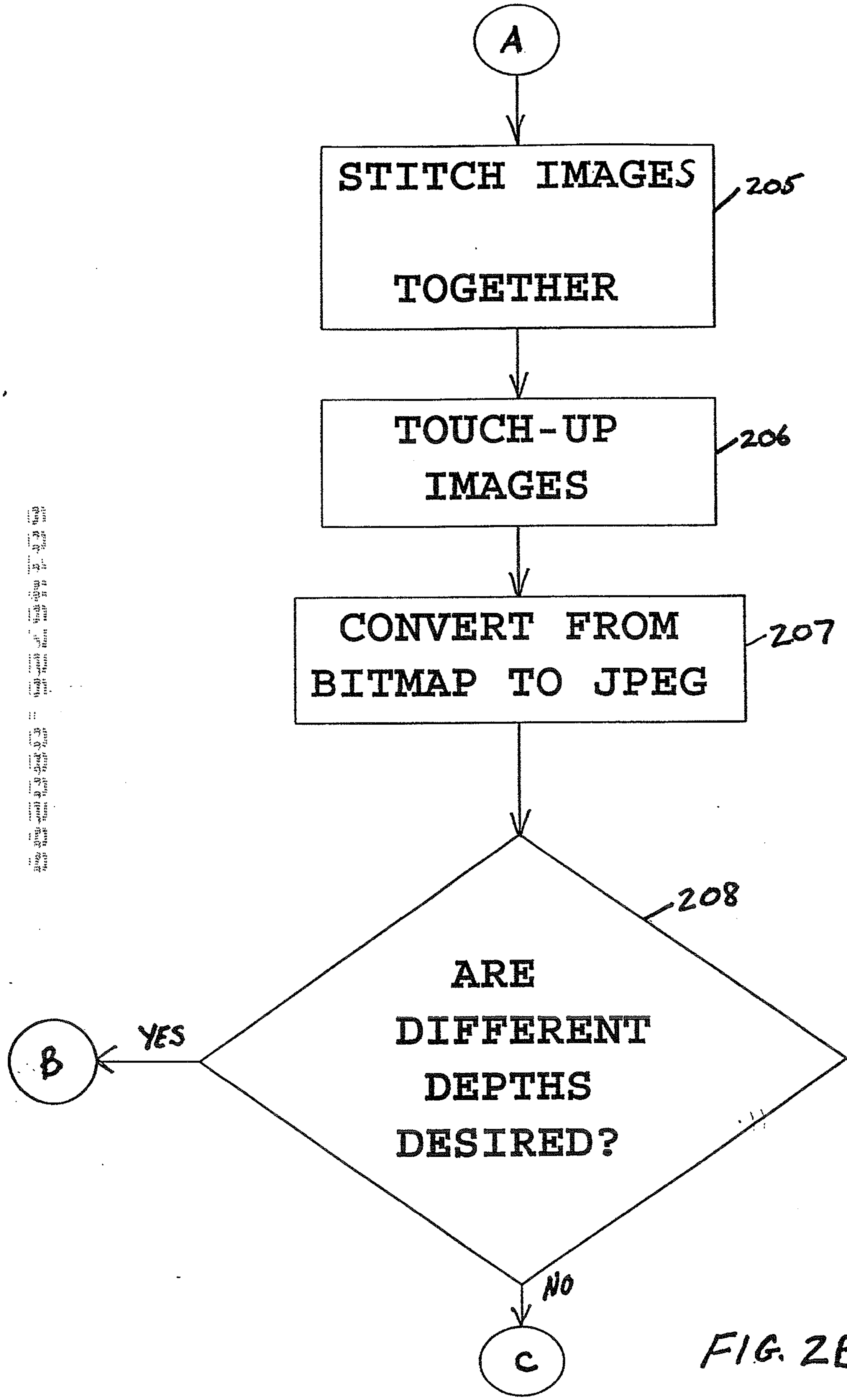
A
STITCH IMAGES TOGETHER
205
TOUCH-UP IMAGES
206
CONVERT FROM BITMAP TO JPEG
207
ARE DIFFERENT DEPTHS DESIRED?
208
YES
B
NO
C

FIG. 2B

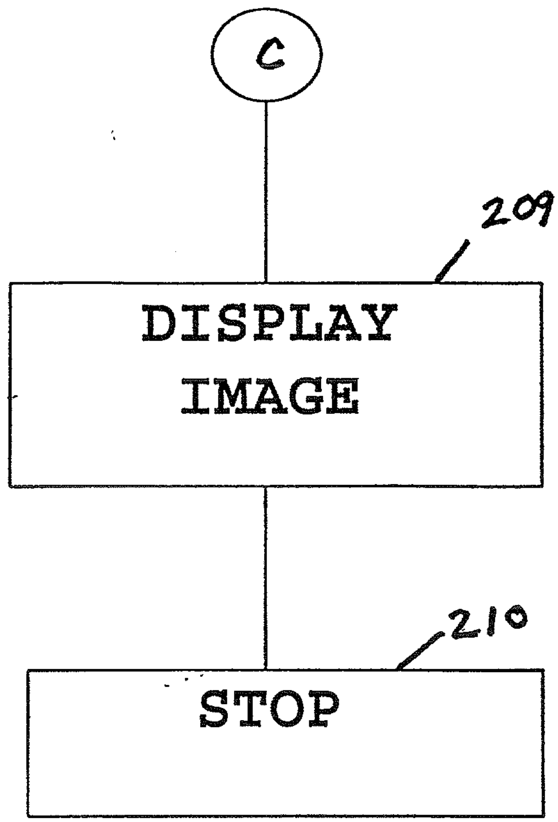

FIG. 2C

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APPLICATION NUMBER: *60/149,737*
FILING DATE: *August 19, 1999*

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

JC594 U.S. PTO

JC541 U.S. PTO 60/149737 08/19/99

60149737.081999

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Eliot I.	Bernstein	500 S.E. Mizner Blvd. Suite 102 Boca Raton, FL 33432-6080

☐ Additional inventors are being named on the ___ separately numbered sheets attached hereto

TITLE OF THE INVENTION (280 characters max)

APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES AND/OR DIGITAL VIDEO FILES

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ENCLOSED APPLICATION PARTS *(check all that apply)*

[X] Specification *Number of Pages* 21

[X] Drawing(s) *Number of Sheets* 4

[X] Small Entity Statement

[X] Other (specify) Power of Attorney

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

[X] A check or money order is enclosed to cover the filing fees

☐ The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: [ ]

FILING FEE AMOUNT ($): 75.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

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Respectfully submitted,

SIGNATURE Raymond A. Joao

Date 8/19/99

TYPED or PRINTED NAME Raymond A. Joao, Esq.

REGISTRATION NO. *(if appropriate)* 35,907

TELEPHONE 516-747-0300, XTN 240

Docket Number: 5865-5

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

Attorney Docket No.: 5865-5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	**:**	**Eliot I. Bernstein**
Serial No.	**:**	**Please assign**
Filed	**:**	**Concurrently herewith**
Title	**:**	**APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES AND/OR DIGITAL VIDEO FILES**

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I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated below and is addressed to: Box Provisional Application, Assistant Commissioner for Patents, Washington, D C 20231

Date of Deposit: August 19, 1999

(Signature): Nicole Eliseo Pinou

Nicole Eliseo-Pinou

Box Provisional Application
Assistant Commissioner for Patents
Washington, D.C. 20231

PROVISIONAL PATENT APPLICATION TRANSMITTAL LETTER

Sir:

Please find transmitted herewith for filing the following:

(1) Provisional Application for Patent Cover Sheet;

(2) Provisional Patent Application including Specification, Claims and Abstract - 21 pages, and Drawings - 4 sheets.

(3) Verified Statement Claiming Small Entity Status;

(4) Check in the amount of $75.00 for the filing fee;

(5) Power of Attorney form; and

(6) Return Receipt Postcard.

It is respectfully requested that the above papers be filed as a Provisional Patent Application.

Respectfully submitted,
MELTZER, LIPPE, GOLDSTEIN,
WOLF & SCHLISSEL, P.C.

By: Raymond A. Joao

Raymond A. Joao
Reg. No. 35,907

August 19, 1999

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VERIFIED STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) & 1.27(b))--INDEPENDENT INVENTOR	Attorney Docket No.: 5865-5

Applicant or Patentee: Eliot I. Bernstein

Serial or Patent No.: Please assign

Filed or Issued: Concurrently herewith

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As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:

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__ the patent identified above.

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Separate verified statements are required from each named person, concern or organization having the rights to the invention averring to their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

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SIGNATURE

8.19.99
DATE

Attorney Docket No. 5865-5

APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES AND/OR DIGITAL VIDEO FILES

FIELD OF THE INVENTION

The present invention is directed to an apparatus and a method for producing enhanced digital images and/or digital video files and, in particular, to an apparatus and a method for producing enhanced resolution digital images and/or digital video files obtained via a digital camera and/or a digital recording device.

BACKGROUND OF THE INVENTION

The fields of telecommunications, multimedia, and related areas, are growing at increasing rates. With this continued growth, the need for high resolution digital imagery and video files for utilization in conjunction with the corresponding technologies, is becoming greater. Current technologies can utilize digital panoramic cameras and video recording equipment, as opposed to film or print film cameras or film video recording devices.

Conventional digital technologies typically have very low zoom quality and low image size restrictions or limitations associated therewith. Generally speaking, enlarged images produce a higher resolution image, and an associated higher resolution scanning quality, which further facilitates an improved enlargement or reduction of the image for different sizes and different depths, without pixel distortion. Photographs, videos, and associated images, utilize pixels which typically have a certain size. When enlarged or reduced, these pixels of the image or video become distorted, a feature which typically results in the image or video being fixed to an original size, or being available at very low magnifications, such as, for example, magnifications of from 200 times to 300 times. These images or video are also difficult to enlarge to a full screen size without a tremendous amount of distortion present in the end product.

Currently, panoramic imaging and video recording and/or production techniques utilize non-enlarged images as their starting point. With such associated limitations, the ability to provide enhanced resolution digital images and video and, especially, an enhanced resolution digital panoramic image or video, such as those utilized on, or over, the Internet and/or the World Wide Web, has been greatly compromised.

Another major drawback in the current technology lies in the fact that conventional processes often utilize panoramic lenses in order to capture an image or video. This practice has been criticized as creating distortions in the image or video immediately upon the enlargement or reduction of same. The conventional techniques associated with the use of panoramic lenses are known to result in image or video "bending", which further curtails one's ability to obtain realistic views, especially upon performing any associated cropping and/or editing processes. In such instances, the upper end and the lower end of the image or video must be either erased, or covered, in order to prevent the flaw from being exposed. This typically results in the resulting image or video having a "fishbowl-type" distortion. In some instances, 32 mm lenses have been utilized in order to obtain enhanced floor to ceiling images without experiencing image bending. In these applications, however, the ability of the lens to capture optimal images varies depending upon the scene, image, or video being photographed or recorded.

SUMMARY OF THE INVENTION

The present invention provides an apparatus and a method for providing enhanced digital images and/or digital video files which can be utilized and which can be easily managed, when displayed, projected, or posted, on any viewing device and/or entity such as, but not limited to, an Internet Web server, a Web site, a Web page, a television, etc.

The present invention can be utilized to produce enhanced images and/or video files for posting and/or for downloading, to a digital display medium. The present invention can be utilized to produce enhanced digital images and/or digital video files from digital images and/or digital video files obtained via a digital camera and/or a digital recording device. The resolution which is achieved can be unaffected by the typical resolution limiting parameters and phenomena which are associated with conventional digital image processing equipment, techniques and methods.

The apparatus includes a camera which can be a digital camera and/or a digital recording device or digital camcorder. The camera can be utilized to obtain the image which is photographed or the video which is recorded, respectively. The apparatus can also include an enlarging device for enlarging the digital image or digital video file which is obtained via the respective camera or recorder. The images may or may not be digitally enlarged.

The apparatus also includes a computer for performing the various processing routines during the operation of the apparatus and method of the present invention. The computer includes a central processing (CPU), a read only memory (ROM), a random access memory (RAM), a display device, an input device and an output device. The computer may also include any other hardware device or peripheral device and/or software which is, or which may be needed and/or desired, in order to perform any of the functions and/or operation described herein.

The computer may also include a receiver for receiving data and/or information over a communication network, and a transmitter for transmitting data and/or information over the communication network. The apparatus can also include a scanning device for scanning images or photographs.

The image can be photographed by using the digital camera or recorded by using the video recorder. Thereafter, if needed, the image can be enlarged by using the enlarger, and scanned, in order to generate a digital data file of the desired image or digital video file.

The image file or video file can then be converted to a suitable high resolution image or video compression or other suitable file. The above processes may be modified, altered, and/or varied, depending upon the data formats which are utilized in the various data processing steps. The image files or video files may or may not be compressed depending upon the application.

The above process can also repeated using different depth images or digital photographs in order to attain higher magnification levels. The resulting image data and/or video file data can then be displayed via any appropriate and/or suitable means and/or be transmitted over a communication network.

The apparatus and method of the present invention can also be utilized in conjunction with three-dimensional images and video files in order to produce high resolution, three-dimensional digital images and/or digital video files.

The digital images and/or digital video files which are obtained with the present invention can be utilized for any digital or projection applications, including full screen display and/or projection applications.

Accordingly, it is an object of the present invention to provide an apparatus and a method for producing enhanced digital images and/or digital video files.

It is another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files obtained via a digital camera and/or a digital recording device.

It is still another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files obtained via a digital camera and/or a digital recording device which images and/or files can be displayed from any suitable display device and/or posted and/or transmitted on and/or from, respectively, any suitable medium.

It is yet another object of the present invention to provide an apparatus and a method for producing digital images and/or video files which dispenses with the need for file compression.

It is another object of the present invention to provide an apparatus and a method for producing digital images and/or video files which can utilize any suitable data file formatting.

It is still another object of the present invention to provide an apparatus and a method for producing digital images and/or video files which can be utilized to obtain enhanced resolution digital images and/or digital video files obtained via a digital camera and/or a digital recording device which can be utilized in conjunction with three-dimensional image or video production techniques in order to produce enhanced three-dimensional digital images and video files.

It is yet another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files obtained via a digital camera and/or a digital recording device which can be utilized in display and projection applications.

Other objects and advantages of the present invention will be apparent to those skilled in the art upon a review of the Description of the Preferred Embodiment taken in conjunction with the Drawings which follow.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings:

Figure 1 illustrates the apparatus of the present invention, in block diagram form; and

Figures 2A, 2B and 2C illustrate the method of the present invention, in flow diagram form.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention provides an apparatus and a method for providing enhanced digital images and/or digital video files which can be utilized and which can be easily managed, when displayed, projected, or posted on any viewing device and/or entity such as, but not limited to, an Internet Web server, Web site or Web page, television, etc. In particular, the present invention provides an apparatus and a method for producing an enhanced digital image from a print or digital film image, or from a photographic image, which is taken with any camera. The digital images which are produced by the apparatus and method of the present invention have improved and enhanced resolution and require far less effort in the associated maintenance and management of same. The digital images, after enlargement which are produced by the apparatus and method of the present invention, can be utilized and displayed on computers, projection devices, and, as noted above, can be posted to an Internet Web server, a Web site, and/or a Web page.

The present invention, in a preferred embodiment, is utilized to produce enhanced images for posting and/or for downloading or streaming, to a digital display medium, which in the preferred embodiment, is an Internet and/or a World Wide Web server, a Web site, and/or Web page. In this manner, enhanced digital images and/or digital video files can be produced from digital images and/or digital video files which are obtained via a digital camera and/or a digital recording device, with the resulting digital images and/or digital video files having enhanced resolution. This resolution is unaffected by the typical resolution limiting parameters and phenomena which are associated with conventional digital image processing equipment, techniques and methods.

Figure 1 illustrates the apparatus of the present invention which is denoted generally by the reference numeral 100, in block diagram form. With reference to Figure 1, the apparatus 100 includes a camera 105 which, in the preferred embodiment, is a digital camera and/or a digital recording device or digital camcorder. In the preferred embodiment, the camera 105 may be a hand-held camera, a fixed camera, and/or a camera which is mountable, such as on a tripod or on a stand or camcorder or film recorder, etc. The camera 105 is utilized to obtain the image of the image or scene which is being photographed.

The apparatus 100 also includes an enlarging device 115 for enlarging the digital image which is obtained via the camera or recorder 105. In the preferred embodiment, the images are digitally enlarged. However, in other preferred embodiments image enlargement may not be required or be rendered necessary.

The apparatus 100 also includes a computer 120, for performing the various processing routines during operation of the apparatus and method of the present invention. The computer 120 may be a personal computer, a laptop computer, a mini-computer, a microcomputer, a mainframe computer, a network computer, a server computer, and/or any other suitable computer or computer system. The computer 120 includes a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), a display device, an input device and an output device. The computer 120 may also include any other hardware device or peripheral device and/or software which is, or which may be needed and/or desired in order to perform any of the functions and/or operation described herein. The input device may include a keyboard, a mouse, or other pointing device, and/or any other data and/or command input device, for allowing for data and/or command input by a user. The output device may include a printer and, in the preferred embodiment, the printer may be a color laser printer or a color inkjet printer. The computer 120 also includes a receiver for receiving data and/or information over a communication network and a transmitter for transmitting data and/or information over the communication network.

The apparatus 100 also includes a scanning device 125, for scanning images or photographs, whether they be digital or of a print film type, in order to obtain a digital image representation of same. Any suitable computer or scanner and any suitable scanning software may be utilized in conjunction with the present invention. In a preferred embodiment, a UMAX® Astra scanner is utilized in conjunction with Microsoft® Photo Editor software.

Figures 2A, 2B and 2C illustrate the method of the present invention, in flow diagram form. With reference to Figures 2A, 2B and 2C, the method of the present invention commences at step 200. At step 201, a scene, image, or video (hereafter "image") is photographed or recorded by using the digital camera or digital video recorder 105.

At step 202, the image is enlarged by the enlarger 115, if needed. The enlargement step at Step 202 is optional and may be dispensed with if it is not necessary to enlarge the image or video file. In the preferred embodiment, the images can be enlarged to sizes of between 8"x6" to 8"x12" for photographs or to any other appropriate size for video. Although enlargement to any size may be obtained and utilized, the aforementioned sizes represent the respective lower end and upper end limits for the print sizes of photographs which provide optimal magnification capability in the preferred embodiment. In the preferred embodiment, a magnification capability of up to 1700 times may be attained for most views or scenes. It is, however, recommended that larger enlargement sizes be obtained for smaller object images.

At step 203, the image obtained at step 202 is scanned by the scanner 125 in order to generate a bitmap image file or other image extension file, whether of a high quality resolution or low quality resolution. At step 204, a plurality of bit map files, which are obtained for the photographic images, can be stitched together after scanning, thereby creating a panoramic scene or image, or simply a scene requiring a plurality of photographs. This stitching operation can be performed by utilizing photo stitching software such as, for example, Photo Vista software by Live Picture, Live Picture Reality Studio, and/or Live Picture Object Modeler and/or Photo Vista software. The stitching operation, at step 204, may be dispensed with in the case of recorded video.

At step 205, the computer 120 performs a touch-up operation on the scanned image or stitched image collection in order to make refinements and/or enhancements thereto. This touch-up operation is accomplished by utilizing imaging software. In the preferred embodiment, Adobe Photoshop software can be used as the imaging software for touching up the images. At step 206, the image is then converted from a bitmap file, or any other suitable high resolution image compression extension file, to a JPEG file or other suitable low resolution graphic or video image extension file. In the preferred embodiment, Adobe Image Ready software is utilized to perform the bitmap to JPEG file conversion. In embodiments wherein the image is not captured in JPEG format, the above described step can be dispensed with. The bitmap to

JPEG file conversion, which is performed at step 206, serves to preserve video image quality and resolution, thereby providing an optimum digital image or video image. At step 206, the JPEG file of the image or video can also be compressed, if speed is a consideration, by utilizing image compression software, such as Adobe Image Ready software. In high speed applications, no compression would typically be required. The compressed image is, thereafter, ready for display, posting, and/or for playback, to and/or from a host computer, a Web server, a Web site, or a Web page.

The above process can be repeated using different depth images or digital photographs or video segments, for any of the images or video obtained, in order to create areas of higher resolution or "hot spots", for detailed close-up inspection or viewing. These depth images, digital photographs, or videos, can also be stitched into the respective image, image segment, video, or video segment, by using the stitching techniques described above, which are hereby incorporated by reference herein. The above process can be utilized in order to create higher zoom capabilities with each new depth layer of an image or video.

At step 207, a determination is made as to whether different depth photographs or video segments are desired. If different depth photographs or video segments are desired, steps 201 through 207 can be repeated in order to obtain the desired image. If no additional depth images, digital photographs or video segments are desired, the method proceeds to step 208.

At step 208, the resulting digital image can be displayed, or played back, on a digital display device, projected from a projection device, or posted to a host computer, a Web server, a Web site, or a Web page. In the instance where the image is posted to an Internet Web server, Web site, or Web page, the upload from the computer 120, to the respective server, site, or page, can be performed by utilizing file uploading software, such as WFTP Pro software. The uploading can be facilitated by transmitting the pertinent data and/or information via the transmitter (not shown) of the central processing computer 120. The image can then be viewed at reasonable speeds. Upon completion of the file upload at Step 208, the operation of the apparatus and method of the present invention ceases operation at Step 209.

If the digital image is obtained via a digital camera, an enhanced resolution digital image can be obtained. If the digital image or video file is obtained via a digital recorder or digital camcorder and recorded as a video file, the above described process can also be utilized to produce an enhanced digital video file or collection of digital images and/or digital video files which can be played back as a video file and/or be used for applications including single images, single panoramic images, stitched images, non-stitched images and/or any other suitable image type or video type.

The processing steps described herein provide for the production of digital images and/or digital video files which have enhanced resolution and which can be easily and effectively managed in applications involving the display or playback of same, and/or the posting of same, to a host computer, a Web server, a Web site, a Web page, a computer display, a full screen projection display and/or a video presentation and/or playback of same, respectively. Further, the method of the present invention provides for image processing, including various digital image processing techniques, which may or may not include image compression operations and/or techniques, subsequent to a stitching operation, thereby preserving image quality.

The apparatus and method of the present invention provides images which have enhanced resolution and quality while requiring less file management efforts.

The resulting images which are obtained via the apparatus and method of the present invention are characterized by a high definition resolution and are suitable for high definition television, Web television, and large, full screen, panoramic or object models Internet applications, including video playback and/or video transmission, which preserving resolution upon image and/or video file magnification or reduction. The present invention also dispenses with the need for plug-in software during download and/or file transfer operations. Further, a zoom capacity of up to 1700 times or greater may be easily obtained with the present invention. The present invention also facilitates high speed file transfers of high resolution digital images and/or digital video files, thereby dispensing with the need to engage in long and slow conventional file downloads and/or file transfers.

The apparatus and method of the present invention can also be utilized in conjunction with three-dimensional images and video files in order to produce high resolution, three-dimensional digital images and/or digital video files and 30D texturings.

The digital images and/or digital video files which are obtained with the present invention can be utilized for any digital or projection application, including full screen display and/or projection applications.

While the present invention has been described and illustrated in various preferred embodiments, such descriptions are merely illustrative of the present invention and are not to be construed to be limitations thereof. In this regard, the present invention encompasses any and all modifications, variations, and/or alternate embodiments, with the scope of the present invention being limited only by the claims which follow.

CLAIMS

What is claimed is:

1. An apparatus for producing enhanced digital images and/or digital video files, comprising:

a processor for processing a first data file containing one of image data and video data, wherein said processor generates an image extension file corresponding to said first data file, and further wherein said processor converts said image extension file to a low resolution one of graphic and video image extension file.

2. The apparatus of claim 1, further comprising:

a digital recording device for recording one of an image and a video, wherein said digital recording device generates said first data file corresponding to said one of an image and a video.

3. The apparatus of claim 1, further comprising:

an enlarging device for enlarging said one of an image and a video represented in said first data file.

4. The apparatus of claim 1, further comprising:

a scanning device for scanning one of an image and a video represented in said first data file.

5. The apparatus of claim 1, wherein said processor digitally merges a plurality of one of images and video segments together.

6. The apparatus of claim 1, wherein said processor performs an enhancement operation on said image extension file.

7. The apparatus of claim 1, further comprising:

a display device for one of displaying, posting, and playing, one of the image and the video represented in said one of graphic and video image extension file.

8. The apparatus of claim 1, wherein said processor performs a subsequent enhancement operation on said one of graphic and video image extension file.

9. An apparatus for producing enhanced digital images and/or digital video files, comprising:

means for processing a first data file containing one of image data and video data, wherein said processing means generates an image extension file corresponding to said first data file, and further wherein said processing means converts said image extension file to a low resolution one of graphic and video image extension file.

10. The apparatus of claim 9, further comprising:

means for recording one of an image and a video, wherein said digital recording means generates said first data file corresponding to said one of an image and a video.

11. The apparatus of claim 9, further comprising:

means for enlarging said one of the image and the video represented in said first data file.

12. The apparatus of claim 9, further comprising:

means for scanning one of an image and a video represented in said first data file.

13. The apparatus of claim 9, wherein said processing means merges a plurality of one of images and video segments together.

14. The apparatus of claim 9, wherein said processing means performs an enhancement operation on said image extension file.

15. The apparatus of claim 9, further comprising:

means for one of displaying, posting, and playing, one of the image and the video represented in said one of graphic and video image extension file.

16. The apparatus of claim 9, wherein said processor performs a subsequent enhancement operation on said one of graphic and video image extension file.

17. A method for producing enhanced digital images and/or digital video files, comprising:

processing a first data file containing one of image data and video data;

generating an image extension file corresponding to said first data file; and

converting said image extension file to a low resolution one of graphic and video image extension file.

18. The method of claim 17, further comprising:

recording one of an image and a video, wherein said recording means generates said first data file corresponding to said one of an image and a video.

19. The method of claim 17, further comprising:

enlarging said one of the image and the video represented in said first data file.

20. The method of claim 17, further comprising:

scanning one of an image and a video represented in said first data file.

21. The method of claim 17, further comprising:

merging a plurality of one of images and video segments together.

22. The method of claim 17, further comprising:

means for performing an enhancement operation on said image extension file.

23. The method of claim 17, further comprising:

one of displaying, posting, and playing, one of the image and the video represented in said one of graphic and video image extension file.

24. The method of claim 17, further comprising:

performing a subsequent enhancement operation on said one of graphic and video image extension file.

ABSTRACT OF THE DISCLOSURE

An apparatus for producing enhanced digital images and/or digital video files, including a processor for processing a first data file containing one of image data and video data. The processor generates an image extension file corresponding to the first data file. The processor converts the image extension file to a low resolution one of graphic and video image extension file. A method for producing enhanced digital images and/or digital video files including processing a first data file containing one of image data and video data, generating an image extension file corresponding to the first data file and converting the image extension file to a low resolution one of graphic and video image extension file.

Attorney Docket No.: 5865-5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

POWER OF ATTORNEY

Application of:	Eliot I. Bernstein
Serial No.:	Please assign
Filed on:	Concurrently herewith
Title:	APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL IMAGES AND/OR DIGITAL VIDEO FILES

09/378,609

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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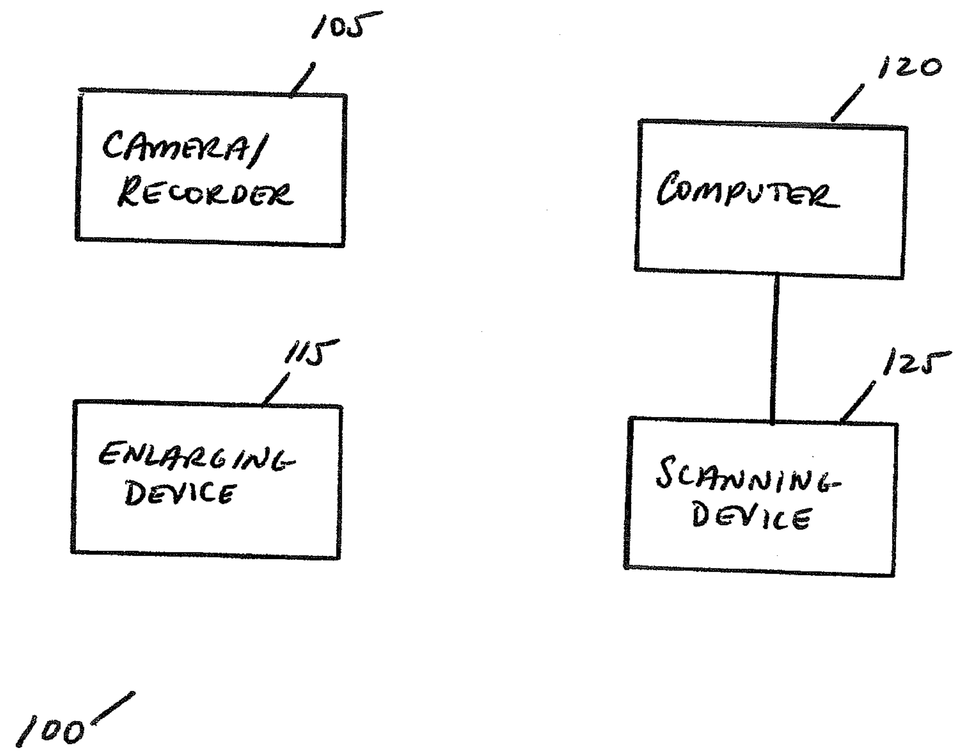
Residence: 500 S.E. Mizner Boulevard Suite 102 Boca Raton, FL 33432-6080	**Citizenship:** U.S.A.
Post Office Address: SAME AS ABOVE	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CAMERA/
RECORDER
120
COMPUTER
115
ENLARGING
DEVICE
125
SCANNING
DEVICE
100

FIG. 1

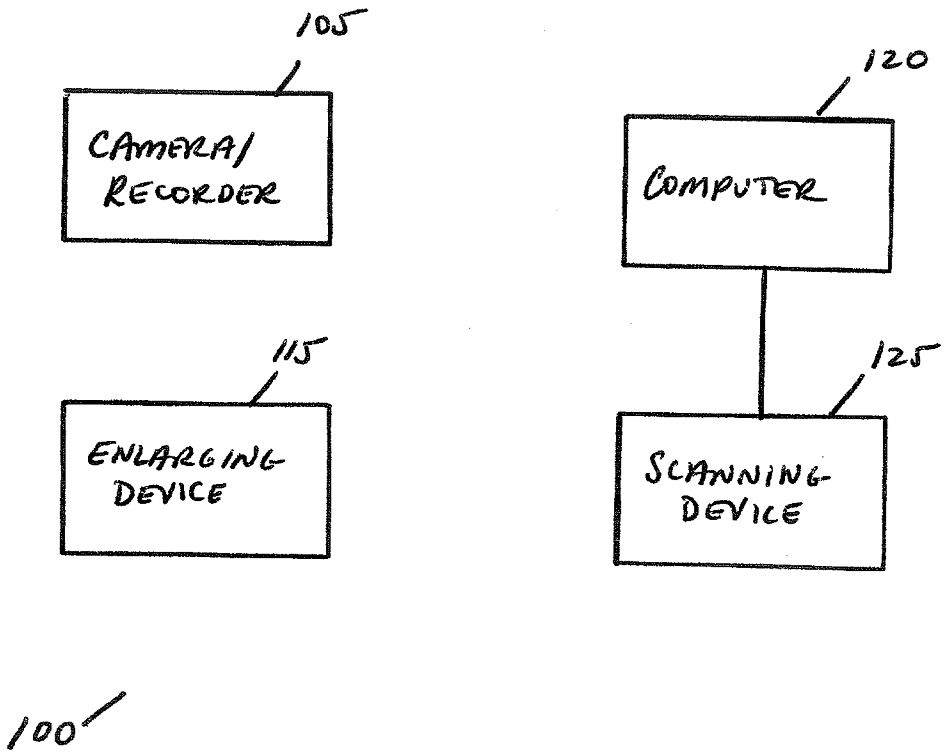
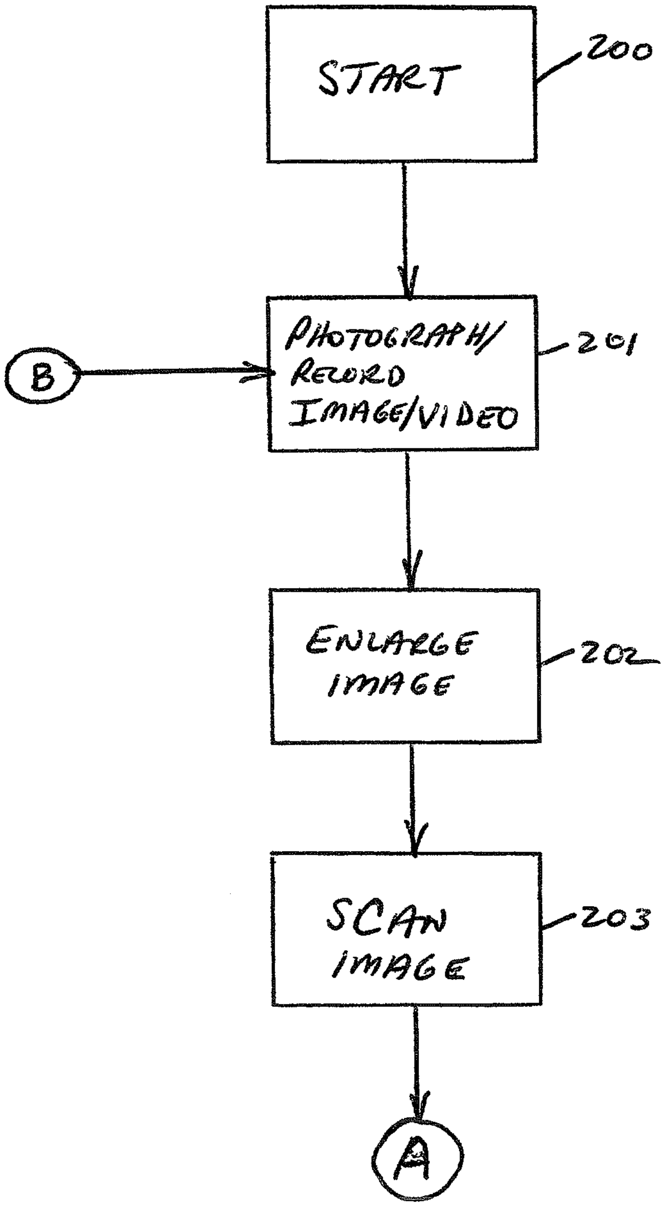

105
CAMERA/ RECORDER
120
COMPUTER
115
ENLARGING DEVICE
125
SCANNING DEVICE
100

FIG. 1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200
PHOTOGRAPH/ RECORD IMAGE/VIDEO
201
B
ENLARGE IMAGE
202
SCAN IMAGE
203
A

FIG. 2A

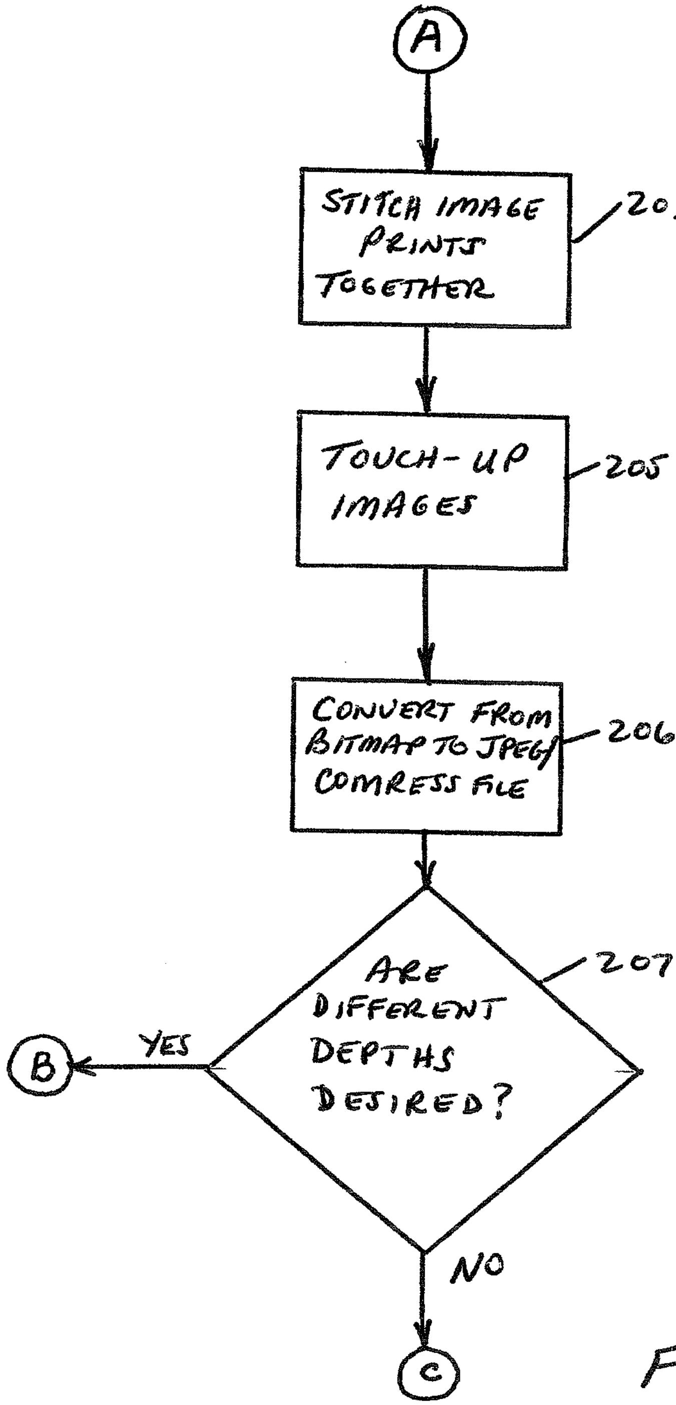
A
STITCH IMAGE PRINTS TOGETHER
204
TOUCH-UP IMAGES
205
CONVERT FROM BITMAP TO JPEG/ COMRESS FILE
206
ARE DIFFERENT DEPTHS DESIRED?
207
YES
B
NO
C

FIG. 2B

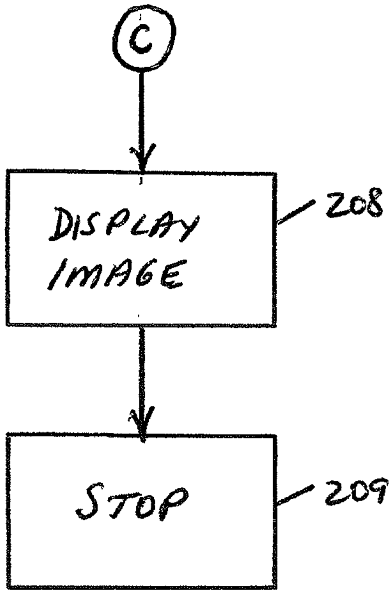

FIG. 2C

PA 1150500

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APPLICATION NUMBER: ***60/155,404***
FILING DATE: ***September 22, 1999***

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

INVENTOR(S)

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Eliot I.	BERNSTEIN	500 S.E. Mizner Blvd. Suite 102 Boca Raton, FL 33432-6080

☐ *Additional inventors are being named on the ___ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (280 characters max)

APPARATUS AND METHOD FOR PRODUCING ENHANCED VIDEO IMAGES AND/OR VIDEO FILES

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ENCLOSED APPLICATION PARTS *(check all that apply)*

[X] Specification *Number of Pages*	29	[X] Small Entity Statement	
[X] Drawing(s) *Number of Sheets*	4	[X] Other (specify)	Power of Attorney

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

[X] A check or money order is enclosed to cover the filing fees

☐ The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: [ ]

FILING FEE AMOUNT ($): 75.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

[XX] No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: ______

Respectfully submitted,

SIGNATURE [signature]

Date 9/22/99

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REGISTRATION NO. *(if appropriate)* 35,907

TELEPHONE 516-747-0300, xtn-240

Docket Number: 5865-7

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

Attorney Docket No.: 5865-7

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	**:**	**Eliot I. Bernstein**
Serial No.	**:**	**Please assign**
Filed	**:**	**Concurrently herewith**
Title	**:**	**APPARATUS AND METHOD FOR PRODUCING ENHANCED VIDEO IMAGES AND/OR VIDEO FILES**

"Express Mail" mailing label number EL355808546US

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Date of Deposit: September 22, 1999

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Nicole Eliseo-Pinou

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(1) Provisional Application for Patent Cover Sheet;

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It is respectfully requested that the above papers be filed as a Provisional Patent Application.

Respectfully submitted,
MELTZER, LIPPE, GOLDSTEIN
& SCHLISSEL, P.C.

By: ______________________
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September 22, 1999

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FROM : VERIFIED STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(b))--INDEPENDENT INVENTOR

Attorney Docket No.: 5865-7

Applicant or Patentee: Eliot I. Bernstein

Serial or Patent No.: Please assign

Filed or Issued: Concurrently herewith

Title: APPARATUS AND METHOD FOR PRODUCING ENHANCED VIDEO IMAGES AND/OR VIDEO FILES

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SIGNATURE

9/22/99
DATE

Attorney Docket No. 5865-7

APPARATUS AND METHOD FOR PRODUCING ENHANCED VIDEO IMAGES AND/OR VIDEO FILES

FIELD OF THE INVENTION

The present invention is directed to an apparatus and a method for producing enhanced images and/or video files and, in particular, to an apparatus and a method for producing enhanced resolution digital images and/or digital video files obtained via digital and/or film video cameras and/or recording devices.

BACKGROUND OF THE INVENTION

The fields of telecommunications, multimedia, and related areas, are growing at increasing rates. With this continued growth, the need for high resolution digital imagery, for utilization in conjunction with the corresponding technologies, is becoming greater. Current technologies utilize film cameras and recorders as well as digital cameras and recorders.

Conventional video and image technologies typically have very low zoom quality and low image size restrictions or limitations associated therewith. Generally speaking, enlarged images produce a higher resolution image, and an associated higher resolution scanning quality, which further facilitates an improved enlargement or reduction of the image for different sizes and different depths, without pixel distortion. Photographs, negatives, and associated images, utilize pixels which typically have a certain size. When enlarged or reduced, these pixels of the image become distorted, a feature which typically results in the image being fixed to an original size, or being available at very low magnifications, such as, for example, magnifications of from 200 times to 300 times. These images are also difficult to enlarge to a full screen size without a tremendous amount of distortion present in the end product.

Currently, panoramic imaging techniques utilize non-enlarged images as their starting point. With such associated limitations, the ability to provide enhanced resolution digital images and, especially, an enhanced resolution digital panoramic image, such as those utilized on, or over, the Internet and/or the World Wide Web, has been greatly compromised.

Another major drawback in the current technology lies in the fact that conventional processes often utilize panoramic lenses in order to capture an image. This practice has been criticized as creating distortions in the image immediately upon the image's enlargement or reduction. The conventional techniques associated with the use of panoramic lenses are known to result in image "bending", which further curtails one's ability to obtain realistic views, especially upon performing any associated cropping and/or editing processes. In such instances, the upper end and the lower end of the image must be either erased, or covered, in order to prevent the flaw from being exposed. This typically results in the resulting image having a "fishbowl-type" distortion.

In some instances, wide angle lenses have been utilized in order to obtain enhanced floor to ceiling images without experiencing image bending. In these applications, however, the ability of the lens to capture optimal images varies depending upon the scene or image being photographed.

As a result, the ability to obtain enhanced video images and/or video files from film cameras and film recorders, from negatives and from digital cameras and recorders, has been limited.

SUMMARY OF THE INVENTION

The present invention provides an apparatus and a method for providing enhanced digital video images and/or digital video files which overcomes the shortcomings of the prior art. The digital images and/or digital files produced by utilizing the present invention can be easily managed, when displayed, projected, and/or posted on any viewing device and/or entity such as, but not limited to, an Internet Web server, Web site or Web page, television, etc.

The present invention provides an apparatus and a method for producing enhanced digital video images and video files from video which may be recorded as print film image or file, a negative image or file, and/or a digital video image and/or file. The video images and/or files may be obtained via a digital camera, a digital recording device, a digital recorder, a digital camcorder, a film video camera, recorder, and/or camcorder, a VHS video camera, recorder, and/or camcorder, a beta video camera, recorder, and/or camcorder, and/or any other suitable video recording device.

The video images and/or video files which are produced by the apparatus and method of the present invention have improved and enhanced resolution and require far less effort in the associated maintenance and management of same. The video images and/or files, which are produced by the apparatus and method of the present invention, can be utilized and displayed on computers, projection devices, televisions, and, as noted above, can be posted to an Internet Web server, a Web site, and/or a Web page. The video images and/or files can be transmitted over a communication network and/or in computer-to-computer applications.

The present invention, in a preferred embodiment, is utilized to produce enhanced video images and/or files for posting and/or for downloading, to a digital display medium, which in the preferred embodiment, is an Internet and/or a World Wide Web server, a Web site, and/or Web page. In this manner, enhanced video images and/or video files can be produced from video images and/or video files which can be recorded using any video recording device and recording medium such as, but not limited to, digital cameras, digital recorders, film cameras, film recorders, etc. The video images and/or files obtained are thereafter processed in accordance with the apparatus and method of the present invention in order to produce enhanced video images and/or video files.

These resulting video images and/or video files have enhanced resolution which is unaffected by the typical resolution limiting and degrading parameters and phenomena which are associated with conventional digital and/or film video cameras, recorders and corresponding processing equipment, methods and/or techniques.

The apparatus can include a video camera or recorder which can be any one of an analog camera and/or a digital camera, an analog and/or digital recording device, an analog and/or digital camcorder, a film camera, a film recording device, and/or a film camcorder. For full motion video, a 3CCD chip, and/or any other appropriate and/or suitable motion capture recording device, can be utilized in conjunction with the present invention. The camera can also be a hand-held camera, a fixed camera, and/or a camera which is mountable, such as on a tripod or on a stand. The camera can be utilized to obtain the video image and/or video file which will be processed in accordance with the present invention.

The present invention preserves image integrity from the point of capture of the image through and including any final compression or compressions of same. The apparatus can also include a developing device, which can be utilized for developing video images and/or files which are obtained on film. In the case of video images and/or files which are obtained digitally, no developing device would be needed. The apparatus can also include an enlarging device which can be utilized to enlarge the video images obtained. An enlarger can be utilized for enlarging either film images and/or digital images.

The apparatus can also include a computer, for performing the various processing routines during operation of the apparatus and method of the present invention. The computer may be a personal computer, a laptop computer, a mini-computer, a microcomputer, a mainframe computer, a network computer, a server computer, and/or any other suitable computer or computer system.

The computer can include a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), a display device, an input device and an output device. The input device may include a keyboard, a mouse, or other pointing device, and/or any other data and/or command input device, for allowing for data and/or command input by a user. The output device may include a printer and, in the preferred embodiment, the printer may be a color laser printer or a color inkjet printer. The computer can also include a receiver for receiving data and/or information over a communication network and a transmitter for transmitting data and/or information over the communication network.

The computer can also include a video capture device, which may or may not be an integral component of the computer. The video capture can also be an external peripheral device. Video data and/or information can be fed into, and/or played through, the video capture device, thereby digitizing the video data and/or information. The present invention preserves the integrity of any and/or all data and/or information upon conversion to digital formats. If full motion video is captured, any conversion can utilize full motion capture software and/or hardware. The video data and/or information can be fed into, and/or through, the video capture card, in real-time, thereby facilitating real-time video transmissions.

The computer can also include any other hardware device or peripheral device and/or software which is, or which may be, needed and/or desired in order to perform any of the functions and/or operation described herein. The computer can also include a video data capture device for capturing and processing the video images and/or files processed by the present invention.

The apparatus can also include a scanning device, for scanning video images or files, if needed, whether they be of a digital or of a print film type, in order to obtain a digital image representation of same.

The apparatus and method of the present invention provides video images and/or files which have enhanced resolution and quality while requiring less file management efforts.

The resulting video images and/or files which are obtained via the apparatus and method of the present invention are characterized by a high definition resolution and are suitable for high definition television, Web television, and large, full screen, panoramic Internet applications, including video playback and/or video transmission, which preserving resolution upon image and/or video file magnification or reduction.

The present invention also facilitates high speed file transfers of high resolution video images and/or video files, thereby dispensing with the need to engage in long and slow conventional file downloads and/or file transfers.

The apparatus and method of the present invention can also be utilized in conjunction with three-dimensional images and video files in order to produce high resolution, three-dimensional video images and/or video files.

Accordingly, it is an object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files from files obtained via digital and/or film video cameras and/or a recording devices.

It is another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files from files obtained via digital and/or film video cameras and/or a recording devices, which have improved and enhanced resolution.

It is still another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, from files obtained via digital and/or film video cameras and/or a recording devices digital images, which are suitable for display and/or for downloading to a digital computer, a television, and/or any other communication device utilized in a telecommunication environment and/or communications environment.

It is still another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, from files obtained via digital and/or film video cameras and/or a recording devices, which are characterized by image compression and/or minimal image compression thereby avoiding any dramatic loss in image quality.

It is another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, from files obtained via digital and/or film video cameras and/or a recording devices, which may dispense with the need to compress the image data.

It is yet another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, from files obtained via digital and/or film video cameras and/or a recording devices, which are characterized by high definition resolution, and which are suitable for high definition television, Web television and large, full screen, panoramic internet applications, without loss of resolution upon image magnification or reduction.

It is another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, from files obtained via digital and/or film video cameras and/or a recording devices, which can be transmitted in a network environment.

It is still another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, from files obtained via digital and/or film video cameras and/or a recording devices, which facilitates high speed file transfer in a network environment and/or in a computer environment.

It is another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, which preserves image integrity from the point of capture of the image through and including final compression or compressions.

It is still another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, which preserves the integrity of any and/or all data and/or information upon conversion to digital formats.

Other objects and advantages of the present invention will be apparent to those skilled in the art upon a review of the Description of the Preferred Embodiment taken in conjunction with the Drawings which follow.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings:

Figure 1 illustrates the apparatus of the present invention, in block diagram form; and

Figures 2A, 2B and 2C illustrate the method of the present invention, in flow diagram form.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention provides an apparatus and a method for providing enhanced digital video images and/or digital video files which can be utilized and which can be easily managed, when displayed, projected, and/or posted on any viewing device and/or entity such as, but not limited to, an Internet Web server, Web site or Web page, television, etc. In particular, the present invention provides an apparatus and a method for producing enhanced digital video images and video files from video which may be recorded as a digital video image and/or files and/or as a film video image and/or file a print film image.

The video images and/or files may be obtained via a digital camera, a digital recording device, a digital recorder, a digital camcorder, a film video camera, recorder, and/or camcorder, a VHS video camera, recorder, and/or camcorder, a beta video camera, recorder, and/or camcorder, and/or any other suitable video recording device. The video images and/or video files which are produced by the apparatus and method of the present invention have improved and enhanced resolution and require far less effort in the associated maintenance and management of same. The video images and/or files, which are produced by the apparatus and method of the present invention, can be utilized and displayed on computers, projection devices, televisions, and, as noted above, can be posted to an Internet Web server, a Web site, and/or a Web page. The video images and/or files can be transmitted over a communication network and/or in computer-to-computer applications.

The present invention, in a preferred embodiment, is utilized to produce enhanced video images and/or files for posting and/or for downloading, to a digital display medium, which in the preferred embodiment, is an Internet and/or a World

Wide Web server, a Web site, and/or Web page. In this manner, enhanced video images and/or video files can be produced from video images and/or video files which can be recorded using any video recording device and recording medium such as, but not limited to, digital cameras, digital recorders, film cameras, film recorders, etc. The video images and/or files obtained are thereafter processed in accordance with the apparatus and method of the present invention in order to produce enhanced video images and/or video files.

These resulting video images and/or video files have enhanced resolution which is unaffected by the typical resolution limiting parameters and phenomena which are associated with conventional digital and film video cameras, recorders and corresponding processing equipment, methods and/or techniques.

Figure 1 illustrates the apparatus of the present invention which is denoted generally by the reference numeral 100, in block diagram form. With reference to Figure 1, the apparatus 100 includes a video camera or recorder 105 which, in the preferred embodiment, can be any one of a digital camera, a digital recording device, digital camcorder, a film camera, a film recording device, and/or a film camcorder. In the preferred embodiment, the camera 105 may be a hand-held camera, a fixed camera, and/or a camera which is mountable, such as on a tripod or on a stand. The camera 105 is utilized to obtain the video image and/or video file which will be processed as described herein.

For full motion video, a 3CCD chip, and/or any other appropriate and/or suitable motion capture recording device, can be utilized in conjunction with the present invention.

The present invention can also be utilized in conjunction with any imaging and/or any video recording device and/or equipment, such as, but not limited to, those devices and equipment utilized in, or in conjunction with, medical imaging equipment, devices and/or instruments, motion picture production equipment, devices and/or instruments and/or in any other equipment, device, and/or instrument, which is, or which can be, utilized in conjunction with imaging and/or video applications and/or uses.

The apparatus 100 also includes a developing device 115, which would be utilized for developing video images and/or files which are obtained on film. In the case of video images and/or files which are obtained digitally, no developing device. The apparatus also includes an enlarging device which can be utilized to enlarge the video images obtained. The apparatus can include an enlarger for both film images as well as for digital images.

The apparatus 100 also includes a computer 120, for performing the various processing routines during operation of the apparatus and method of the present invention. The computer 120 may be a personal computer, a laptop computer, a mini-computer, a microcomputer, a mainframe computer, a network computer, a server computer, and/or any other suitable computer or computer system.

The computer 120 includes a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), a display device, an input device and an output device. The input device may include a keyboard, a mouse, or other pointing device, and/or any other data and/or command input device, for allowing for data and/or command input by a user. The output device may include a printer and, in the preferred embodiment, the printer may be a color laser printer or a color inkjet printer. The computer 120 also includes a receiver for receiving data and/or information over a communication network and a transmitter for transmitting data and/or information over the communication network.

The computer 120 also includes a video capture device 121 which, in the preferred embodiment, is an integral component of the computer 120. The video capture device 121, in the preferred embodiment, is a video capture card 121 which is located internal to the computer 120. The video computer device 121 may also be an external peripheral device. As described herein, the video data and/or information is fed into, and/or played through, the video capture device 121, thereby digitizing the video data and/or information. The video data and/or information can be fed into, and/or through, the video capture card 121, in real-time, thereby facilitating real-time video transmissions.

The computer 120 may also include any other hardware device or peripheral device and/or software which is, or which may be needed and/or desired in order to perform any of the functions and/or operation described herein. In particular, the computer 120 will also include a video data capture device for capturing and processing the video images and/or files processed by the present invention.

The apparatus 100 also includes a scanning device 125, for scanning video images or files, if needed, whether they be digital or of a print film type, in order to obtain a digital image representation of same. Any suitable computer or scanner, and any suitable scanning software, may be utilized in conjunction with the present invention. In a preferred embodiment, any suitable scanning device can be utilized in conjunction with any appropriate software.

Figures 2A, 2B and 2C illustrate the method of the present invention, in flow diagram form. With reference to Figures 2A, 2B and 2C, the method of the present invention commences at step 200. At step 201, the video images and/or files are recorded with the video camera 105. The video can be recorded in any format, such as, but not limited to, i.e., beta, VHS, digital, and/or any of the standard file formats, including, but not limited to, *.AVI, *.MOV, *.MPEG, etc., by utilizing the video recording device 105. The video recording device 105 may also be a reel-to-reel recording device and/or a live video recording device.

At step 202, the video images and/or files are converted to a converted to digital files, if necessary, by utilizing the scanner 110. At step 203, digital video image files are loaded into the computer 120 for processing. At step 204, the video image files are fed into, or through, the capture device 121 of the computer 120. The video capture operation, which is performed by the video capture device 121, in the preferred embodiment, can be performed without compression and/or encoding operations being performed on the video image files and/or with only minimal compression and/or encoding operations being performed on the video image files.

The video capture device, in the preferred embodiment, can be any suitable video capture device or card and/or any other appropriate and/or suitable video capture hardware. The capture software utilized can be any appropriate and/or suitable video capture software.

At step 205, the video images and/or files are edited, if necessary, by using any standard video editing tools, such as, for example, any editing software. At step 206, the video image files are then converted to any suitable real video format such as, for example, a *.RM format. At step 207, the size of the video within the file code is set either manually or automatically. In the preferred embodiment, the size of the video is set within the file code, which may or may not be the HTML file code to a 640 x 480 frame resolution, or any other suitable resolution, such as, but not limited to, 800 x 600, 1024 x 768, 1280 x 1024, 1600 x 1200 or other sizes.

At step 208, the obtained video image file or files is then posted to the computer 120 and/or to another hosting computer. If the posting is to an computer other than the computer 120, the posting is performed by transmitting the video file or files over a communication network to the hosting computer. In the preferred embodiment, the video file or files are posted via the Internet, and/or the World Wide Web, and can posted to a Web Page, a Web site, and/or any other network device. The posting operation is performed by utilizing any suitable posting software.

At step 209, the computer 120 or other hosting computer generates or writes a file or script, such as an ASCII file which calls the video to stream or to download. This results in video which will stream or "streaming" video for a full screen application which will be characterized by a good clarity and quality. At step 210, a separate file or script, such as an ASCII file is written and saved to an appropriately formatted file, such as an *.RPM file, or other suitable file format, which will call the original video file. This script can be typically included in any suitable code, such as an HTML code.

In the case of MPEG videos, Steps 201 through 203 are followed as described above. At step 204, however, the video file is converted, if not previously converted, to an MPEG format. Thereafter, the video is inserted into the appropriate file which may contain suitable coding, such as HTML codes. Thereafter, the file can be sized to any of herein-described resolutions. Thereafter, the video file is uploaded to the hosting computer, if utilized. Thereafter, the MPEG file is played from the computer 120 or the hosting computer, the Web page, and/or the Web site, depending upon the application, by first downloading a small portion of the file and by playing the file through a suitable device such as a player which supports any suitable video formats, such as AVI, MPEG-type, etc., and/or other suitable formats.

Thereafter, operation of the apparatus ceases at step 210.

The processing steps described herein provide for the production of video images and/or video files which have enhanced resolution and which can be easily and effectively managed in applications involving the display of same, the posting of same, to a host computer, a Web server, a Web site, a Web page, a computer display, a full screen projection display and/or a video presentation and/or playback of same, respectively. Further, the method of the present invention provides for image processing, including various image and/or file processing techniques, which may or may not include image compression and/or encoding operations.

The apparatus and method of the present invention provides video images and/or files which have enhanced resolution and quality while requiring less file management efforts.

The resulting video images and/or files which are obtained via the apparatus and method of the present invention are characterized by a high definition resolution and are suitable for high definition television, Web television, and large, full screen, panoramic Internet applications, including video playback and/or video transmission, which preserving resolution upon image and/or video file magnification or reduction. The present invention also dispenses with the need for plug-in software during download and/or file transfer operations. The present invention also facilitates high speed file transfers of high resolution video images and/or video files, thereby dispensing with the need to engage in long and slow conventional file downloads and/or file transfers.

The apparatus and method of the present invention can also be utilized in conjunction with three-dimensional images and video files in order to produce high resolution, three-dimensional video images and/or video files.

The present invention preserves image integrity from the point of capture of the image through, and including, any final compression or compressions of same.

The present invention also preserves the integrity of any and/or all data and/or all information upon conversion to digital formats. If full motion video is captured, any conversion can utilize full motion capture software and/or hardware.

The resulting video images and/or files, which are obtained via the apparatus and method of the present invention, can be utilized, in any and/or all of the embodiments described herein, in conjunction with data and/or information which can be provided by any other and/or any external information source. The data and/or information may contain, but is not limited to, data and/or information of and for sound and/or audio files, text files, video files, image files, and/or graphics files, and/or any other information source, data, information and/or file, which can be, and/or which may be linked to or with, and/or which can be operated and/or utilized in conjunction with, any video and/or image data and/or information. For example, any image and/or video data, information, or file, obtained via the present invention, can be utilized in conjunction with any sound file, audio file, text file, video file, image file, and/or graphics file, and/or any other data, information and/or file utilized in a multimedia environment, thereby providing for the utilization of enhanced images and/or video in conjunction with the respective file.

While the present invention has been described and illustrated in various preferred embodiments, such descriptions are merely illustrative of the present invention and are not to be construed to be limitations thereof. In this regard, the present invention encompasses any and all modifications, variations, and/or alternate embodiments, with the scope of the present invention being limited only by the claims which follow.

CLAIMS

What Is Claimed Is:

1. An apparatus for producing a digital image, comprising:

a device for generating a digital signal file from an image; and

a processor for processing said digital signal file and for generating an image file,

wherein said processor generates a first signal file from said digital signal file, and further wherein said processor processes said first signal file and generates said image file.

2. The apparatus of claim 1, further comprising:

one of a camera and a recording device for obtaining one of a photographic representation of an image, a film image, a negative image and a digital image.

3. The apparatus of claim 2, further comprising:

a developing device for developing one of said photographic representation of an image, a film image and a negative image.

4. The apparatus of claim 3, further comprising:

an enlarging device for enlarging said image.

5. The apparatus of claim 4, further comprising:

a scanning device for generating said digital signal file from said one of photographic representation of an image, a film image and a negative image.

6. The apparatus of claim 1, further comprising:

a video capture device for one capturing and processing said digital signal file.

7. The apparatus of claim 1, wherein said first signal file is an image file.

8. An apparatus for producing a digital image, comprising:

means for generating a digital signal file from an image file; and

means for processing said digital signal file and for generating an image file,

wherein said processing means generates a first signal file from said digital signal file, and further wherein said processing means processes said first signal file and generates said image file.

9. The apparatus of claim 8, further comprising:

means for obtaining said one of a photographic representation of an image, a film image, a negative image and a digital image.

10. The apparatus of claim 8, further comprising:

means for developing said one of photographic representation of an image, a film image and a negative image.

11. The apparatus of claim 8, further comprising:

means for enlarging said image.

12. The apparatus of claim 8, further comprising:

means for generating said digital signal file from said image.

13. The apparatus of claim 8, further comprising:

means for one of capturing and processing said digital signal file.

14. A method for producing a digital image, comprising:

generating a digital signal file from an image;

processing said digital signal file; and

generating an image file, wherein said processing operation further comprises:

generating a first signal file from said digital signal file; and

processing said first signal file and generating said image file.

15. The method of claim 14, further comprising:

obtaining one of a photographic representation of an image, a film image, a negative image and a digital image..

16. The method of claim 14, further comprising:

developing said one of photographic representation of an image, a film image, and a negative image; and

generating said image.

17. The method of claim 14, further comprising:

enlarging said image.

19. The method of claim 14, further comprising:

generating said digital signal file from said image.

20. The method of claim 14, further comprising:

one of capturing and processing said digital signal file.

21. The apparatus of any one of claims 1 to 13, wherein said image file is utilized in conjunction with at least one of a sound file, an audio file, a text file, a video file, an image file, and a graphics file.

22. The method of any one of claims 14 to 20, wherein said image file is utilized in conjunction with at least one of a sound

file, an audio file, a text file, a video file, an image file, and a graphics file.

ABSTRACT OF THE DISCLOSURE

An apparatus and method for producing a digital image, including a device for generating a digital signal file from an image and a processor for processing said digital signal file and for generating an image file. The processor generates a first signal file from the digital signal file. The processor processes the first signal file and generates the image file.

Attorney Docket No.: 5865-7

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

POWER OF ATTORNEY

Application of:	Eliot I. Bernstein
Serial No.:	Please assign
Filed on:	Concurrently herewith
Title:	APPARATUS AND METHOD FOR PRODUCING ENHANCED DIGITAL VIDEO IMAGES AND/OR VIDEO FILES

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

RAYMOND A. JOAO, Reg. No. 35,907

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of the sole inventor (given name, family name): ELIOT I. BERNSTEIN	
Inventor's signature: >	Date: > 9/22/99
Residence: 500 S.E. Mizner Boulevard Suite 102 Boca Raton, FL 33432-6080	Citizenship: U.S.A.
Post Office Address: SAME AS ABOVE	

P:\PUBLIC\PATENT\VIEWIT\5865-7\

09455026

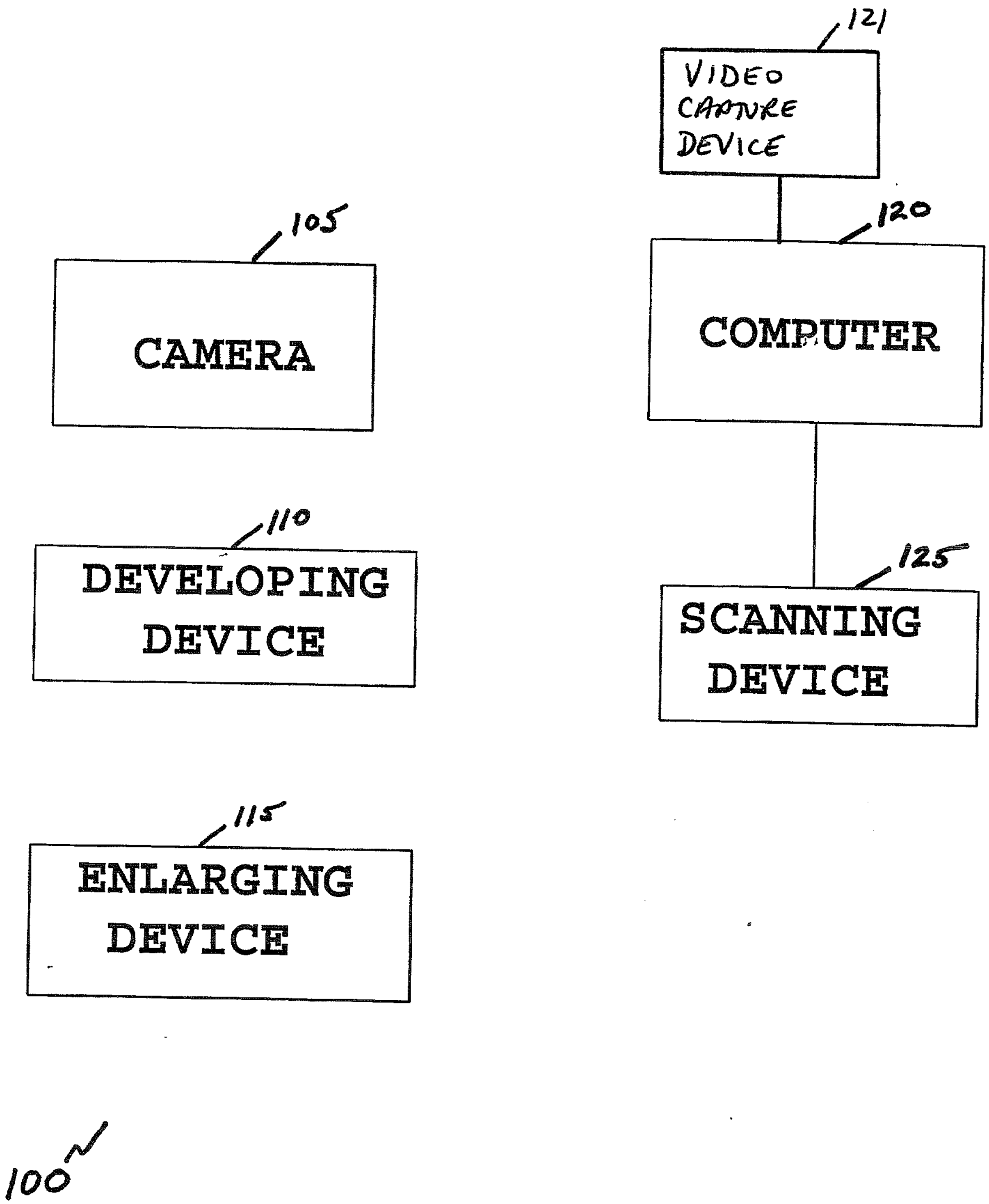
121
VIDEO CAPTURE DEVICE
105
CAMERA
120
COMPUTER
110
DEVELOPING DEVICE
125
SCANNING DEVICE
115
ENLARGING DEVICE
100

FIG. 1

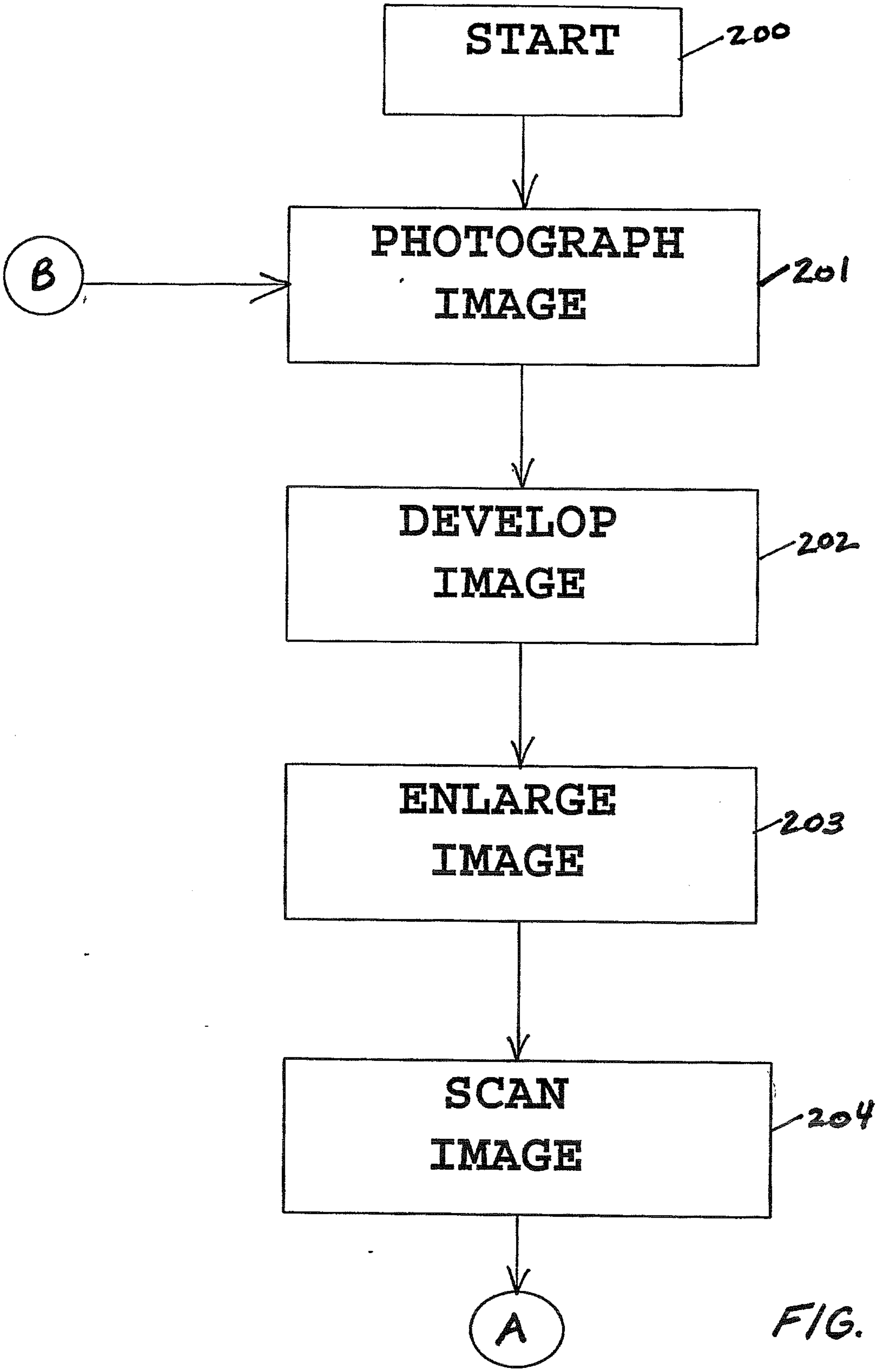
START
200
PHOTOGRAPH IMAGE
201
B
DEVELOP IMAGE
202
ENLARGE IMAGE
203
SCAN IMAGE
204
A

FIG. 2A

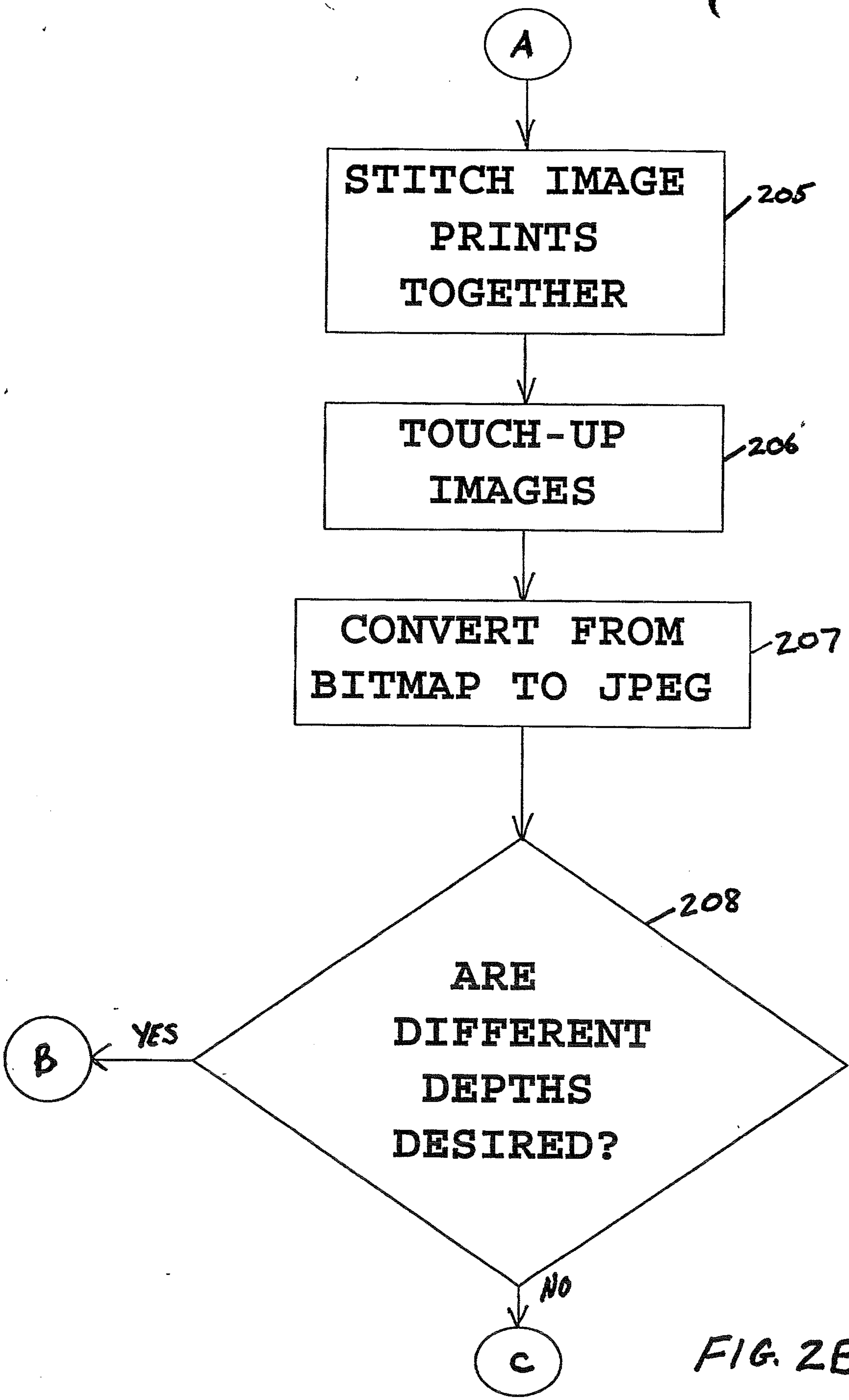
A
STITCH IMAGE PRINTS TOGETHER
205
TOUCH-UP IMAGES
206
CONVERT FROM BITMAP TO JPEG
207
ARE DIFFERENT DEPTHS DESIRED?
208
YES
B
NO
C

FIG. 2B

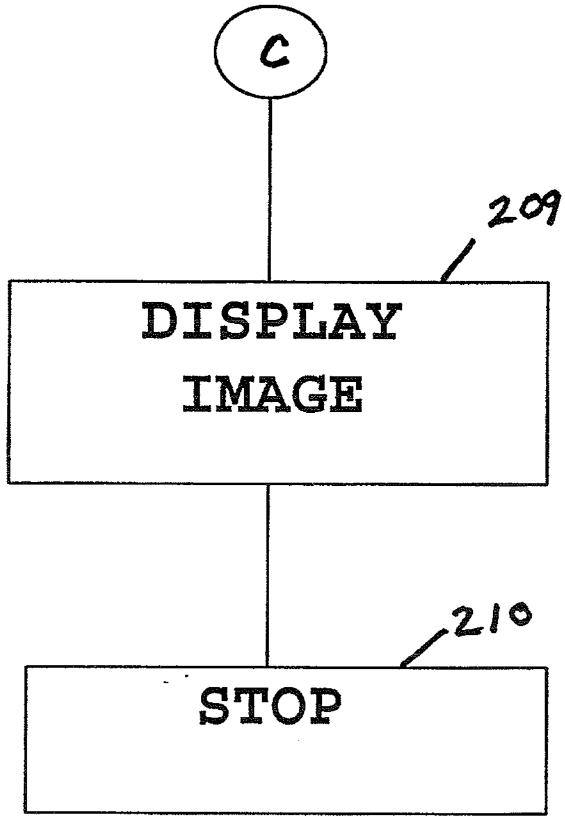

FIG. 2C

PA 1150500

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April 06, 2004

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APPLICATION NUMBER: ***60/169,559***
FILING DATE: ***December 08, 1999***

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

L. Edelen

L. EDELEN
Certifying Officer

UNITED STATES PATENT AND TRADEMARK OFFICE
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JC662 U.S. PTO 12/08/99

JC541 U.S. PTO 60/169559 12/08/99

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
ELIOT	BERNSTEIN	500 S.E. Mizner Road Suite 102 Boca Raton, FL 33432

☐ *Additional inventors are being named on the ___ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (280 characters max)

APPARATUS AND METHOD FOR PRODUCING ENHANCED VIDEO IMAGES AND/OR VIDEO FILES

CORRESPONDENCE ADDRESS

Direct all correspondence to:

☐ Customer Number ______ *Type Customer Number here* → *Place Customer Number Bar Code Label here*

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Address	190 WILLIS AVENUE				
City	MINEOLA	State	NEW YORK	ZIP	11501
Country	USA	Telephone	516-747-0300	Fax	516-747-936

ENCLOSED APPLICATION PARTS *(check all that apply)*

X Specification *Number of Pages*	47	☐ Small Entity Statement	
X Drawing(s) *Number of Sheets*	5	X Other (specify)	return postcard

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

X A check or money order is enclosed to cover the filing fees

☐ The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: ______

FILING FEE AMOUNT ($): $150.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: ______

Respectfully submitted,

SIGNATURE Raymond A. Joao

Date 12 8/99

TYPED or PRINTED NAME RAYMOND A. JOAO

REGISTRATION NO. *(if appropriate)* 35,907

TELEPHONE 516-747-0300

Docket Number: 5865-8

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

+

12-09-99 A/PROV

jc662 U.S. PTO
12/08/99

Attorney Docket No.: 5865-8

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: Eliot I. Bernstein

Serial No.: Please assign

Filed on: Concurrently herewith

Title: APPARATUS AND METHOD FOR PRODUCING ENHANCED VIDEO IMAGES AND/OR VIDEO FILES

Box Provisional Application
Assistant Commissioner for Patents
Washington, D.C. 20231

PROVISIONAL PATENT APPLICATION TRANSMITTAL LETTER

Sir:

Please find transmitted herewith for filing the following:

(1) Provisional Application for Patent Cover Sheet;

(2) Provisional Patent Application, including Specification, Claims and Abstract of the Disclosure (47 pages) and Drawings (5 sheets);

(3) Check in the amount of $150.00 for the filing fee;

(4) Power of Attorney form; and

(5) Return Receipt Postcard.

It is respectfully requested that the above papers be filed as a Provisional Patent Application.

Respectfully submitted,
MELTZER, LIPPE, GOLDSTEIN
& SCHLISSEL, P.C.

By: Raymond A. Joao
Raymond A. Joao
Reg. No. 35,907

December 8, 1999

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"Express Mail" mailing label number EK291365701US

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Date of Deposit: December 8, 1999

(Signature): [signature]

Attorney Docket No.: 5865-8

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

POWER OF ATTORNEY

Application of:	Eliot I. Bernstein
Serial No.:	Please assign
Filed on:	Concurrently herewith
Title:	APPARATUS AND METHOD FOR PRODUCING ENHANCED VIDEO IMAGES AND/OR VIDEO FILES

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of the sole inventor (given name, family name): ELIOT I. BERNSTEIN	
Inventor's signature: >	**Date:** >12/8/99
Residence: 500 S.E. Mizner Boulevard, Suite 102, Boca Raton, FL 33432-6080	**Citizenship:** U.S.A.
Post Office Address: SAME AS ABOVE	

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Attorney Docket No. 5865-8

APPARATUS AND METHOD FOR PRODUCING ENHANCED VIDEO IMAGES AND/OR VIDEO FILES

FIELD OF THE INVENTION

The present invention is directed to an apparatus and a method for producing enhanced images and/or video files and, in particular, to an apparatus and a method for producing enhanced resolution digital images and/or digital video files obtained via digital and/or film video cameras and/or recording devices.

BACKGROUND OF THE INVENTION

The fields of telecommunications, multimedia, and related areas, are growing at increasing rates. With this continued growth, the need for high resolution digital imagery, for utilization in conjunction with the corresponding technologies, is becoming greater. Current technologies utilize film cameras and recorders as well as digital cameras and recorders.

Conventional print film, negative and digital, technologies typically have very low zoom quality and low image size restrictions or limitations associated therewith. Generally speaking, enlarged images produce a higher resolution image, and an associated higher resolution scanning quality, which further facilitates an improved enlargement or reduction of the image for different sizes and different depths, without pixel distortion. Photographs, negatives, and associated images, utilize pixels which typically have a certain size. When enlarged or reduced, these pixels of the image become distorted, a feature which typically results in the image being fixed to an original size, or being available at very low magnifications, such as, for example, magnifications of from 200 times to 300 times. These images are also difficult to enlarge to a full screen size without a tremendous amount of distortion present in the end product without expanding the file size proportionately.

Currently, panoramic imaging techniques utilize non-enlarged images as their starting point. With such associated limitations, the ability to provide enhanced resolution digital images and, especially, an enhanced resolution digital panoramic image, such as those utilized on, or over, the Internet and/or the World Wide Web, has been greatly compromised.

Another major drawback in the current technology lies in the fact that conventional processes often utilize panoramic lenses in order to capture an image. This practice has been criticized as creating distortions in the image immediately upon the image's enlargement or reduction. The conventional techniques associated with the use of panoramic lenses are known to result in image "bending", which further curtails one's ability to obtain realistic views, especially upon performing any associated cropping and/or editing processes. In such instances, the upper end and the lower end of the image must be either erased, or covered, in order to prevent the flaw from being exposed. This typically results in the resulting image having a "fishbowl-type" distortion.

In some instances, 32 mm lenses have been utilized in order to obtain enhanced floor to ceiling images without experiencing image bending. In these applications, however, the ability of the lens to capture optimal images varies depending upon the scene or image being photographed.

Images have typically been over-compressed prior to transmission over a communication network. This over compression has typically resulted in lack of image quality.

As a result, the ability to obtain enhanced video images and/or video files from film cameras and film recorders, from negatives and from digital cameras and recorders, has been limited.

SUMMARY OF THE INVENTION

The present invention provides an apparatus and a method for providing enhanced digital video images and/or digital video files which overcomes the shortcomings of the prior art. The digital images and/or digital files produced by utilizing the present invention can be easily managed, when displayed, projected, and/or posted on any viewing device and/or entity such as, but not limited to, an Internet Web server, Web site or Web page, television, intranet computers and/or servers, and/or computers and/or servers which are utilized in wireless environments, etc.

The present invention provides for the processing, production and/or transmission of streaming video which can be transmitted on, or over, a communication network, the Internet, the World Wide Web, and/or any other communication network and/or medium. The streaming video obtained and/or transmitted via the present invention can provide for a video transmission which, once commenced, need not be stopped. The streaming video which is facilitated via the present invention can be played on demand while maintaining its streaming video nature.

The present invention provides an apparatus and a method for producing enhanced digital video images and video files from video which may be recorded as print film image or file, a negative image or file, a digital magnetic representation of a video image, an analog representation of a video image, and/or a digital video image and/or file. The video images and/or files may be obtained via a digital camera, a digital recording device, a digital recorder, a digital camcorder, a film video camera, a recorder, and/or camcorder, a motion picture camera, a VHS video camera, recorder, and/or camcorder, a beta video camera, recorder, and/or camcorder, and/or any other suitable video recording device. The camera or recorder can be a conventional device and/or a solid state device which may contain a solid state storage medium.

The video images and/or video files which are produced by the apparatus and method of the present invention have improved and enhanced resolution and require far less effort in the associated maintenance and management of same. The video images and/or files, which are produced by the apparatus and method of the present invention, can be utilized and displayed on computers, projection devices, televisions, and, as noted above, can be posted to an Internet Web server, a Web site, and/or a Web page, an intranet computer and/or server, and/or computers and/or servers utilized in wireless environments. The video images and/or files can be transmitted over a communication network and/or in computer-to-computer applications. The video images and/or files obtained may also be stored in an appropriate storage medium, such as, but not limited to, a compact disk, a digital video disk, and/or any other appropriate digital and/or analog storage medium.

The present invention, in a preferred embodiment, is utilized to produce enhanced video images and/or files for posting and/or for downloading, to a digital display medium, which in the preferred embodiment, is an Internet and/or a World Wide Web server, a Web site, and/or Web page, and/or an intranet computer and/or server, and/or computers and/or servers which are utilized in a wireless environment, and/or a compact disk, a digital video disk, and/or other suitable storage medium. In this manner, enhanced video images and/or video files can be produced from video images and/or video files which can be recorded using any video recording device and recording medium such as, but not limited to, digital cameras, digital recorders, film cameras, film recorders, motion picture cameras, photographic film recorders, and/or magnetic film or disk film recorders, etc. The video images and/or files obtained are thereafter processed in accordance with the apparatus and method of the present invention in order to produce enhanced video images and/or video files.

These resulting video images and/or video files have enhanced resolution which is unaffected by the typical resolution limiting and degrading parameters and phenomena which are associated with conventional digital and/or film video cameras, recorders and corresponding processing equipment, methods and/or techniques.

The apparatus can include a video camera or recorder which can be any one of an analog camera and/or a digital camera, an analog and/or digital recording device, an analog and/or digital camcorder, a film camera, a film recording device, and/or a film camcorder. For full motion video, a 3CCD chip, and/or any other appropriate and/or suitable motion video capture recording device, can be utilized in conjunction with the present invention. A suitable audio capture device for digitizing any audio which accompanies and/or which corresponds to the video can also be utilized. The camera or recording device can be a hand-held camera, a fixed camera, and/or a camera which is mountable, such as on a tripod or on a stand. The camera can be utilized to obtain the video image and/or video file which will be processed in accordance with the present invention. The camera can also be a video recording device for recording both video and audio.

The present invention preserves image and/or video integrity, as well preserves the integrity of any audio, from the point of capture of the image through and including any final compression or compressions of same. The apparatus can also include a developing device, which can be utilized for developing video images and/or files which are obtained on film. In the case of video images and/or files which are obtained digitally, no developing device would be needed. The apparatus can also include an enlarging device which can be utilized to enlarge the video images obtained. An enlarger can be utilized for enlarging either film images and/or digital images.

The apparatus can also include a computer, for performing the various processing routines during operation of the apparatus and method of the present invention. The computer may be a personal computer, a laptop computer, a mini-computer, a microcomputer, a mainframe computer, a network computer, a server computer, and/or any other suitable computer or computer system, television system, either of the conventional, digital, and/or high definition variety.

The computer can include a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), a display device, an input device and an output device. The input device may include a keyboard, a mouse, or other pointing device, and/or any other data and/or command input device, for allowing for data and/or command input by a user. The output device may include a printer and, in the preferred embodiment, the printer may be a color laser printer or a color inkjet printer, a compact disk recorder, a digital video disk recorder, and/or any other suitable storage medium recorder. The computer can also include a receiver for receiving data and/or information over a communication network and a transmitter for transmitting data and/or information over the communication network.

The computer can also include a video capture device, which may or may not be an integral component of the computer. The computer can also include an audio capture device which may or may not be an integral component of the computer. The video capture can also be an external peripheral device. Video data and/or information, as well as any audio data and/or information, is utilized, can be fed into, and/or played through, the respective video capture device and audio capture device, thereby digitizing the respective video data and/or information and audio data and/or information. The present invention preserves the integrity of any and/or all data and/or information upon conversion to digital formats. If full motion video is captured, any conversion can utilize full motion capture software and/or hardware. The video data and/or information can be fed into, and/or through, the video capture device, in real-time, thereby facilitating real-time video transmissions. In a similar fashion, the audio data and/or information can be fed into, and/or through, the audio capture device, in real-time, thereby facilitating real-time audio transmissions.

The computer can also include any other hardware device or peripheral device and/or software which is, or which may be, needed and/or desired in order to perform any of the functions and/or operation described herein. The computer can also include a video data capture device, for capturing and processing the video images and/or files processed by the present invention, as well as an audio data capture device, for capturing and processing the audio files processed by the present invention.

The apparatus can also include a scanning device, for scanning video images or files, if needed, whether they be of a digital or of a print film type, in order to obtain a digital image representation of same.

The apparatus and method of the present invention provides video images and/or files, as well as any accompanying audio files, which have enhanced resolution and quality while requiring less file management efforts.

The resulting video images and/or files, and any accompanying audio files, which are obtained via the apparatus and method of the present invention are characterized by a high definition resolution and are suitable for high definition television, Web television, and large, full screen, panoramic Internet applications, including video playback and/or video transmission, along with any accompanying audio, while preserving resolution upon image and/or video file magnification or reduction.

The present invention also facilitates high speed file transfers of high resolution video images and/or video files, and any accompanying audio files, thereby dispensing with the need to engage in long and slow conventional file downloads and/or file transfers in order to maintain viewing quality.

The apparatus and method of the present invention can also be utilized in conjunction with three-dimensional images and video files in order to produce high resolution, three-dimensional video images and/or video files.

Accordingly, it is an object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files from files obtained via digital and/or film video cameras and/or a recording devices.

It is another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files from files obtained via digital and/or film video cameras and/or a recording devices, which have improved and enhanced resolution.

It is still another object of the present invention to provide an apparatus and a method for processing, producing, and/or transmitting streaming video for use on, or over, a communication network.

It is another object of the present invention to provide an apparatus and a method for producing streaming video which, once commenced, need not be stopped and/or halted during the subsequent transmission of same.

It is another object of the present invention to provide an apparatus and a method for producing streaming video which can be played continuously and on-demand.

It is yet another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, and accompanying audio files, from files obtained via digital and/or film video cameras and/or a recording devices, which have improved and enhanced resolution.

It is still another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, from files obtained via digital and/or film video cameras and/or a recording devices digital images, which are suitable for display and/or for downloading to a digital computer, a television, and/or any other communication device utilized in a telecommunication environment and/or communications environment.

It is still another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, from files obtained via digital and/or film video cameras and/or a recording devices, which are characterized by image compression and/or minimal image compression thereby avoiding any dramatic loss in image quality.

It is another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, from files obtained via digital and/or film video cameras and/or a recording devices, which may dispense with the need to compress the image data.

It is yet another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, from files obtained via digital and/or film video cameras and/or a recording devices, which are characterized by high definition resolution, and which are suitable for high definition television, Web television and large, full screen, panoramic internet applications, without loss of resolution upon image magnification or reduction.

It is another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, from files obtained via digital and/or film video cameras and/or a recording devices, which can be transmitted in a network environment.

It is still another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, from files obtained via digital and/or film video cameras and/or a recording devices, which facilitates high speed file transfer in a network environment and/or in a computer environment.

It is another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, which preserves image integrity from the point of capture of the image through and including final compression or compressions.

It is still another object of the present invention to provide an apparatus and a method for producing enhanced resolution digital images and/or digital video files, which preserves the integrity of any and/or all data and/or information upon conversion to digital formats.

Other objects and advantages of the present invention will be apparent to those skilled in the art upon a review of the Description of the Preferred Embodiment taken in conjunction with the Drawings which follow.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings:

Figure 1 illustrates the apparatus of the present invention, in block diagram form; and

Figures 2 illustrates a method of the present invention, in flow diagram form; and

Figures 3a, 3B and 3C illustrate another method of the present invention, in flow diagram form.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention provides an apparatus and a method for providing enhanced digital video images and/or digital video, as well as any accompanying audio, files which can be utilized and which can be easily managed, when displayed, projected, and/or posted on any viewing device and/or entity such as, but not limited to, an Internet Web server, Web site or Web page, television, etc. In particular, the present invention provides an apparatus and a method for producing enhanced digital video images and video files from video, as well as any accompanying audio files, which may be recorded as a digital video image and/or files and/or as a film video image and/or file a print film image.

The present invention provides for the processing, production and/or transmission of streaming video which can be transmitted on, or over, a communication network, the Internet, the World Wide Web, and/or any other communication network and/or medium. The streaming video obtained and/or transmitted via the present invention can provide for a video transmission which, once commenced, need not be stopped. The streaming video which is facilitated via the present invention can be played on demand while maintaining its streaming video nature.

The video images and/or files, and any accompanying audio files, may be obtained via a digital camera, a digital recording device, a digital recorder, a digital camcorder, a film video camera, recorder, and/or camcorder, a VHS video camera, recorder, and/or camcorder, a beta video camera, recorder, and/or camcorder, and/or any other suitable video recording device. The video images and/or video files and any accompanying audio files, which are produced by the apparatus and method of the present invention have improved and enhanced resolution and require far less effort in the associated maintenance and management of same. The video images and/or files, and any accompanying audio files, which are produced by the apparatus and method of the present invention, can be utilized, displayed, and/or played, whichever the case may be, on computers, projection devices, televisions, and, as noted above, can be posted to an Internet Web server, a Web site, and/or a Web page. The video images and/or files, and any accompanying audio files, can be transmitted over a communication network and/or in computer-to-computer applications.

The present invention, in a preferred embodiment, is utilized to produce enhanced video images and/or files, and any accompanying audio files, for posting and/or for downloading, to a digital display medium, which in the preferred embodiment, is an Internet and/or a World Wide Web server, a Web site, and/or Web page. In this manner, enhanced video images and/or video files, and any accompanying audio files, can be produced from video images and/or video files, and accompanying audio files, which can be recorded using any video recording device and recording medium such as, but not limited to, digital cameras, digital recorders, film cameras, film recorders, etc. The video images and/or files, and any accompanying audio files, obtained are thereafter processed in accordance with the apparatus and method of the present invention in order to produce enhanced video images and/or video files.

These resulting video images and/or video files, and any accompanying audio files, have enhanced resolution which is unaffected by the typical resolution limiting parameters and phenomena which are associated with conventional digital and film video cameras, recorders and corresponding processing equipment, methods and/or techniques.

Figure 1 illustrates the apparatus of the present invention which is denoted generally by the reference numeral 100, in block diagram form. With reference to Figure 1, the apparatus 100 includes a video camera or recorder 105 which, in the preferred embodiment, can be any one of a digital camera, a digital recording device, digital camcorder, a film camera, a film recording device, and/or a film camcorder. The camera or recorder can be a conventional device and/or a solid state device which may contain a solid state storage medium.

The camera or recording device can record video as well as audio data and/or information. In the preferred embodiment, the camera 105 may be a hand-held camera, a fixed camera, and/or a camera which is mountable, such as on a tripod or on a stand. The camera 105 is utilized to obtain the video image and/or video file, as well as any audio files, which will be processed as described herein.

For full motion video, a 3CCD chip, and/or any other appropriate and/or suitable motion and/or video capture recording device, can be utilized in conjunction with the present invention. A suitable audio capture recording device can also be utilized in conjunction with the present invention.

The present invention can also be utilized in conjunction with any imaging and/or any video recording device, and/or audio recording device, and/or equipment, such as, but not limited to, those devices and equipment utilized in, or in conjunction with, medical imaging equipment, devices and/or instruments, motion picture production equipment, devices and/or instruments and/or in any other equipment, device, and/or instrument, which is, or which can be, utilized in conjunction with imaging and/or video and/or audio applications and/or uses.

The apparatus 100 also includes a developing device 115, which could be utilized for developing video images and/or files which are obtained on film. In the case of video images and/or files which are obtained digitally, no developing device may be needed. The apparatus also includes an enlarging device which can be utilized to enlarge the video images obtained. The apparatus can include an enlarger for both film images as well as for digital images.

The apparatus 100 also includes a computer 120, for performing the various processing routines during operation of the apparatus and method of the present invention. The computer 120 may be a personal computer, a laptop computer, a mini-computer, a microcomputer, a mainframe computer, a network computer, a server computer, and/or any other suitable computer or computer system.

The computer 120 includes a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), a display device, an input device and an output device. The input device may include a keyboard, a mouse, or other pointing device, and/or any other data and/or command input device, for allowing for data and/or command input by a user. The output device may include a printer and, in the preferred embodiment, the printer may be a color laser printer or a color inkjet printer. The computer 120 also includes a receiver for receiving data and/or information over a communication network and a transmitter for transmitting data and/or information over the communication network.

The computer 120 also includes a video capture device 121A and an audio capture device 121B, which, in the preferred embodiment, are integral components of the computer 120. The video capture device 121A, in the preferred embodiment, can be a video capture card 121A which is located internal to the computer 120. The video capture device 121A may also be an external peripheral device. As described herein, the video data and/or information is fed into, and/or played through, the video capture device 121A, thereby digitizing the video data and/or information. The video data and/or information can be fed into, and/or through, the video capture card 121A, in real-time, thereby facilitating real-time video transmissions.

In a similar manner, the audio capture device 121B, in the preferred embodiment, can be an audio capture card 121B which is located internal to the computer 120. The audio capture device 121 may also be an external peripheral device. As described herein, the audio data and/or information is fed into, and/or played through, the audio capture device 121B, thereby digitizing the audio data and/or information. The audio data and/or information can be fed into, and/or through, the audio capture card 121B, in real-time, thereby facilitating real-time audio transmissions.

The computer 120 may also include any other hardware device or peripheral device and/or software which is, or which may be needed and/or desired in order to perform any of the functions and/or operation described herein. In particular, the computer 120 will also include a video data capture device for capturing and processing the video images and/or files processed by the present invention. The computer 120 can also include an audio capture device for capturing and processing the audio files processed by the present invention.

The computer 120 also includes a transmitter (not shown) and a receiver (not shown) for facilitating operation in a network environment and/or as a server computer.

The apparatus 100 also includes a scanning device 125, for scanning video images or files, if needed, whether they be digital or of a print film type, in order to obtain a digital image representation of same. Any suitable computer or scanner, and any suitable scanning software, may be utilized in conjunction with the present invention. In a preferred embodiment, any suitable scanning device can be utilized in conjunction with any appropriate software.

Figure 2 illustrates a preferred embodiment method of the present invention, in flow diagram form. With reference to

Figure 2, the method of the present invention commences at step 200. The method described herein can be utilized to process both video and audio files as well as files which contain only video information. For the sake of explaining the present invention in a preferred embodiment, the processing of video files along with corresponding audio files is described below. At step 201, the video images or files, and corresponding audio files, are recorded with any appropriate or suitable recording device such as, but not limited to, the video recording camera 105. The video and corresponding audio can be recorded and/or otherwise obtained in any suitable format, such as, but not limited to, for example, beta, VHS, digital, and/or any other standard formats, including, but not limited to, NTSC, PAL, or SECAM. The video and corresponding audio files can also be obtained in other standard digital formats such as, but not limited to, IEEE1834, *.AVI, *.MOV, *.MPEG, etc., by utilizing an appropriately equipped video recording device. The video recording device 105 may also be a reel-to-reel recording device and/or a live video recording device.

At step 202, the respective digital files and corresponding audio files, are converted to digital files, if necessary, by utilizing respective digitizing and/or scanning hardware and/or software and/or devices. In the case of the video files, the video is digitized by utilizing digitizing hardware and/or software and/or any other necessary and/or appropriate driver software or programs in conjunction with a video capture device. In the preferred embodiment, hardware such as Pinnacle DC10∞ or other equivalent and/or similar hardware and/or software and/or associated drivers can be utilized to perform the video digitizing operation. The video digitizing step can be performed, in the preferred embodiment, at a minimum frames per second (fps) or at least a television standard and/or 30fps and with frame sizes of at least 320 X 240 pixels.

It is understood that the herein-described video digitizing step is not limited to the settings and/or parameters described herein. Rather, any appropriate settings and/or parameters may be utilized in order to obtain digital video data and/or information which is consistent with the digital data and/or information described herein.

In an analogous manner, at step 201, the audio files are also digitized by utilizing appropriate digitizing or capture hardware and/or software and any other necessary and/or appropriate driver software or programs. In the preferred embodiment, hardware such as produced by Turtle Beach Montego∞ other equivalent and/or similar hardware and/or software, and any associated drivers, if needed, are utilized in order to perform the audio digitizing operation. The audio digitizing step can be performed, in the preferred embodiment, by utilizing PCM or an equivalent and/or similar technique and at a sampling rate of at least 44 to 48 kilohertz (Khz), 16-bit stereo, and an audio resolution of at least 16-bits.

The video and/or audio files which are obtained via the processing routines at step 201, are digital files which can be in any standard digital format such as, but not limited to, *.AVI, *.MOV, or *.MPEG, and/or any other suitable digital file format. While video information can be obtained for any frame setting, in a preferred embodiment, frames settings of 320 x 240, 480 x 320 and/or 640 x 480 can be utilized.

At step 202, if desired the digitized video and audio files can be processed in conjunction with video editing software, such as, for example Adobe Premiere 5.1 and/or any other equivalent and/or similar editing software. The processing which is performed at step 202 is optional and need not be performed on the digital video and audio files. The processing which is performed on the digital video and audio files , at step 202, can be performed in order to facilitating the editing of the respective digital video and audio files if such may be desired.

The processing at step 202 also serves to convert the digital video and audio to respective digital formats which are amenable to various editing procedures. For example, a *.MOV formatted file is converted to a .RM file format, a *.AVI formatted fire is converted to a .ASF file format, and a *.MPEG formatted file is converted to a .RM file format. The processing step which is performed at the optional step 202 can be preformed with the following processing parameters.

At step 203, the digital video and audio file is processed and/or encoded in order to generate the respective files for presentation from a player or server computer. The processing which occurs at step 203 is accomplished with Windows Media Encoder/Reel Producer Plus software in order to create digital files for both video and audio which are in an appropriate digital file format, such as, but not limited to .RM and .ASF, or other suitable and/or similar digital file formats. Thereafter, the digital video and audio files will be available for transmission to appropriate computers and/or communication devices, and/or for storage onto an appropriate storage medium.

The digital video and audio file, which is processed and encoded at step 203, can be transmitted at a data rate having a range of between 35Kbps to 750Kbps and can have a frame rate range of between 24 to 29.97 fps.

At step 204, the video and audio file can be transmitted from the sever computer 120 to a client computer or communication device. In the preferred embodiment, and in order to facilitate the presentation of the video and audio file at the client computer or communication device, the presentation of the video and audio file can be accomplished in conjunction with video software such as, but not limited to, RealPlayer∞, MediaPlayer∞, and/or any other appropriate software. The transmission of the video and audio will take place with a data rate range of between 35 Kbps to 750 Kbps at with a frame rate range of between 24fps – 29.97fps.

The obtained video and audio file or files can then be posted to the computer 120 and/or to another hosting computer. If the posting is to a computer other than the computer 120, the posting is performed by transmitting the video file or files over a communication network to the hosting computer. In the preferred embodiment, the video and audio file or files are posted via the Internet, and/or the World Wide Web, and can posted to a Web Page, a Web site, and/or any other network device. The posting operation is performed by utilizing any suitable posting software. The video and audio file or video file can also be stored on a compact disk, a digital video disk and/or any other appropriate storage medium.

The above-describe processing routine facilitates the processing of digital video and audio files in such a manner that any compression, if performed, is maintained at minimum levels.

The respective video and audio files are digitized at an optimal level and thereafter encoded at an optimal level, thereby preserving the highest quality of video and audio content.

Transmission of the video and audio files to a client computer (not shown) can thereafter commence at step 205.

Typically, the various rates of transmission for the above transmission parameters will be dependent upon the type and specifications of the receiver or modem associated with the client computer or communication device. In another preferred embodiment, the server computer 120 can ascertain the receiver or modem specifications. Thereafter, the server 120 can process the information obtained regarding the client computer or communication device and determine the appropriate transmission rates and/or other parameters and commence transmission to the client computer or communication device at step 205.

Operation of the apparatus will then cease at step 206.

Figures 3A, 3B and 3C illustrate another preferred embodiment method of the present invention, in flow diagram form. With reference to Figures 3A, 3B and 3C, the method of the present invention commences at step 300. At step 301, the video images and/or files are recorded with the video camera 105. The video can be recorded in any format, such as, but not limited to, i.e., beta, VHS, digital, and/or any of the standard file formats, including, but not limited to, *.AVI, *.MOV, *.MPEG, etc., by utilizing the video recording device 105. The video recording device 105 may also be a reel-to-reel recording device and/or a live video recording device.

At step 302, the video images and/or files are converted to a converted to digital files, if necessary, by utilizing the scanner 110. At step 303, digital video image files are loaded into the computer 120 for processing. At step 304, the video image files are fed into, or through, the capture device 121A of the computer 120. The video capture operation, which is performed by the video capture device 121A, in the preferred embodiment, can be performed with minimum compression and/or encoding operations being performed on the video image files and/or with only minimal compression and/or encoding operations being performed on the video image files.

The video capture device 121A, in the preferred embodiment, can be any suitable video capture device or card and/or any other appropriate and/or suitable video capture hardware. The capture software utilized can be any appropriate and/or suitable video capture software.

At step 305, the video images and/or files are edited, if necessary, by using any standard video editing tools, such as, for example, any editing software. At step 306, the video image files are then converted to any suitable real video format such as, for example, a *.RM format. At step 307, the size of the video within the file code is set either manually or automatically. In the preferred embodiment, the size of the video is set within the file code, which may or may not be the HTML file code to a 640 x 480 frame resolution, or any other suitable resolution, such as, but not limited to, 800 x 600, 1024 x 768, 1280 x 1024, 1600 x 1200 or other sizes.

At step 308, the obtained video image file or files is then posted to the computer 120 and/or to another hosting computer. If the posting is to a computer other than the computer 120, the posting is performed by transmitting the video file or files over a communication network to the hosting computer. In the preferred embodiment, the video file or files are posted via the Internet, and/or the World Wide Web, and can posted to a Web Page, a Web site, and/or any other network device. The posting operation is performed by utilizing any suitable posting software. The video image file or video file can also be stored on a compact disk, a digital video disk and/or any other appropriate storage medium.

At step 309, the computer 120 or other hosting computer generates or writes a file or script, such as an ASCII file which calls the video to stream or to download. This results in video which will stream or "streaming" video for a full screen application which will be characterized by a good clarity and quality. At step 309, the video file can then be transmitted to a client computer (not shown). At step 309, a separate file or script, such as an ASCII file is written and saved to an appropriately formatted file, such as an *.RPM file, or other suitable file format, which will call the original video file. This script can be typically included in any suitable code, such as an HTML code.

In the case of MPEG videos, Steps 301 through 303 are followed as described above. At step 304, however, the video file is converted, if not previously converted, to an MPEG format. Thereafter, the video is inserted into the appropriate file which may contain suitable coding, such as HTML codes. Thereafter, the file can be sized to any of herein-described resolutions. Thereafter, the video file is uploaded to the hosting computer, if utilized. Thereafter, the MPEG file is played from the computer 120 or the hosting computer, the Web page, and/or the Web site, depending upon the application, by first downloading a small portion of the file and by playing the file through a suitable device such as a player which supports any suitable video formats, such as AVI, MPEG-type, etc., and/or other suitable formats.

Thereafter, operation of the apparatus ceases at step 310.

The processing steps described herein provide for the production of video images and/or video files which have enhanced resolution and which can be easily and effectively managed in applications involving the display of same, the posting of same, to a host computer, a Web server, a Web site, a Web page, a computer display, a full screen projection display and/or a video presentation and/or playback of same, respectively. Further, the method of the present invention provides for image processing, including various image and/or file processing techniques, which may or may not include image compression and/or encoding operations.

The apparatus and method of the present invention provides video images and/or files which have enhanced resolution and quality while requiring less file management efforts.

The resulting video images and/or files, and any accompanying audio files, which are obtained via the apparatus and method of the present invention are characterized by a high definition resolution and are suitable for high definition television, Web television, and large, full screen, panoramic

Internet applications, including video playback and/or video transmission, which preserving resolution upon image and/or video file magnification or reduction. The present invention also facilitates high speed file transfers of high resolution video images and/or video files, and any accompanying audio files, thereby dispensing with the need to engage in long and slow conventional file downloads and/or file transfers.

The apparatus and method of the present invention can also be utilized in conjunction with three-dimensional images and video files in order to produce high resolution, three-dimensional video images and/or video files.

The present invention preserves image integrity from the point of capture of the image through, and including, any final compression or compressions of same.

The resulting video images and/or files, and any accompanying audio files, which are obtained via the apparatus and method of the present invention, can be utilized, in any and/or all of the embodiments described herein, in conjunction with data and/or information which can be provided by any other and/or any external information source. The data and/or information may contain, but is not limited to, data and/or information of and for sound and/or audio files, text files, video files, image files, and/or graphics files, and/or any other information source, data, information and/or file, which can be, and/or which may be linked to or with, and/or which can be operated and/or utilized in conjunction with, any video and/or image data and/or information. For example, any image and/or video data, information, or file, obtained via the present invention, can be utilized in conjunction with any sound file, audio file, text file, video file, image file, and/or graphics file, and/or any other data, information and/or file utilized in a multimedia environment, thereby providing for the utilization of enhanced images and/or video in conjunction with the respective file.

As noted above, the present invention provides for the processing, production and/or transmission of streaming video which can be transmitted on, or over, a communication network, the Internet, the World Wide Web, and/or any other communication network and/or medium. The streaming video obtained and/or transmitted via the present invention can provide for a video transmission which, once commenced, need not be stopped. The streaming video which is facilitated via the present invention can be played on demand while maintaining its streaming video nature.

While the present invention has been described and illustrated in various preferred embodiments, such descriptions are merely illustrative of the present invention and are not to be construed to be limitations thereof. In this regard, the present invention encompasses any and all modifications, variations, and/or alternate embodiments, with the scope of the present invention being limited only by the claims which follow.

CLAIMS

What Is Claimed Is:

1. An apparatus for producing a digital image, comprising:

   a device for generating a digital signal file from an image; and

   a processor for processing said digital signal file and for generating an image file,

   wherein said processor generates a first signal file from said digital signal file, and further wherein said processor processes said first signal file and generates said image file.

2. The apparatus of claim 1, further comprising:

   one of a camera and a recording device for obtaining one of a photographic representation of an image, a film image, a negative image and a digital image.

3. The apparatus of claim 2, further comprising:

   a developing device for developing one of said photographic representation of an image, a film image and a negative image.

4. The apparatus of claim 3, further comprising:

an enlarging device for enlarging said image.

5. The apparatus of claim 4, further comprising:

a scanning device for generating said digital signal file from said one of photographic representation of an image, a film image and a negative image.

6. The apparatus of claim 1, further comprising:

a video capture device for one capturing and processing said digital signal file.

7. The apparatus of claim 1, wherein said first signal file is an image file.

8. An apparatus for producing a digital image, comprising:

means for generating a digital signal file from an image file; and

means for processing said digital signal file and for generating an image file,

wherein said processing means generates a first signal file from said digital signal file, and further wherein said processing means processes said first signal file and generates said image file.

9. The apparatus of claim 8, further comprising:

means for obtaining said one of a photographic representation of an image, a film image, a negative image and a digital image.

10. The apparatus of claim 8, further comprising:

means for developing said one of photographic representation of an image, a film image and a negative image.

11. The apparatus of claim 8, further comprising:

means for enlarging said image.

12. The apparatus of claim 8, further comprising:

means for generating said digital signal file from said image.

13. The apparatus of claim 8, further comprising:

means for one of capturing and processing said digital signal file.

14. A method for producing a digital image, comprising:

generating a digital signal file from an image;

processing said digital signal file; and

generating an image file, wherein said processing operation further comprises:

generating a first signal file from said digital signal file; and

processing said first signal file and generating said image file.

15. The method of claim 14, further comprising:

obtaining one of a photographic representation of an image, a film image, a negative image and a digital image.

16. The method of claim 14, further comprising:

developing said one of photographic representation of an image, a film image, and a negative image; and

generating said image.

17. The method of claim 14, further comprising:

enlarging said image.

19. The method of claim 14, further comprising:

generating said digital signal file from said image.

20. The method of claim 14, further comprising:

one of capturing and processing said digital signal file.

21. The apparatus of any one of claims 1 to 13, wherein said

image file is utilized in conjunction with at least one of a sound file, an audio file, a text file, a video file, an image file, and a graphics file.

22. The method of any one of claims 14 to 20, wherein said image file is utilized in conjunction with at least one of an audio file, a text file, a video file, an image file, and a graphics file.

23. An apparatus for producing a streaming video file, comprising:

a device for generating a digital signal file from a first video file; and

a processor for processing said digital signal file and for generating a second video file,

wherein said processor generates a first signal file from said digital signal file, and further wherein said processor processes said first signal file and generates said second video file, and further wherein said second video file is a streaming video file.

24. The apparatus of claim 23, further comprising:

one of a camera and a recording device for obtaining one of a photographic representation of an image, a film image, a negative image, a digital image, a video file, and a motion picture.

25. The apparatus of claim 24, further comprising:

a developing device for developing one of said photographic representation of an image, a film image and a negative image, a digital image, a video file, and a motion picture.

26. The apparatus of claim 25, further comprising:

an enlarging device for enlarging said photographic representation of an image, a film image, a negative image, a digital image, a video file, and a motion picture video file.

27. The apparatus of claim 24, further comprising:

a scanning device for generating said digital signal file from said one of photographic representation of an image, a film image, a negative image photographic representation of an image, a film image and a negative image, a digital image, a video file, and a motion picture.

28. The apparatus of claim 23, further comprising:

a video capture device for one capturing and processing at least one of said video file and said digital signal file.

29. The apparatus of claim 23, wherein said first signal file is

a video image file.

30. The apparatus of claim 23, wherein said streaming video file is one of posted to a host computer and stored on a storage medium.

31. The apparatus of claim 30, wherein said storage medium is at least on of a compact disk, a digital video disk, a floppy disk, and solid state device.

32. The apparatus of claim 23, wherein said streaming video file can be transmitted at least one of on demand and continuously.

33. An apparatus for producing a streaming video file, comprising:

means for generating a digital signal file from a first video file; and

means for processing said digital signal file and for generating a second video file,

wherein said processing means generates a first signal file from said digital signal file, and further wherein said processing means processes said first signal file and generates said second video file, and further wherein said second video file is a streaming video file.

34. The apparatus of claim 33, further comprising:

means for obtaining one of a photographic representation of an image, a film image, a negative image, a digital image, a video file, and a motion picture.

35. The apparatus of claim 34, further comprising:

means for developing one of said photographic representation of an image, a film image and a negative image, a digital image, a video file, and a motion picture.

36. The apparatus of claim 35, further comprising:

means for enlarging said photographic representation of an image, a film image, a negative image, a digital image, a video file, and a motion picture video file.

37. The apparatus of claim 33, further comprising:

means for generating said digital signal file from said one of photographic representation of an image, a film image, a negative image photographic representation of an image, a film image and a negative image, a digital image, a video file, and a motion picture.

38. The apparatus of claim 33, further comprising:

means for one capturing and processing at least one of said video file and said digital signal file.

39. The apparatus of claim 33, wherein said first signal file is a video image file.

40. The apparatus of claim 33, wherein said streaming video file is one of posted to a host computer and stored on a storage medium.

41. The apparatus of claim 40, wherein said storage medium is at least on of a compact disk, a digital video disk, a floppy disk, and solid state device.

42. The apparatus of claim 33, wherein said streaming video file can be transmitted at least one of on demand and continuously.

43. A method for producing a streaming video file, comprising:

generating a digital signal file from a first video file; and

processing said digital signal file and generating a second video file,

wherein said first signal file is generated from said digital signal file, and further wherein said first signal file is utilized to generate said second video file, and further wherein said second video file is a streaming video file.

44. The method of claim 43, further comprising:

obtaining one of a photographic representation of an image, a film image, a negative image, a digital image, a video file, and a motion picture.

45. The method of claim 44, further comprising:

developing one of said photographic representation of an image, a film image and a negative image, a digital image, a video file, and a motion picture.

46. The method of claim 45, further comprising:

enlarging said photographic representation of an image, a film image, a negative image, a digital image, a video file, and a motion picture video file.

47. The method of claim 43, further comprising:

generating said digital signal file from said one of photographic representation of an image, a film image, a negative image photographic representation of an image, a film image and a negative image, a digital image, a video file, and a motion picture.

48. The method of claim 43, further comprising:

one capturing and processing at least one of said video file and said digital signal file.

49. The method of claim 43, wherein said first signal file is a video image file.

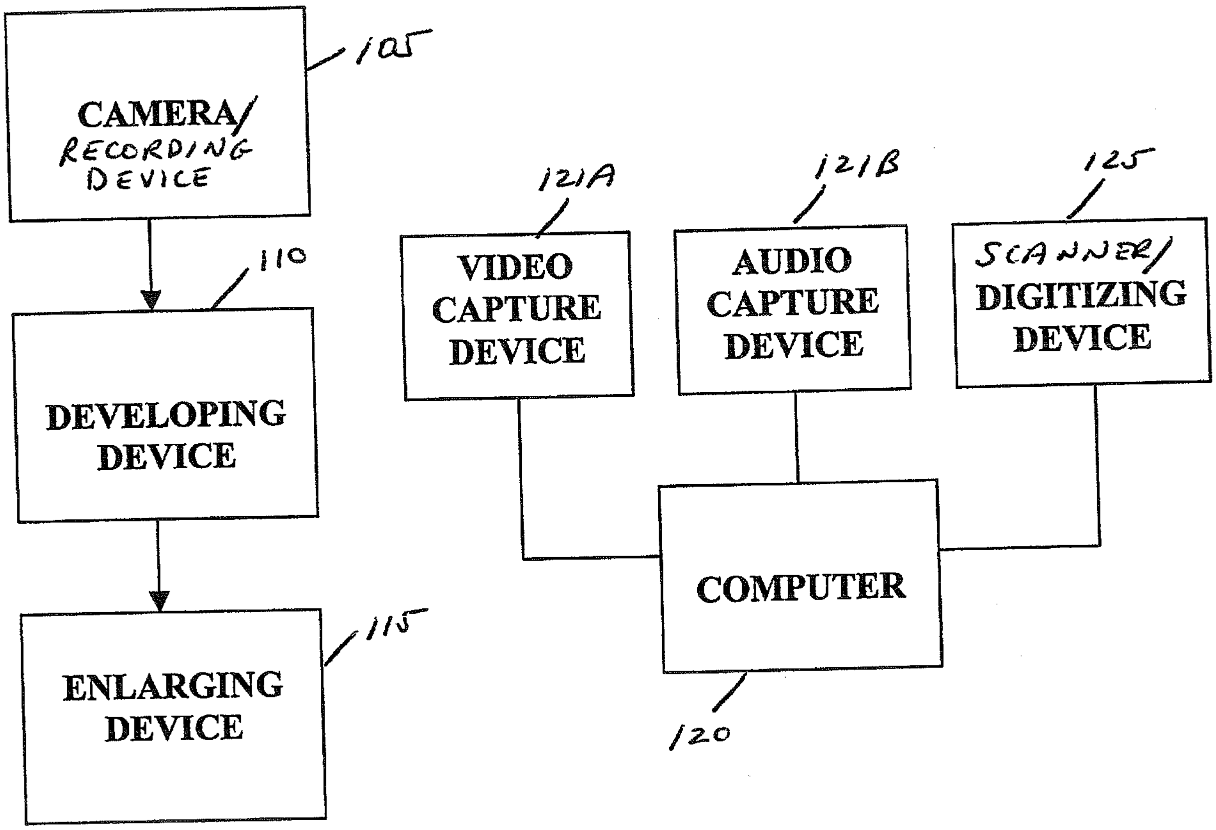
50. The method of claim 43, wherein said streaming video file is one of posted to a host computer and stored on a storage medium.

51. The method of claim 50, wherein said storage medium is at least on of a compact disk, a digital video disk, a floppy disk, and solid state device.

52. The apparatus of claim 43, wherein said streaming video file can be transmitted at least one of on demand and continuously.

ABSTRACT OF THE DISCLOSURE

An apparatus and method for producing a digital image, including a device for generating a digital signal file from an image and a processor for processing said digital signal file and for generating an image file. The processor generates a first signal file from the digital signal file. The processor processes the first signal file and generates the image file. An apparatus for producing a streaming video file, including a device for generating a digital signal file from a first video file and a processor for processing the digital signal file and for generating a second video file. The processor generates a first signal file from the digital signal file. The processor processes the first signal file and generates the second video, wherein the second video file is a streaming video file.


CAMERA/ RECORDING DEVICE
105
DEVELOPING DEVICE
110
ENLARGING DEVICE
115
VIDEO CAPTURE DEVICE
121A
AUDIO CAPTURE DEVICE
121B
SCANNER/ DIGITIZING DEVICE
125
COMPUTER
120

100

FIG. 1

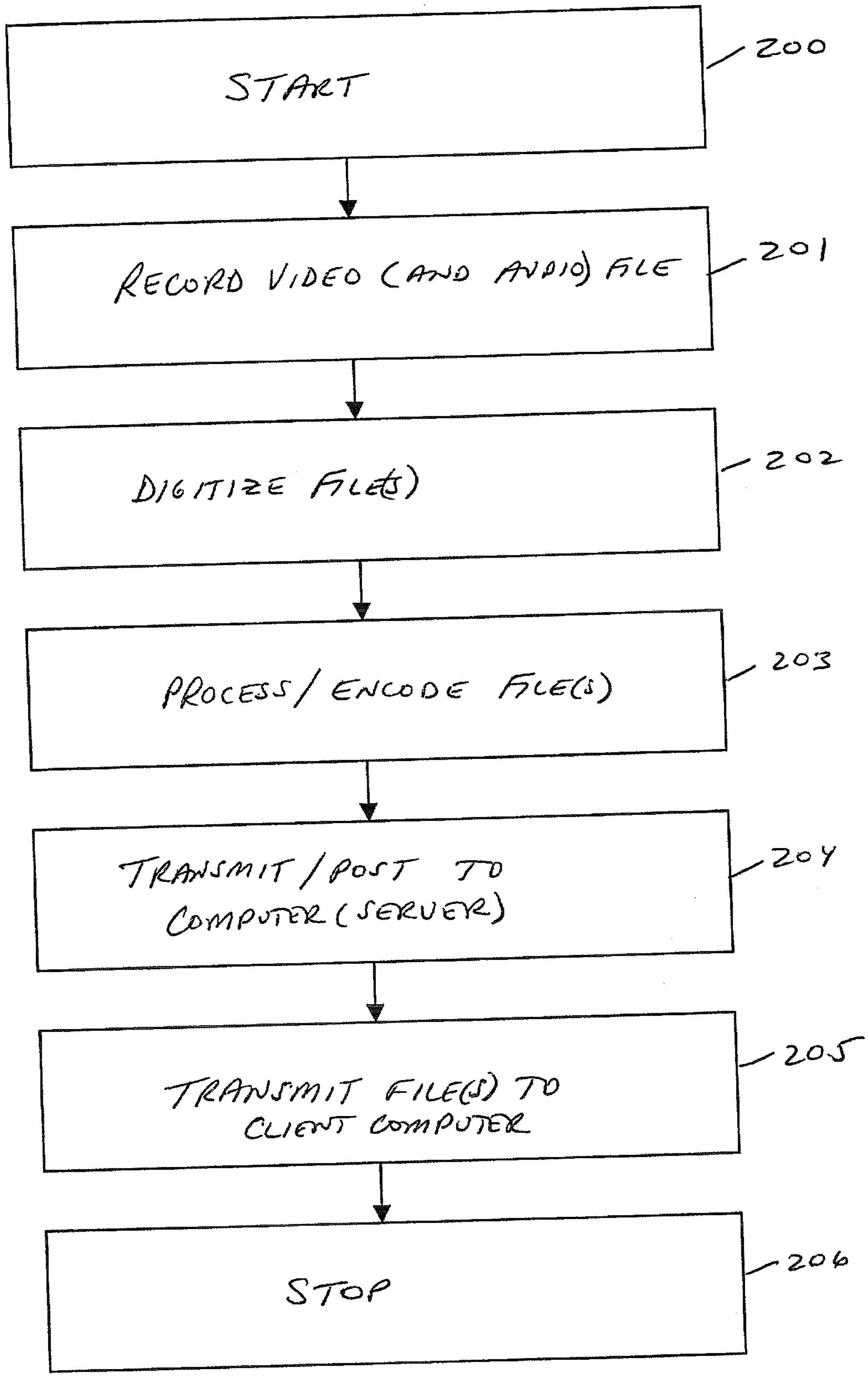

START
200
RECORD VIDEO (AND AUDIO) FILE
201
DIGITIZE FILE(S)
202
PROCESS/ENCODE FILE(S)
203
TRANSMIT/POST TO COMPUTER (SERVER)
204
TRANSMIT FILE(S) TO CLIENT COMPUTER
205
STOP
206

FIG. 2

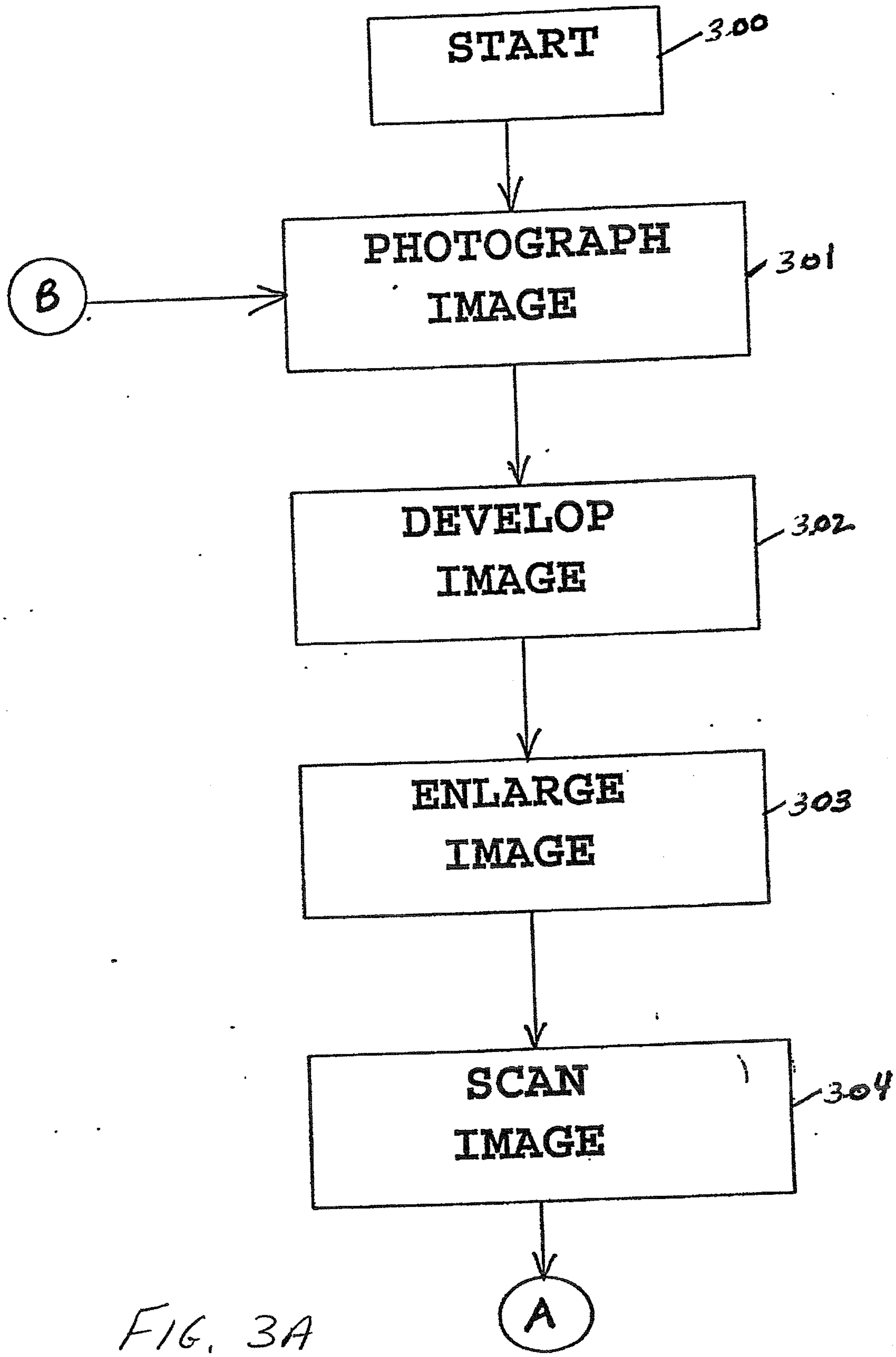

START
300
PHOTOGRAPH IMAGE
301
B
DEVELOP IMAGE
302
ENLARGE IMAGE
303
SCAN IMAGE
304
A

FIG. 3A

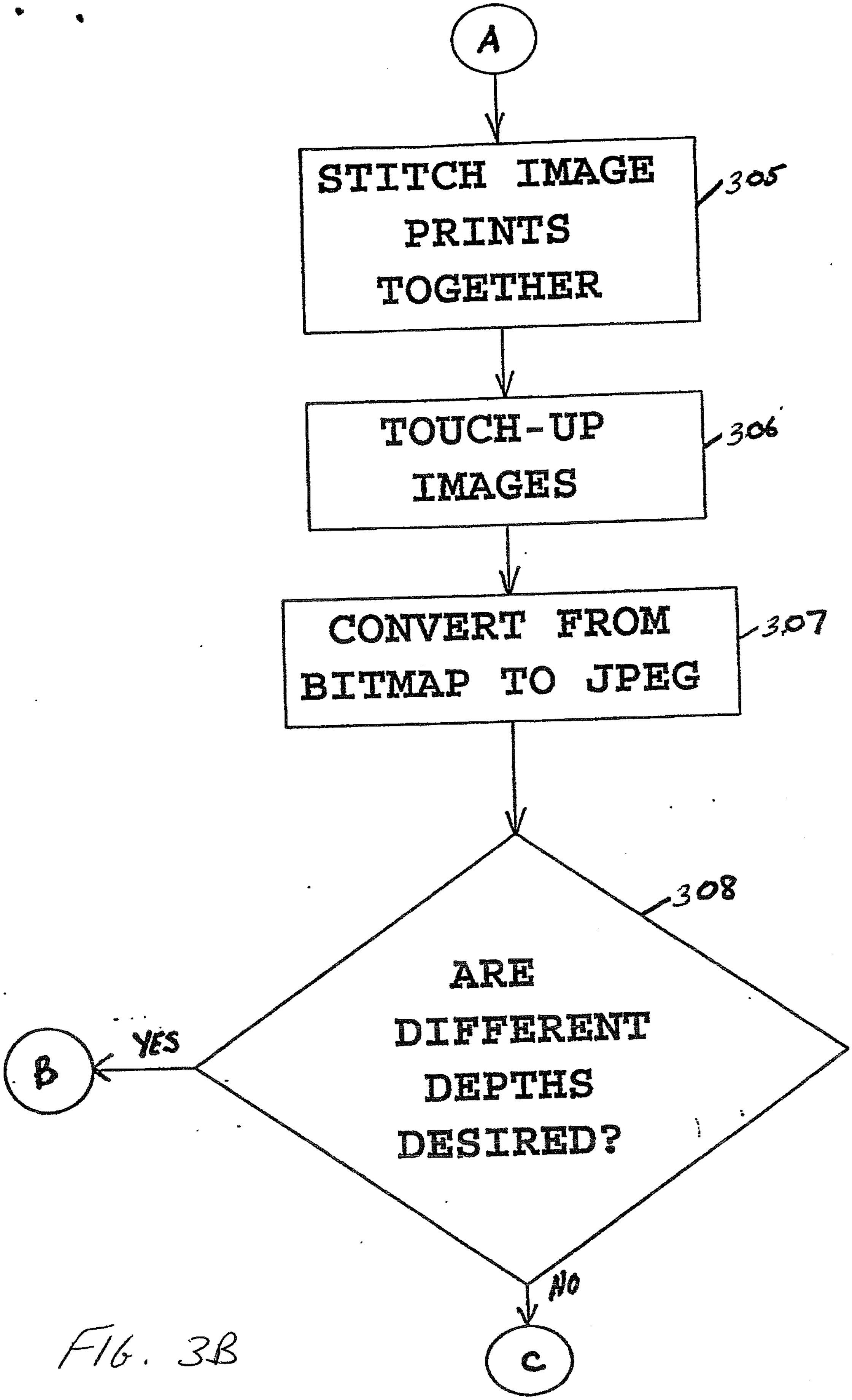

A
STITCH IMAGE PRINTS TOGETHER
305
TOUCH-UP IMAGES
306
CONVERT FROM BITMAP TO JPEG
307
ARE DIFFERENT DEPTHS DESIRED?
308
YES
B
NO
C

FIG. 3B

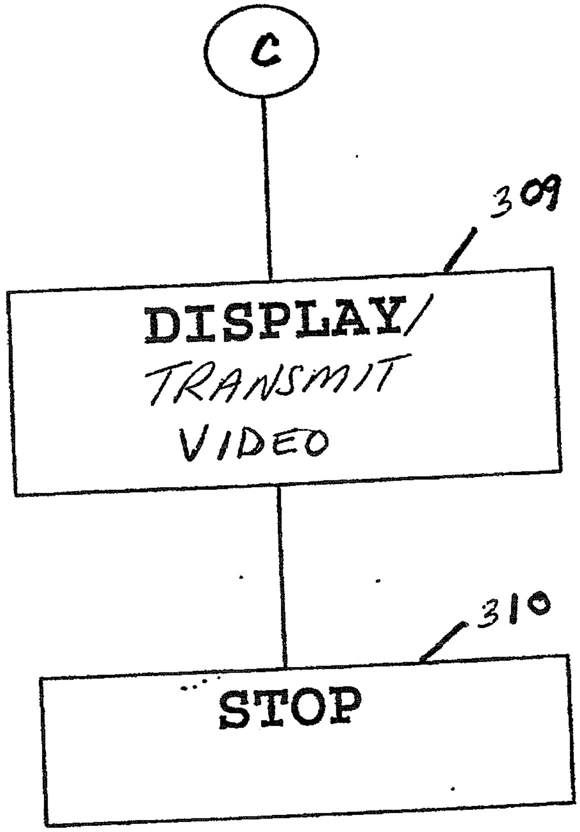


FIG. 3C

MS

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ORDER NUMBER	1150500
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Customer Name: **IVIEWIT HOLDINGS INC.**

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2004-03-31 01:04:00	IDON726121	( ) -

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FILING DATE: ***September 18, 2000***

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60/233341
09/18/00

Page 1 of 1

ORDER NUMBER	1150500
REFERENCE ORDER NUMBER	0
BIN NUMBER	0
DELIVERY INSTRUCTIONS	

ORDER DATE/TIME	PALM NUMBER	CUSTOMER NUMBER	CONTACT PHONE NUMBER	PAYMENT METHOD	TOTAL COST OF ORDER
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Applicant: Brian G. Utley

Title: Zoom and Pan Imaging Design Tool

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PROVISIONAL PATENT APPLICATION TRANSMITTAL

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Sir:

Transmitted herewith for filing under 37 C.F.R. § 1.53(c) is the provisional patent application of:

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Enclosed are:

[X] Specification, Claim(s), Abstract, and Figures(~~105~~ 112 pages).

[ ] Assignment of the invention to Iviewit.com, Inc..

[ ] Small Entity statement.

The filing fee is calculated below:

		Rate		Fee Totals
Basic Fee		$150.00		$150.00
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Please direct all correspondence to the undersigned attorney or agent at the address indicated below.

Respectfully submitted,

Date 9/18/00

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U.S. PROVISIONAL PATENT APPLICATION

for

ZOOM AND PAN IMAGING DESIGN TOOL

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ZOOM AND PAN IMAGING DESIGN TOOL

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is related to U.S. Patent Application No. 09/630,939, filed August 2, 2000, and U.S. Provisional Patent Application entitled "Zoom and Pan Imaging Using a Digital Camera" filed on even date herewith, a copy of each is attached hereto and incorporated herein by reference.

FIELD OF THE INVENTION

The present invention is directed to a system and a method for producing enhanced digital images and, in particular, to a design tool for producing enhanced digital images having improved resolution for zooming and/or panning within an image.

BACKGROUND OF THE INVENTION

See Background in related applications.

DESCRIPTION OF THE INVENTION

The object of this invention is to provide a design tool for provide pan and zoom capabilities as described in the related applications.

Note that the relationship between the target image and the viewing image is very important, as described in the related applications. By panning the viewing window, every portion of the target image may be viewed from each level of zooming. Zoom capability is provided up to a maximum level where the image begins to pixelate.

The preferred embodiment of the present invention is a computer spreadsheet program written in Microsoft Excel and its associated Visual Basic for Applications (VBA) macro language.

Attached hereto and incorporated by reference herein are the spreadsheets, forms, and VBA program code for the preferred embodiment. Examples are given for different target and source image sizes. The design tool works for both digital and analog source images, but the scan density parameter is not applicable to digital images.

iviewit Imaging Setup

Application Overview

The iviewit proprietary imaging system is designed to provide clear, sharp images which can be zoomed into at great depth, and panned around at the discretion of the viewer, or under program control. The resulting experience is one of immersion into the image and an ability to view detail at a level heretofore not thought possible.

The fundemental concept of the imaging system is the creation of a 'Virtual Image' which is designed to be large enough to provide the level of detailed viewing desired. The Virtual Image is viewed through a 'Viewing Window' which is an allocated space on the user display device. The initial presentation of the image in the viewing window is normally a view of the total image. Since this is smaller than the Virtual Image, the Virtual Image must be scaled down to fit the viewing window. This scaling factor is refered to as the 'Maximum Magnification Factor', since, from the viewers perspective, zooming into the image has the appearance of magnifying the image.

iviewit Imaging Setup

Viewing Window Size in Pixels

Width	640
Height	480
Pixels	307,200

Minimun Image Size in Pixels

Width	600
Height	480
Pixels	288,000

Desired Maximum Magnification

Magnification	5.0

Virtual Image Size in Pixels

Width	1,342
Height	1,073
Pixels	1,440,000
Bit Map MB	4,104,000

Source Image Size in Pixels

Width	1,500
Height	1,200
Pixels	1,800,000
Bit Map MB	5,130,000

Input Format

Image Format	1500 X 1200

Image Orientation

Orientation	Landscape

Minimum Scan Density in dpi

Scan Density	N/A

Start

1. Press "Start" button to initiate program
2. Follow intructions in order to set virtual image size and scan density where applicable.
3. Virtual Image size provides the necessary settings for the JPEG compression of the image. Compression factor should be 80 (Corel Draw).

iviewit Imaging Setup

Viewing Window Size in Pixels

Width	640
Height	480
Pixels	307,200

Minimun Image Size in Pixels

Width	343
Height	480
Pixels	164,571

Desired Maximum Magnification

Magnification	20.0

Virtual Image Size in Pixels

Width	1,533
Height	2,147
Pixels	3,291,429
Bit Map MB	9,380,571

Source Image Size in Pixels

Width	1,533
Height	2,147
Pixels	3,291,429
Bit Map MB	9,380,571

Input Format

Image Format	5" x 7"

Image Orientation

Orientation	Portrait

Minimum Scan Density in dpi

Scan Density	307

Start

1. Press "Start" button to initiate program
2. Follow intructions in order to set virtual image size and scan density where applicable.
3. Virtual Image size provides the necessary settings for the JPEG compression of the image. Compression factor should be 80 (Corel Draw).

iviewit Imaging Setup

Viewing Window Size in Pixels

Width	320
Height	240
Pixels	76,800

Minimun Image Size in Pixels

Width	300
Height	240
Pixels	72,000

Desired Maximum Magnification

Magnification	10.0

Virtual Image Size in Pixels

Width	949
Height	759
Pixels	720,000
Bit Map MB	2,052,000

Source Image Size in Pixels

Width	949
Height	759
Pixels	720,000
Bit Map MB	2,052,000

Input Format

Image Format	8" x 10"

Image Orientation

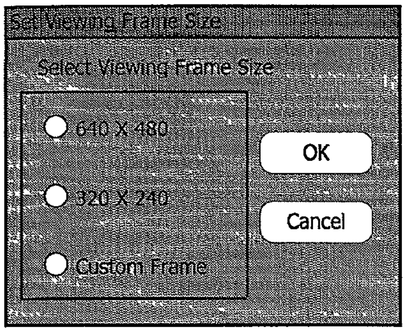
Orientation	Landscape

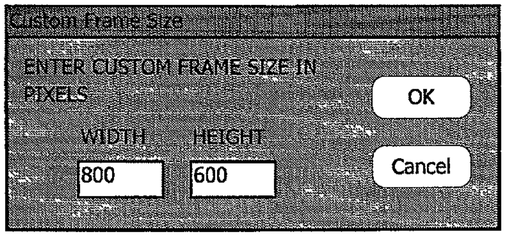
Minimum Scan Density in dpi

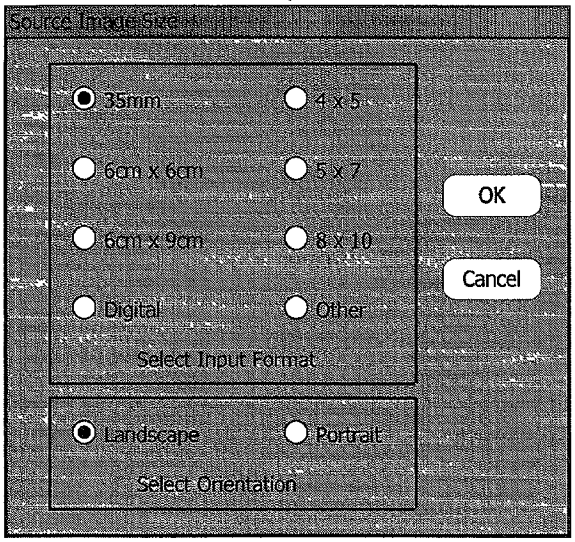
Scan Density	95

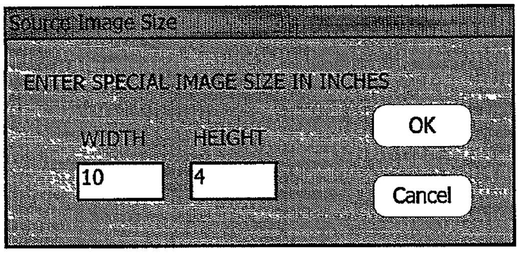
Start

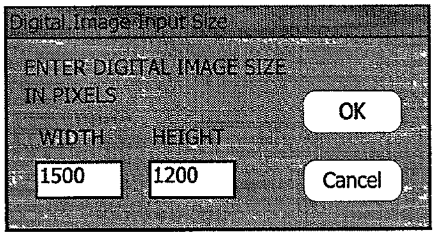
1. Press "Start" button to initiate program
2. Follow intructions in order to set virtual image size and scan density where applicable.
3. Virtual Image size provides the necessary settings for the JPEG compression of the image. Compression factor should be 80 (Corel Draw).

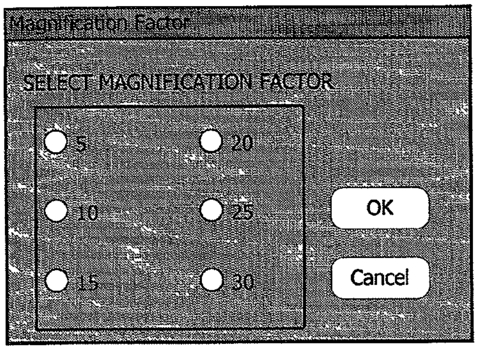

Set Viewing Frame Size
Select Viewing Frame Size
640 X 480
320 X 240
Custom Frame
OK
Cancel


Custom Frame Size
ENTER CUSTOM FRAME SIZE IN PIXELS
OK
WIDTH
HEIGHT
800
600
Cancel


Source Image Size
35mm
4 x 5
6cm x 6cm
5 x 7
6cm x 9cm
8 x 10
Digital
Other
Select Input Format
OK
Cancel
Landscape
Portrait
Select Orientation


Source Image Size
ENTER SPECIAL IMAGE SIZE IN INCHES
WIDTH
HEIGHT
10
4
OK
Cancel


Digital Image Input Size
ENTER DIGITAL IMAGE SIZE
IN PIXELS
WIDTH
HEIGHT
1500
1200
OK
Cancel


Magnification Factor
SELECT MAGNIFICATION FACTOR
5
20
10
25
OK
15
30
Cancel

```
Dim rtmag As Variant
' Copywrite by iviewit.com, Inc.
' Button3_Click Macro
' Start button from sheet 1
'
Sub startbutton_Click()
    icancel = 0                 'initialize cancel button state
    framew = Range("framewidth").Value      'capture current frame size
    frameh = Range("frameheight").Value
    'set dlgframe dialog box radio button to 1st button
    Range("framewidth").Value = 1
    DialogSheets("dlgframe").Show
    If icancel = 1 Then     'Test for cancel button
        Range("framewidth").Value = framew
        GoTo cancelop
    End If
    'check for frame selection and set up framew and frameh
    framecase = Range("framewidth").Value
    Select Case framecase   'Determine vewing frame size
        Case 1      '640 X 480
            Range("framewidth").Value = 640
            framew = 640
            Range("frameheight").Value = 480
            frameh = 480
        Case 2      '320 X 240
            Range("framewidth").Value = 320
            framew = 320
            Range("frameheight").Value = 240
            frameh = 240
        Case 3      'Custom Frame
            'set up custom frame dimensions in dialog box from last frame defined
            DialogSheets("Dlgframe1").EditBoxes("Edit Box 5").Text = framew
            DialogSheets("Dlgframe1").EditBoxes("Edit Box 6").Text = frameh
            'show custom frame dialog box
            DialogSheets("dlgframe1").Show
                If icancel = 1 Then     'Test for cancel button
                Range("framewidth").Value = framew
                GoTo cancelop
            End If
            framew = DialogSheets("Dlgframe1").EditBoxes("Edit Box 5").Text
            frameh = DialogSheets("Dlgframe1").EditBoxes("Edit Box 6").Text
            Range("framewidth").Value = framew
            Range("frameheight") = frameh
    End Select
    'initialize orientation and source format in dialog box
    Range("orient").Value = 1
    Range("informat").Value = 1
    'show source dialog box
    DialogSheets("dlgsource").Show
    If icancel = 1 Then     'Test for cancel button
        GoTo cancelop
    End If
    formatno = Range("informat").Value  'formatno specifies the source format radio button
    Select Case formatno
        Case 1          '35mm
                sourcew = 15 / 8
                sourceh = 15 / 16
                Range("informat").Value = "35mm"
            Case 2          '6cm x 6cm
                sourcew = 6 / 2.54
                sourceh = 6 / 2.54
                Range("informat").Value = "6cm x 6cm"
            Case 3          '6cm x 9cm
                sourcew = 9 / 2.54
                sourceh = 6 / 2.54
                Range("informat").Value = "6cm x 9cm"
            Case 4          '4 x 5
                sourcew = 5
                sourceh = 4
```

```
            Range("informat").Value = "4"" x 5"""
        Case 5          '5 x 7
            sourcew = 7
            sourceh = 5
            Range("informat").Value = "5"" x 7"""
        Case 6          '8 x 10
            sourcew = 10
            sourceh = 8
            Range("informat").Value = "8"" x 10"""
        Case 7          'digital input format
            DialogSheets("dlgsource2").Show
            If icancel = 1 Then     'Test for cancel button
                GoTo cancelop
            End If
            sourcew = DialogSheets("Dlgsource2").EditBoxes("Edit Box 4").Text
            sourceh = DialogSheets("Dlgsource2").EditBoxes("Edit Box 5").Text
            Range("informat").Value = sourcew & " X " & sourceh
        Case 8          'Special input source image size
            DialogSheets("dlgsource1").Show
            If icancel = 1 Then     'Test for cancel button
                GoTo cancelop
            End If
            sourcew = DialogSheets("Dlgsource1").EditBoxes("Edit Box 7").Text
            sourceh = DialogSheets("Dlgsource1").EditBoxes("Edit Box 8").Text
            Range("informat").Value = sourcew & """ X " & sourceh & """"
    End Select
    'check for image orientation
    If Range("orient").Value = 1 Then
        Range("orient").Value = "Landscape"
    Else
        Range("orient").Value = "Portrait"
        'if orientation is not landscape and "other" input was not selected then swap height and
 width
        If formatno < 8 Then
            temp = sourcew
            sourcew = sourceh
            sourceh = temp
        End If
    End If
    'get ratio of hieght to width for source and target
    frameratio = frameh / framew
    sourceratio = sourceh / sourcew
    'initialize magnification value in dialog box to 10
    Range("magfactor").Value = 2
    DialogSheets("dlgmag").Show
    If icancel = 1 Then     'Test for cancel button
        GoTo cancelop
    End If
    'multiply the radio button for magnification factor by 5 to obtain real magnification factor
    magtgt = Range("magfactor").Value * 5
    Range("magfactor").Value = magtgt   'put magnification factor into spread sheet
    'determine aspect ratio of source relative to target to determine whethe fit is to height or
 width
    'determine size of the target image based upon multiplying the used partion of the window ne
glecting
    'unused portions of the minimum image size
    If frameratio > sourceratio Then
        'image width is equal to frame width and image height is equal to frame with * image rat
io

        tgtw = framew * Sqr(magtgt)
        tgth = tgtw * sourceratio
        Range("minimagew").Value = framew
        Range("minimageh").Value = framew * sourceratio
        minimagesize = framew * framew * sourceratio
    Else
        'frame height is maximum
        tgth = frameh * Sqr(magtgt)
        tgtw = tgth * sourcew / sourceh
        Range("minimageh").Value = frameh
```

```
        Range("minimagew").Value = frameh * sourcew / sourceh
        minimagesize = frameh * frameh * 1 / sourceratio
    End If
    'insert values into spread sheet
    Range("tgtw").Value = tgtw
    Range("tgth").Value = tgth
    'scan ppi is equal to target pels divided by the source image in inches
    scanppi = tgth / (sourceh)
    Range("scantgt").Value = scanppi
    Range("sourceh").Value = sourceh * scanppi
    Range("sourcew").Value = sourcew * scanppi
    If formatno = 7 Then
        Range("sourceh").Value = sourceh
        Range("sourcew").Value = sourcew
        Range("scantgt").Value = "N/A"
        If tgtw * tgth > sourcew * sourceh Then
            Range("tgtw").Value = sourcew
            Range("tgth").Value = sourceh
            Range("magfactor").Value = sourceh * sourcew / minimagesize
        End If
    End If
ncelop:
nd Sub
```

```
odule2 - 1

ublic icancel As Integer

Button2_Click Macro
OK button

ub Button2_Click()
nd Sub

Button3_Click Macro

ub Button3_Click()
    icancel = 1
nd Sub
```

COPY

U.S. PATENT APPLICATION

for

SYSTEM AND METHOD FOR PROVIDING AN ENHANCED DIGITAL IMAGE FILE

U.S. Application No.: 09/630939
U.S. Filing Date: August 2, 2000

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U.S. PATENT APPLICATION

for

SYSTEM AND METHOD FOR PROVIDING AN ENHANCED DIGITAL IMAGE FILE

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SYSTEM AND METHOD FOR PROVIDING AN ENHANCED DIGITAL IMAGE FILE

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a continuation-in-part of U.S. Patent Application No. 09/522,721, filed March 10, 2000, which claims the benefit of priority from U.S. Provisional Application No. 60/125,824, filed March 24, 1999. The present application also claims the benefit of priority from U.S. Provisional Application Nos. 60/146,726, filed August 2, 1999, 60/149,737, filed August 19, 1999, 60/155,404, filed September 22, 1999, and 60/169,559, filed December 8, 1999.

FIELD OF THE INVENTION

The present invention is directed to a system and a method for producing enhanced digital images and, in particular, to a system and a method for producing enhanced digital images having improved resolution for zooming and/or panning within a single file.

BACKGROUND OF THE INVENTION

In the field of digital imaging, the primary design challenge is that the viewer desires ideal image quality delivered to the viewer's display system. In a limited-bandwidth network, such as the Internet, it is important to transfer the image data in a reasonable amount of time. However, ideal image quality requires an enormous amount of digital data. Today's networks are not capable of transferring an ideal digital image in a reasonable time.

It is known that one can view a digital image on a display screen and "zoom" (i.e., magnify a portion of an image and appearing to move into the image) and "pan" (i.e., move across or around within the plane of that image). However, prior attempts have failed to produce high-quality, high-resolution digital images having the ability to zoom within the image and pan around the image without pixelation. "Pixelation" generally refers to the effect a digital image has when magnified, in which the pixels (i.e., picture elements) comprising the image become readily apparent to the human eye. More specifically, pixelation occurs when more than one pixel of the display monitor is used to represent one pixel of information of the digitized source image. In prior digital image systems, when the image is magnified, pixelation occurs almost immediately and is very noticeable to the user as a substantial degradation in the quality of the image.

As used herein, the term "pixel" refers to the smallest resolvable element of an image, either on a screen or stored in memory. Each pixel in a monochrome image has its own brightness, from 0 for black to the maximum value (e.g., 255 for an eight-bit pixel) for white. In a color image, each pixel has its own brightness and color, usually represented as a triplet of red, green, and blue intensities.

The teaching in the art is to generate a digital image file having the same number of pixels, or less, as the number that can be shown in a target viewing window. This results in a small source image file size, thereby speeding the transmission of the image file across a network. The target viewing window is typically maintained very small, e.g., 160 x 120 pixels, to further limit the number of pixels needed in the digital image file. Thus, the teaching in the art is to reduce the number of pixels in the digital image file to decrease the size of the image file before compression, so that the compressed image file can be more quickly transmitted over a limited-bandwidth network. However, this teaching has been unsatisfactory in providing high-resolution digital images. It has also been unsatisfactory in providing digital images in large viewing screens, such as, for example, full-sized VGA display monitor screens of 640 x 480 pixels.

Another example of prior systems is mapping or travel web sites. A user selects a desired location and the mapping web site responds by downloading map data from a map database. When the user wishes to zoom into or pan around the selected location, the web site retrieves additional source data, e.g., additional new map images, and sends it to the user computer. One drawback of this type of system is that each zoom or pan operation requires the downloading of additional data over the network connection. This method is slow, and does not allow the user to zoom and pan around a set of data unless the network connection is maintained.

Accordingly, there is a need for a system and a method for providing enhanced digital images. Further, there is a need for a system and a method for providing enhanced digital images within which a user can zoom or pan without loss of resolution and without pixelation. Further still, there is a need for a system and method for providing enhanced digital images that can be transmitted over a network in a reasonable amount of time. Further yet, there is a need for a system and a method for producing enhanced digital images suitable for uploading and for downloading to a display. Also, there is a need for a system and method for providing a digital image file suitable for efficient file transfers of high resolution digital images, thereby dispensing with the need to engage in long and slow, conventional file downloads in order to maintain viewing quality.

SUMMARY OF THE INVENTION

According to an exemplary embodiment, a method of providing a digital image file for viewing in a viewing window of a user display, the viewing window having a predetermined size, includes providing a digital image file having an image size comprising a fixed number of pixels representative of an image. The image size to be displayed is greater than that of the predetermined viewing window size. The method further includes the step of associating a user interface with the digital image file. The user interface is configured to display the digital image file in the viewing window and to allow a user to zoom into the image displayed in the viewing window.

According to another exemplary embodiment, a method of providing an enhanced digitized image file to a user includes predefining a viewing window size in which the digitized image file is to be displayed to a user; providing a digitized image file having an image size greater than of the predefined viewing window size; compressing the digitized image file; and providing the compressed image file to a network server.

According to yet another exemplary embodiment, an enhanced digital image file is disclosed. The enhanced digital image file is displayed on a client computer display system having a viewing window, the viewing window having a predetermined frame size. The enhanced digital image file includes digitized image data representative of an image, wherein the digitized image data has a number of pixels sufficient to allow a user to magnify the digitized image in the viewing window by a magnification factor of greater than one without appreciable pixelation. The enhanced digital image file further includes control data associated therewith for permitting the user to control the magnification factor.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will become more fully understood from the following detailed description, taken in conjunction with the accompanying drawings, wherein like reference numerals refer to like parts, in which:

FIG. 1 is a block diagram of a system for providing an enhanced digital image file according to an exemplary embodiment;

FIG. 2 is a flowchart of a method for providing an enhanced digital image file from a print film image according to an exemplary embodiment;

FIG. 3 is a screen print of a display screen on a user display illustrating an enhanced digital image file according to an exemplary embodiment;

FIG. 4 is a screen print of a display screen on a user display illustrating a zoomed view of the enhanced digital image of FIG. 3;

FIG. 5 is a screen print of a display screen on a user display illustrating a panned and zoomed view of the enhanced digital image of FIG. 3;

FIG. 6 is a flowchart of a method for providing an enhanced digital image file from a digital image according to an exemplary embodiment; and

FIG. 7 is an illustration relating a source image, a viewing image, and a viewing window to one another.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 illustrates a system 10 for providing an enhanced digital image file according to an exemplary embodiment. System 10 includes a camera 12 which may be a conventional print film camera, such as, print film cameras manufactured by Nikon, Canon, Hasselblad, Kodak, or other manufacturers, or may alternatively be a digital camera, a digital video recording device (e.g., including 3CCD technology), an analog recording device such as a reel-to-reel recording device, a live video recording system, etc. In the case where camera 12 is a digital camera, camera 12 may further include a solid state storage medium or memory. Camera 12 may be mountable, such as on a tripod or on a stand, hand-held or fixed, and may include a 24-32 mm lens. Camera 12 is utilized to obtain an image of a scene that is being photographed or video recorded. The image may be a print film image (e.g., a high gloss, photographic print), analog image, digital image, negative, transparency, etc.

As a further alternative, system 10 may be utilized in conjunction with any imaging or video recording system, such as, medical imaging equipment. In this case, camera 12 may be an imaging device, such as a magnetic resonance imaging (MRI) device, an X-ray device, a microscope with a camera attached thereto, etc.

In the case where camera 12 is a print film camera, system 10 also includes a developing device 14, which can be any device or collection of devices, for developing the print film image taken by camera 12. In some cases, such as a POLAROID brand camera, developing device 14 is combined with and integral to camera 12. Developing device 14 is not required in an embodiment in which the image is a digital image.

System 10 also includes an enlarging device 16 for enlarging the image which is developed by developing device 14. The image may be photographically enlarged from a print film image, a negative, or other transparency.

The system of FIG. 1 further includes a scanning device 18, for scanning images or photographs in order to obtain a digitized representation of the source image in the form of a digital image file. Any suitable scanning software may be utilized. In an exemplary embodiment, a UMAX Astra scanner is utilized in conjunction with Microsoft Photo Editor software. Scanning device 18 outputs the digital image file in a bitmapped format (e.g., BMP, TIF, GIF, etc.) The device may include compression software to compress the digital image file into a compressed format (e.g., JPEG). Note that, depending upon the specific type of camera 12 and desired processing steps, a print film image from camera 12 may be provided directly to enlarging device 16 or directly to scanning device 18.

If the source image is obtained with a digital camera of sufficient resolution, the digitized image file from camera 12 may be used directly without first creating a print image. On the other hand, a print image may first be obtained from the camera's digitized source image by sending it to a suitable printing device 20. In this manner, the printed image can then be optically enlarged and scanned to provide the enhanced digitized image.

System 10 also includes a computer 22 configured to process the digital image file created by the above-mentioned devices. Computer 22 may be a personal computer, a laptop computer, a mini computer, a microprocessor, a mainframe computer, a network computer, a server computer, or any other suitable computer or computer system. Computer 22 typically includes a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), a display device such as an SVGA display monitor, an input device and/or an output device. Computer 22 may also include any other hardware device, peripheral device, or software necessary to perform the functions described herein. The input device may include a keyboard, a mouse, or other pointing device, or other devices for allowing user input. The output device may include a printer (e.g., a black-and-white or color laser or inkjet printer). Computer 22 also includes an interface circuit for transmitting and/or receiving data over a network or link 24, such as, a local area network (LAN), a wide area network (WAN), an internet protocol network (e.g., the Internet, an intranet), a broadcast network, a satellite or cable television network, a digital video transmission path, etc. Computer 22 may further act as a network server or may be in communication with such a network server. Furthermore, as will be seen below, the function of network 24 may be, in a simple case, performed by other components of the system. In this exemplary embodiment, computer 22 is accessible by the Internet 26 via network 24 (e.g., a local area network).

A user computer 28 is used to access the enhanced digital image file stored in or provided by computer 22 (acting as a network server). Computer 28 may also load the image file to a storage device (e.g., a hard disk drive) to be used for display on a display 30. User computer 28 may operate an Internet browser, such as Netscape Navigator configured to communicate with the Internet 26 or an intranet or other network.

Display 30 may be any type of user display, such as a cathode ray tube (CRT), liquid crystal display (LCD), hand-held personal digital assistant (PDA) display, mobile phone display, etc. Display 30 normally has a predetermined display resolution (e.g., 1,280 x 1,024 pixels, 640 x 480 pixels, 320 x 240 pixels, etc.). Note that user computer 28 may be combined with display 30 in a single, integrated system, such as would be the case for a WebTV brand system, a high-definition television (HDTV), a PDA, etc. The combined user computer and display system may be referred to herein as the display system.

As will be described in more detail below, the computer display system typically has a viewing window on the display for viewing the image in a particular frame. The viewing window may be all or a portion of the total viewing area of display 30. The viewing window parameters, such as the viewing window area size and aspect ratio (i.e., viewing window width divided by viewing window height) may be under the control of user computer 28. In one embodiment, the viewing window area may be no more than 160 x 120 pixels in size, which is just a portion of the display area of an SVGA display monitor at 800 x 600 pixels.

References herein to frame sizes in pixels (such as, 320 x 240 pixels, 640 x 480 pixels, etc.) are intended to include equivalent frame sizes thereto. As an example, when rectangular pixels are used, the exact pixel count differs from the stated frame size. Thus, one equivalent to a 320 x 240 pixel frame size is 352 x 240. Accordingly, references to frame sizes in pixels are intended to included these and other equivalent frame sizes, and the teachings herein include any and all such insubstantial variations.

Referring now to FIGS. 2 and 6, exemplary methods 50 and 100 of providing an enhanced digital image file will be described. The enhanced digital image file can be generated from a print film image or a digital image. The enhanced digital image file is a digitized image acquired with a digital camera, scanner, or other device suitable for digitizing an image into pixels. The method of FIG. 2 is suitable for processing a print film image; the method of FIG. 6 is suitable for processing a digital image.

At step 52 of FIG. 2, an image is photographed or recorded by using camera 12. If camera 12 is a video camera, the video data is captured using a suitable capture device (e.g., an internal or external capture card, a Dazzle LAV-1000S capture device manufactured by Dazzle, Inc. of Fremont, California, etc.). A single captured frame from the video camera may be further processed as a digital image.

At step 54, the image is developed by developing device 14 in order to produce a photographic print, such as a high gloss photographic print. As mentioned, the step of developing may not be necessary in all cases (e.g., where the print film image of camera 12 is in a suitable format for subsequent enlarging or scanning).

At step 56, the developed image is enlarged by enlarging device 16, if needed. In this exemplary embodiment, the developed image can be enlarged to sizes of between 8"x6" and 8"x12", or to any other appropriate size. The developed image is enlarged to provide additional photo information to scanning device 18. The developed image can be enlarged many times before the granularity of the image is visible to the human eye. A photographic enlargement magnification capability of up to 1700 times or more may be attained for most views or scenes. It is, however, recommended that larger enlargement sizes be obtained for smaller developed images. As mentioned, the step of enlarging may not be necessary in all cases (e.g., where the size of the print film image or developed image is large enough to provide sufficient data to scanning device 18).

At step 58, the enlarged image is scanned by scanning device 18 in order to generate a bitmap image file or other digital image file, such as, JPEG, GIF, or other files. Scanning should be performed at a scan density that will provide the requisite number of pixels in the resulting digital image file (e.g., 100 dpi, 200 dpi, 600 dpi, 1400 dpi, etc.) Contrary to the teachings of the prior art, a large number of pixels are provided in the digital image file such as would be within the particular file size and loading time constraints. According to one example, a sufficient number of pixels are provided in the enhanced digital image file to allow a user to magnify the digitized image in the viewing window of display 30 by a magnification factor of greater than one without pixelation. Alternatively, a sufficient number of pixels are provided to allow the user to magnify the digitized image by a magnification factor of 1.5, 5, 10, 20, 100, or more.

According to one exemplary embodiment, the number of pixels provided in the enhanced digital image file is based on a viewing window size and the desired magnification ratio. By providing more pixels in the enhanced digital image file than is required for a full-window view in the viewing window, the user is able to zoom and pan within the digital image during viewing without pixelation.

FIG. 7 illustrates the parametric details and relationships between the different images and viewing window sizes. These parameters and description are for the purpose of creating large, clear, zoomable and pannable images from a variety of photographic, source images. First, a "source image" (si) provides the original source of the graphical image information before it is digitally processed, as opposed to a "target image" (ti) that is the destination image to be transferred to the computer display system. In the analog case, the source image is not yet digitized. In other words, it has not been converted to a bitmapped format. A source image could be a photograph, a handwritten sketch, a computer-generated graphic, etc. In this case, source image is what is fed to the scanning device 18. In the digital case, the source image has already been digitized, such as the digital output of a CCD camera taking a photograph.

The source image (si) has a source image height (sih) and a source image width (siw). The source image aspect ratio (sir) is the width of the image divided by the height of the image, generally in inches:

$$sir = siw/sih$$

The viewing window (vw) is the window, defined in pixels, within which the target image, when scaled to fit, is to be displayed as the viewing image (vi). The viewing window (vw) has a viewing window width (vww) and a viewing window height (vwh), both defined in pixels. Thus, the viewing window aspect ratio (vwr) can be determined as:

$$vwr = vww/vwh$$

Note that the source image (si) may have a different aspect ratio than the viewing window (vw). To place the viewing image (vi) in the viewing window (vw), a subset of pixels from the source image (si) must be selected and scaled. The viewing image height (vih) and viewing image width (viw) within the viewing window (vw) can be determined by comparing the source image aspect ratio (sir) to the viewing window aspect ratio (vwr), as shown:

if sir < vwr then:

$$vih = vwh$$

$$viw = vih * sir$$

but if sir > = vwr then:

$$viw = vww$$

$$vih = viw / sir$$

This relationship is illustrated in FIG. 7.

Note that the target image (ti) is created from the source image (si), by scaling the image (si) down to fit within the viewing window (vw). When the target image (ti) is scaled down by the desired maximum magnification factor (mmf) to fit within the viewing window (vw), the scaled target image is called the viewing image (vi).

The maximum magnification factor (mmf) is defined as the ratio of the target image area (tia) to the viewing image area (via). This ratio will determine the amount of zoom available without causing the image to distort due to pixelation, i.e., when fewer pixels are in the viewing image being displayed than available in the viewing window. So:

$$\text{target image area (tia)} = tiw \times tih$$

and since

$$via = viw \times vih$$

then

$$tia = via \times mmf$$

To obtain the target image width and height:

$$tiw = \cancel{\text{squareroot}}\sqrt{(tia * sir)}$$

$$tih = tiw / sir$$

The relationship between the target image and the viewing image is shown in FIG. 7. The relationship between the target image and the viewing window is also shown. A zoom to the maximum level will be shown in the viewing window as illustrated at representation 120 of FIG. 7. By panning the viewing window, every portion of the target image may be viewed from each level of zooming.

To determine the minimum scan density (msd) to avoid pixelation at the desired maximum magnification factor (mmf):

msd = tih/sih. = tiw/siw

EXAMPLE 1

Determine the Target Image Area and dimensions, and minimum scan density for the following case:

Source Image = 5" wide x 4" high

Desired Magnification Factor = 20

Source Image Aspect Ratio = 5 / 4 = 1.25

Define the Viewing Window: assume 480w x 320h pixels

Viewing Window Aspect Ratio = 480 / 320 = 1.5

The Source Image Aspect Ratio is < the Viewing Window Aspect Ratio:

1.25 < 1.5 therefore:

vih = vwh = 320 pixels

viw = vwh * 1.25 =320 * 1.25 = 400 pixels

The Viewing Image Area = vis = 320 x 400 = 128,000 pixels

The Target Image Area = vis x 20 = 128,000 x 20 = 2,560,000 pixels

The Target Image width = $\sqrt{2,560,000 / 0.8}$ = 1789 pixels

The Target Image height = 1789 x 0.8 = 1431 pixels

The Minimum Scan Density = 1789 / 5 = 358 pixels per inch

The photo scan can be any scan density > 357 pixels per inch

Thus, a 5 x 4" print film image should be scanned at greater than 357 pixels per inch to allow magnification/zoom up to 20 times in a viewing window of ~~320~~ 480 x ~~240~~ 320 pixels. An enhanced digital image file having 2,560,000 pixels provides a sufficient number of pixels for this example.

EXAMPLE 2

Determine the Target Image Area and dimensions, and minimum scan density for the following case:

Source Image = 5" wide x 4" high

Desired Maximum Magnification Factor = 20

Source Image Aspect Ratio = 5 / 4 = 1.25

Define the Viewing Window: assume 400w x 360h pixels

Viewing Window Aspect Ratio = 400 / 360 = 1.11

The Source Image Aspect Ratio is > the Viewing Window Aspect Ratio:

1.25 > 1.11 therefore:

viw = vww = 400 pixels

vih = viw / 1.25 = 400 / 1.25 = 320 pixels

The Viewing Image Area = via = 400 x 320 = 128,000 pixels

The Target Image Area = via x 20 = 128,000 x 20 = 2,560,000 pixels

The Target Image width = $\sqrt{2{,}560{,}000 * 1.25}$ = 1789 pixels

The Target Image height = 1789 / 1.25 = 1431 pixels

The Minimum Scan Density = 1431 / 4 = 358 pixels per inch

The photo scan can be any scan density > 357 pixels per inch

EXAMPLE 3

Determine the Target Image Area and dimensions, and minimum scan density for the following case:

Source Image = 4" wide x 5" high (portrait orientation)

Desired Magnification Factor = 20

Source Image Aspect Ratio = 4 / 5 = 0.8

Define the Viewing Window: assume 400w x 360~~w~~h pixels

Viewing Window Aspect Ratio = 400 / 360 = 1.11

The Source Image Aspect Ratio is < the Viewing Window Aspect Ratio:

0.8 < 1.11 therefore:

vih = vwh = 360 pixels

viw = vih * 0.8 = 360 * 0.8 = 288 pixels

The Viewing Image area = via = 360 x 288 = 103,680 pixels

The Target Image area = via x 20 = 103,680 x 20 = 2,073,600 pixels

The Target Image width = $\sqrt{2,073,600 * 0.8}$ = 1288 pixels

The Target Image height = 1288 / 0.8 = 1610 pixels

The Minimum Scan Density = 1610 / 5 = 322 pixels per inch

The photo scan can be any scan density > 321 pixels per inch

Returning now to FIG. 2, at step 60, the enhanced digital image file is provided to computer 22 in a digitized format, i.e., pixel-based, bitmapped, etc. (as opposed to vector graphics based format), such as in either in a bitmap BMP format or a compressed JPEG format. Computer 22 performs a touch-up operation on the scanned image in order to make refinements or enhancements thereto. This touch-up operation is accomplished by utilizing imaging software. Touch-up steps may include cleaning the edges of the image, adjusting lighting, adjusting colors, etc. Adobe PhotoShop software, manufactured by Adobe Systems Inc., San Jose, California, can be used as the imaging software for touching up the images.

According to one example, multiple images can be stitched together after scanning, and before or after compression, thereby creating a panoramic scene or image, or simply a scene requiring a plurality of photographs. This stitching operation can be performed by utilizing photo stitching software such as, for example, Photo Vista software by Live Picture, Live Picture Reality Studio or Live Picture Object Modeler. Stitching may comprise sufficient photos for a 360 degree panoramic image of a scene. If images are stitched, they may be touched-up at step 60.

At step 62, if desired, and if the enhanced digital image file has not yet been compressed (e.g., by scanning device 18 or the touch-up software), the image is then converted from a bitmap file format (e.g., BMP) to a compressed file format (e.g., JPEG). Other compression algorithms are contemplated. Adobe Image Ready software is utilized to perform the BMP-to-JPEG file conversion in this exemplary embodiment. The compression is set to a very high compression factor, such as, 70% to 90%, but may alternatively be set to other compression factors. The target image area be set as one of the parameters for compression, thus ensuring an optimum compressed file size.

At step 64, user interface or control data is associated with the enhanced digital image file. The user interface data is a program or code segment (e.g., a Java applet) that provides a graphic user interface on display 30 upon loading of the image. The user interface program is associated with the enhanced digital image file such that the combined file or files can automatically launch the graphic user interface, decompress the digital image data, and display at least a portion of the digital image data within a viewing window having a predetermined viewing size on display 30.

The user interface data may alternatively be a plug-in, applet, or other software program, such as, Photo Vista, Reality Studio, or Object Modeler manufactured by Live Picture Inc., San Francisco, California, or an Ipix plug-in manufactured by Internet Pictures Corporation of Oak Ridge, Tennessee. The user interface data may be either associated with the enhanced digital image file such that it is downloaded with the enhanced digital image data, or it may be launched independently from the enhanced digital image data as, for example, an applet or plug-in on user computer 28. If the user interface data is launched independently of the image data, it may either be first opened by the user before downloading the enhanced digital image file, or it may be automatically opened by the enhanced digital image file, such as, via a script or other code segment within the enhanced digital image file.

Referring to FIG. 3, an exemplary screen print 80 from display 30 is shown illustrating the graphical user interface 82 generated by the user interface program. User interface 82 includes a viewing window or frame 84 for displaying the digital image data 86. User interface 82 further includes zoom buttons 88 for allowing the user to zoom into and out of digital image data 86. By actuating one of zoom buttons 88, user interface program resizes digital image data 86 within viewing frame 84. User interface 82 further includes panning buttons 90 to allow the user to pan up, down, left, and right within image data 86.

Once the user interface program is associated with the enhanced digital image data, the resulting image is ready for providing to a network server, projection from a projector, display system, posting, or playback, to or from a host computer, a Web server, a Web site, or a Web page. At step 66, the enhanced digital image is uploaded to a network server. In the instance where the enhanced digital image is posted to an Internet Web server, the upload from computer 22 to the respective server can be performed by utilizing file uploading software, such as, Web FTP (file transfer protocol) Pro software, manufactured by Ipswitch, Inc., Lexington, Massachusetts.

Referring now to FIGS. 3, 4, and 5, exemplary print screens are shown illustrating the result of an upload or download of the enhanced digital image file to user computer 28 for display on display 30. In FIG. 3, digital image data 86 of a collectible stamp image is shown within a viewing window 84. Although viewing window 84 is slightly smaller than the full-screen size of display 30 (e.g., 640 x 480 pixels in this example), viewing window 84 can alternatively be configured for full-screen display, or display in other sizes or resolutions. As shown, digital image data 86 shows no sign of pixelation.

In FIG. 4, a user has actuated zoom buttons 88 to zoom-in to the digital image. In response, the user interface program provides additional digital image data from the enhanced digital image file stored in a memory (e.g., a hard drive) of user computer 28, to provide a zoomed view of the digital image. Thus, the view of FIG. 4 also shows little sign of pixelation even though the image has been magnified many times.

In FIG. 5, a user has actuated pan buttons 90 to display the lower left-hand corner of the digital image data within viewing window 84. The user has also actuated zoom buttons 88 to zoom-in to the digital image data. Again, little pixelation is visible.

As mentioned, the principles described herein are also operable with a digital camera. Referring now to FIG. 6, a method 100 of providing an enhanced digital image file utilizing a digital camera is shown. At step 102, the digital camera is configured to acquire a digital image. In this step, the camera is set with a high resolution to acquire at least enough pixels for a magnification of two times the size of the viewing window provided on display 30, though higher numbers of pixel data may also be acquired.

Again referring to FIG. 7 and the corresponding description hereinabove, with a digital source image, the maximum magnification factor (mmf) should not produce a target image larger than the source image in pixels because of the pixel distortion or pixelation effect, i.e., distortion due to fewer pixels in the image being displayed than available in the viewing window. Since:

target image area (tia) = tiw x tih = via x mmf

then to obtain the target image width and height:

tiw = tia * sir

tih = tiw / sir

If tih > sih then set tih = sih and tiw = siw

EXAMPLE 4

Determine the Target Image size and dimensions, and minimum scan density for the following case:

Source Image = 1600 x 1200 pixels

Desired Magnification Factor = 20

Source Image Aspect Ratio = 1600 / 1200 = 1.33

Define the Viewing Window: assume 480w x 360h pixels

Viewing Window Aspect Ratio = 480 / 360 = 1.33

The Source Image Aspect Ratio is = the Viewing Window Aspect Ratio:

~~0.75~~ 1.33 = ~~0.75~~ 1.33 therefore:

vih = vwh = 360 pixels

viw = vih * 1.33 = 360 * 1.33 = 480 pixels

The Viewing Image area = via = 480 x 360 = 172,800 pixels

The Target Image area = via x 20 = 172,800 x 20 = 3,456,000 pixels

The Target Image width = $\sqrt{3{,}456{,}000 * 1.33}$ = 2147 pixels

The Target Image height = 2147 / 1.33 = 1610 pixels

But tih of 1610 pixels is > 1200 pixels therefore:

tih = 1200 pixels

tiw = 1600 pixels

tia = 1200 x 1600 = 1,920,000 pixels

Effective Maximum Magnification Factor = tia / via

= 1,920,000 / 172,800 = 11.1

The Minimum Scan Density = N/A

Steps 104 (touch-up image), 106 (compress file), 108 (associate user interface data), and 110 (upload file) may proceed as described with reference to FIG. 2 in the print film image exemplary method.

The above method can be repeated using different depth images or digital photographs for the images in order to create areas of higher resolution or "hot spots" within an image for detailed close-up inspection or viewing. These depth images can be linked to the respective image or image segment. The above method can be utilized in order to create higher zoom capabilities with each new depth layer of an image.

The above method can be utilized for applications including single images, single panoramic images, stitched images, non-stitched images or any other suitable image type.

The system and method of the present invention can also be utilized in conjunction with three-dimensional images in order to produce high resolution, three-dimensional digital images and 3-D texturings.

viw = vih * 1.33 = 360 * 1.33 = 480 pixels

The Viewing Image area = via = 480 x 360 = 172,800 pixels

The Target Image area = via x 20 = 172,800 x 20 = 3,456,000 pixels

The Target Image width = $\sqrt{3{,}456{,}000 * 1.33}$ = 2147 pixels

The Target Image height = 2147 / 1.33 = 1610 pixels

But tih of 1610 pixels is > 1200 pixels therefore:

tih = 1200 pixels

tiw = 1600 pixels

tia = 1200 x 1600 = 1,920,000 pixels

Effective Maximum Magnification Factor = tia / via

= 1,920,000 / 172,800 = 11.1

The Minimum Scan Density = N/A

Steps 104 (touch-up image), 106 (compress file), 108 (associate user interface data), and 110 (upload file) may proceed as described with reference to FIG. 2 in the print film image exemplary method.

The above method can be repeated using different depth images or digital photographs for the images in order to create areas of higher resolution or "hot spots" within an image for detailed close-up inspection or viewing. These depth images can be linked to the respective image or image segment. The above method can be utilized in order to create higher zoom capabilities with each new depth layer of an image.

The above method can be utilized for applications including single images, single panoramic images, stitched images, non-stitched images or any other suitable image type.

The system and method of the present invention can also be utilized in conjunction with three-dimensional images in order to produce high resolution, three-dimensional digital images and 3-D texturings.

The resulting images which are obtained via the exemplary system and method are characterized by a high definition resolution and are suitable for high definition television, Web television, and large, panoramic or object models, Internet applications, which preserve resolution upon image magnification or reduction. The exemplary embodiment also dispenses with the need for plug-in software during download or file transfer operations.

EXAMPLE 5

A variety of photographs were taken using several different types of cameras. A digital camera was used to take several digital images. A Hasselblad camera was used to take several print film images, some of which were 2 ¼" square and others of which were 4 x 5" square. The print film images were taken to a film developing center to be enlarged to 8 x 12" pictures.

The enlarged pictures were scanned with UMAX Astra scanner using Adobe Photo Editor. Some bitmap files were created and some JPEG files were created. In spite of conventional teaching to the contrary, the scanner was set for a high resolution: 600 dpi. For the JPEG files, compression was set to 30:1.

Some of the images were stitched together using Photo Vista. The stitched images were then compressed at a high ratio of compression to generate JPEG files. The compressed files were touched up using Adobe Photo Editor and then uploaded to an Internet server. The uploaded files were then downloaded from the Internet server. The download took only a short time. The images were observed to have exceptionally high quality.

In review, a method is disclosed of providing a digital image file for viewing in a viewing window of a user display, the viewing window having a predetermined size. The method includes providing a digital image having an image size comprising a fixed number of pixels representative of an image, the image size being greater than the predetermined viewing window size. The digital image file is associated with a user interface that is configured to display the digital image in the viewing window and to allow a user to zoom into and pan around in the image displayed in the viewing window while maintaining high image quality.

While the exemplary embodiments illustrated in the FIGS. and described above are presently preferred, it should be understood that these embodiments are offered by way of example only. For example, the specific pixel counts and display sizes disclosed herein are merely exemplary and are used to illustrate the pertinent principles. Also, not all of the steps of the exemplary embodiments need be performed in all embodiments, nor need they be performed in the specific order recited. Accordingly, the present invention is not limited to a particular embodiment, but extends to various modifications that nevertheless fall within the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A method of providing a digital image file for viewing on a user display in a viewing window having a predetermined size, the method comprising:

providing a digital image file having an image size comprising a fixed number of pixels representative of an image, wherein the image size is greater than that of the predetermined viewing window size.

2. The method of claim 1, further comprising providing a user interface for the digital image file, the user interface configured to display the digital image file in the viewing window and to allow a user to zoom into the image displayed in the viewing window,

3. The method of claim 1, wherein the image size is at least ten times that of the predetermined viewing window size.

4. The method of claim 1, wherein the user interface is configured to allow the user to pan across the image.

5. The method of claim 1, wherein the user interface prevents the user from zooming into the image to the point of pixelation.

6. The method of claim 1, wherein the digital image file includes the user interface in a single data file.

7. The method of claim 1, wherein the user interface is an application program applet.

8. The method of claim 1, wherein the user interface is an application program controlled by the user's computer.

9. The method of claim 1, further comprising compressing the digital image file.

10. The method of claim 1, further comprising uploading the digital image file to a network server.

11. The method of claim 1, wherein the digital image file is generated from a print film image.

12. The method of claim 1, wherein the digital image file is acquired with a digital camera.

13. The method of claim 1, wherein the predetermined size represents a full-screen size of the user display.

14. A method of providing an enhanced digitized image file to a user, comprising:

providing a viewing window size in which the digitized image file is to be displayed to a user;

providing a digitized image file having an image size greater than that of the predefined viewing window size;

compressing the digitized image file; and

providing the compressed image file to a network server.

15. The method of claim 13, further comprising:

under user control, transmitting the compressed image file over the network;

displaying the transmitted image file to the user in a viewing window having the predefined viewing window size; and

under user control, magnifying the displayed image within the viewing window.

16. The method of claim 14, further comprising, under user control, moving the displayed image in the predefined viewing window size.

17. The method of claim 14, further comprising providing the user with a plurality of selectable magnification levels to view the displayed image within the viewing window.

18. The method of claim 14, wherein the resolution of the digitized image is greater than that of the image displayed to the user in the predefined viewing window size without image magnification.

19. The method of claim 16, wherein the selectable magnification levels are limited such that no more than one pixel of the user display can display one pixel of the digitized image.

20. The method of claim 13, wherein the digitized image file is compressed to a JPEG format.

21. The method of claim 13, wherein the step of generating includes enlarging and scanning a print film image to provide the digitized image file.

22. The method of claim 19, wherein the print film image is scanned with a density of at least 100 dots per inch.

23. The method of claim 13, wherein the step of generating includes acquiring the digitized image file with a digital camera.

24. The method of claim 13, wherein the compressed image file is accessible via the Internet.

25. The method of claim 14, wherein magnifying the displayed image does not degrade the image quality.

26. An enhanced digital image file downloadable to a client computer having a viewing window on a display, the viewing window having a predetermined frame size, the digital image file comprising:

digitized image data representative of an image, wherein the digitized image data has a number of pixels sufficient to allow a user to magnify the digitized image in the viewing window by a magnification factor of at least two without pixelation; and

control data to allow the user to control the magnification factor.

27. The enhanced digital image file of claim 25, wherein the digitized image data is compressed.

28. The enhanced digital image file of claim 25, wherein the control data is configured to provide zoom buttons and pan buttons to a user.

29. The enhanced digital image file of claim 27, wherein the control data includes a Java applet.

30. The enhanced digital image file of claim 25, wherein the digitized image data has a number of pixels sufficient to allow a user to magnify the digitized image in the viewing window by a magnification factor of at least ten without pixelation.

31. The enhanced digital image file of claim 25, wherein the digitized image data has a number of pixels sufficient to allow a user to magnify the digitized image in the viewing window by a magnification factor of at least one hundred without pixelation.

32. The enhanced digital image file of claim 25, wherein the control data is configured to prevent the user from magnifying the digitized image to the point of pixelation.

ABSTRACT OF THE DISCLOSURE

A method of providing a digital image file for viewing in a viewing window of a user display, the viewing window having a predetermined size. The method includes providing a digital image having an image size comprising a fixed number of pixels representative of an image, the image size being greater than the predetermined viewing window size. The digital image file is associated with a user interface that is configured to display the digital image in the viewing window and to allow a user to zoom into and pan around in the image displayed in the viewing window while maintaining high image quality.

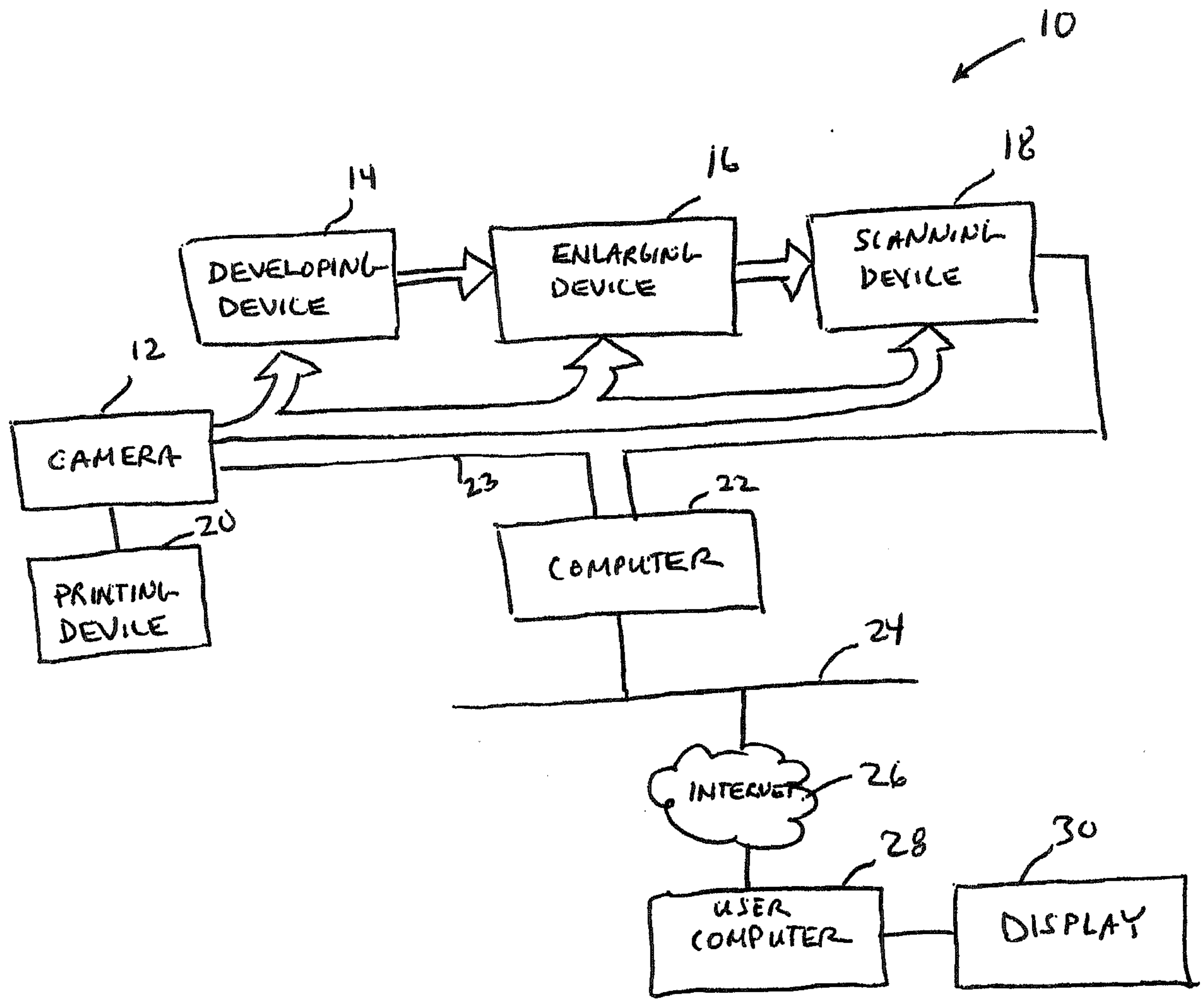

10
14
DEVELOPING DEVICE
16
ENLARGING DEVICE
18
SCANNING DEVICE
12
CAMERA
20
PRINTING DEVICE
23
22
COMPUTER
24
INTERNET
26
28
USER COMPUTER
30
DISPLAY

FIG. 1

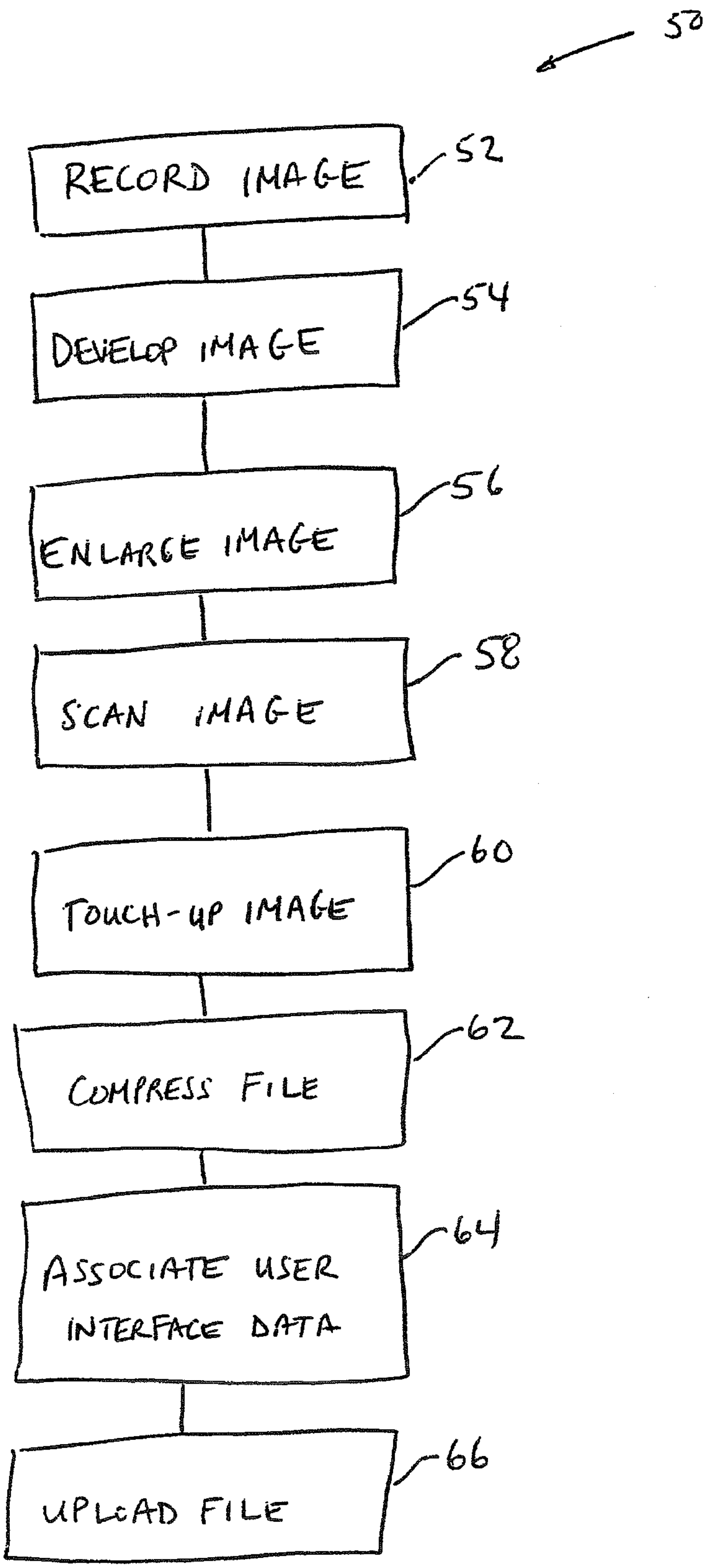
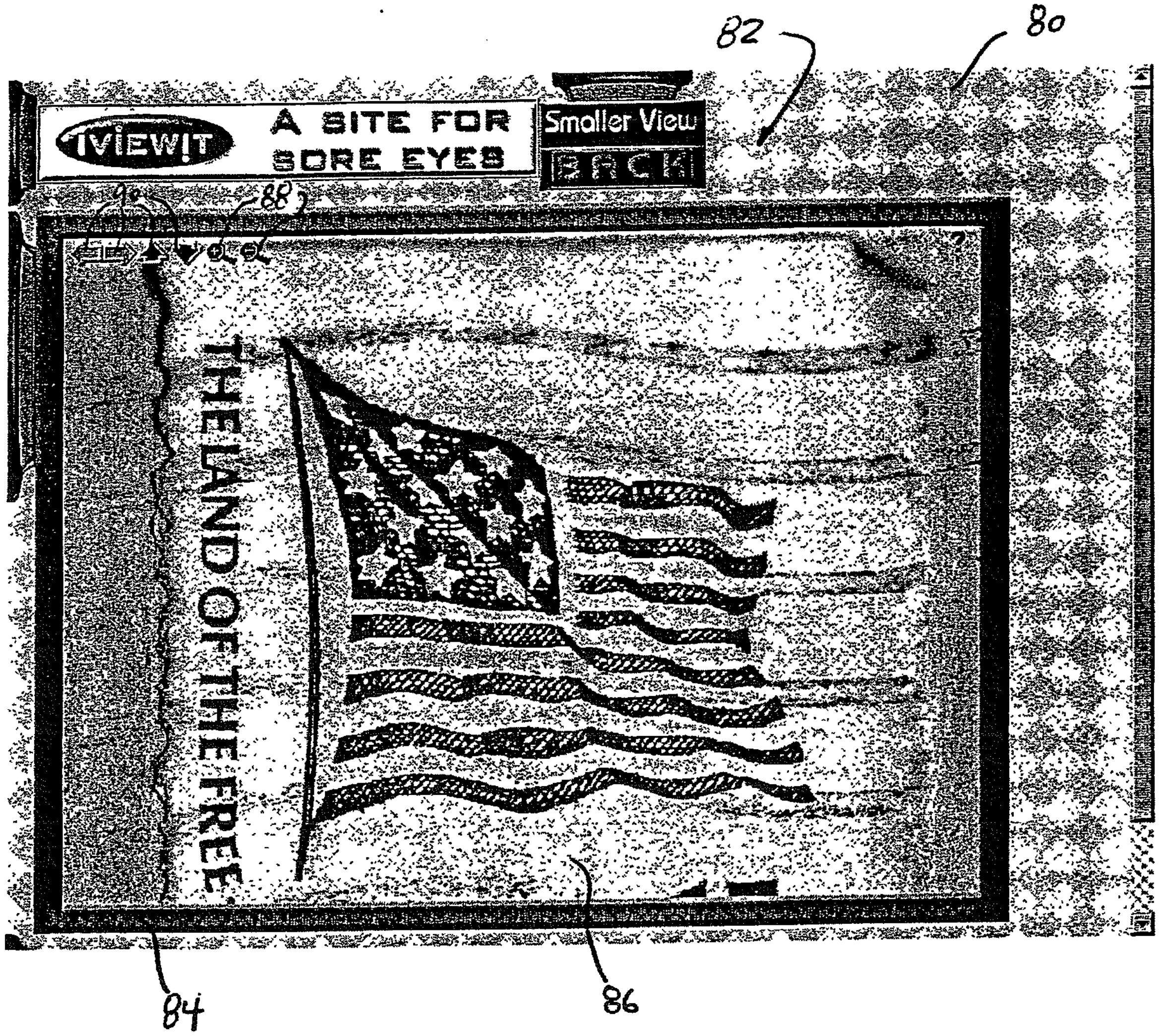

50
RECORD IMAGE
52
DEVELOP IMAGE
54
ENLARGE IMAGE
56
SCAN IMAGE
58
TOUCH-UP IMAGE
60
COMPRESS FILE
62
ASSOCIATE USER INTERFACE DATA
64
UPLOAD FILE
66

FIG. 2



82
80
IVIEWIT
A SITE FOR SORE EYES
Smaller View
BACK
90
88
THE LAND OF THE FREE
84
86

FIG. 3

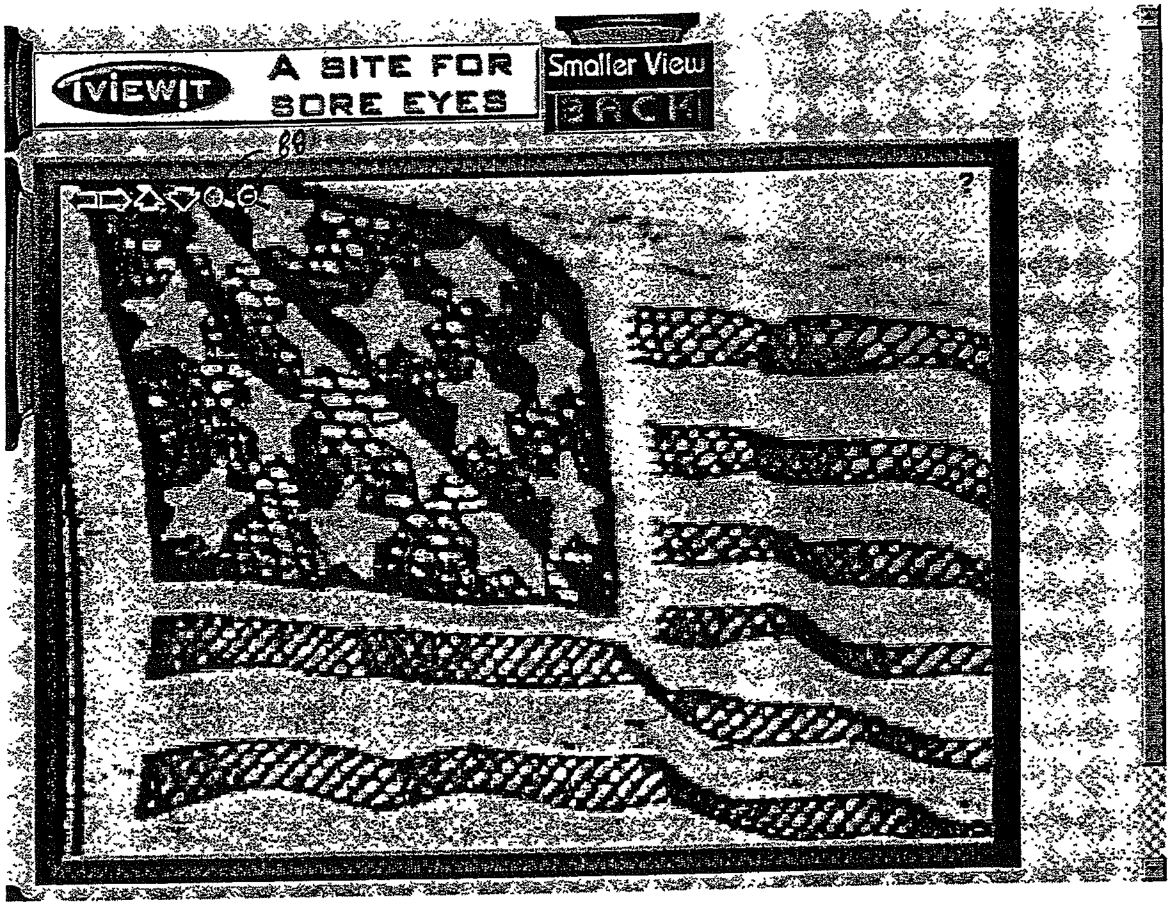


FIG. 4

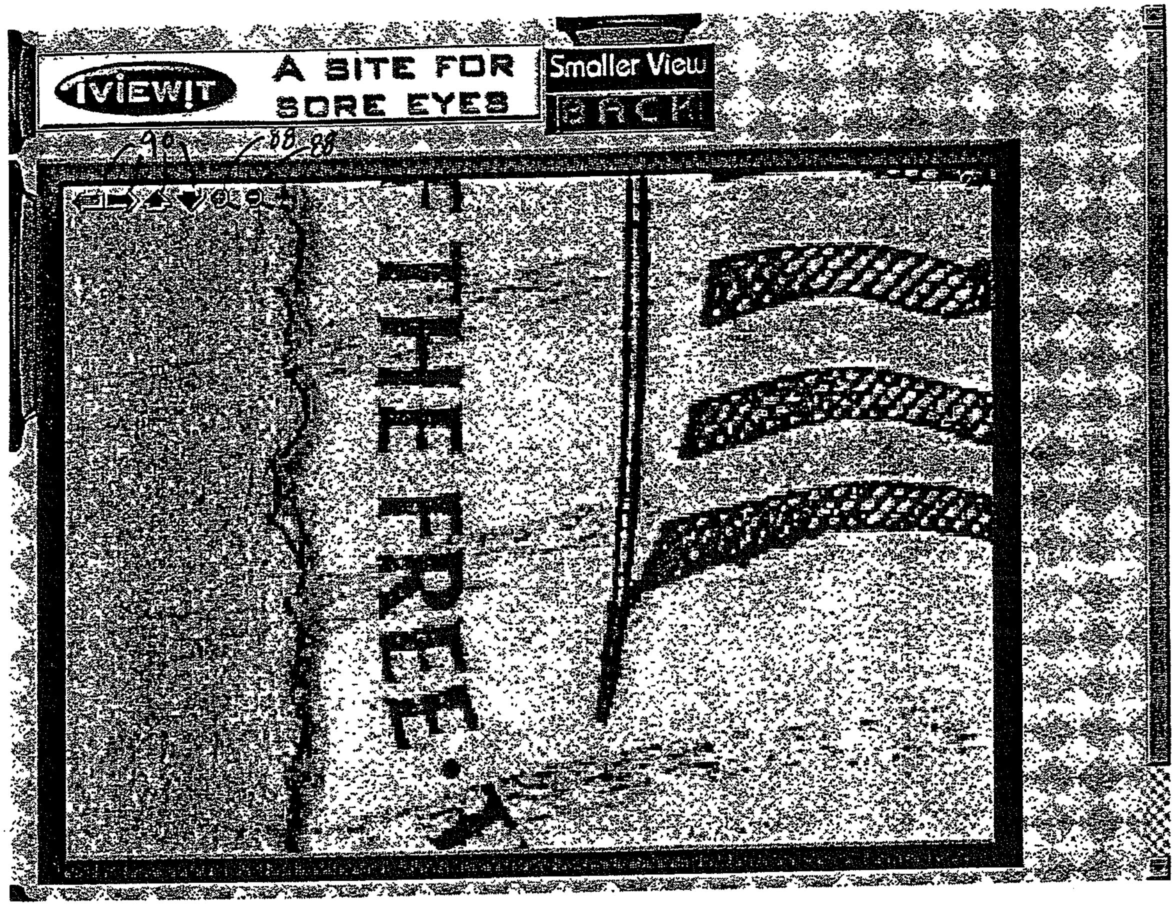


FIG. 5

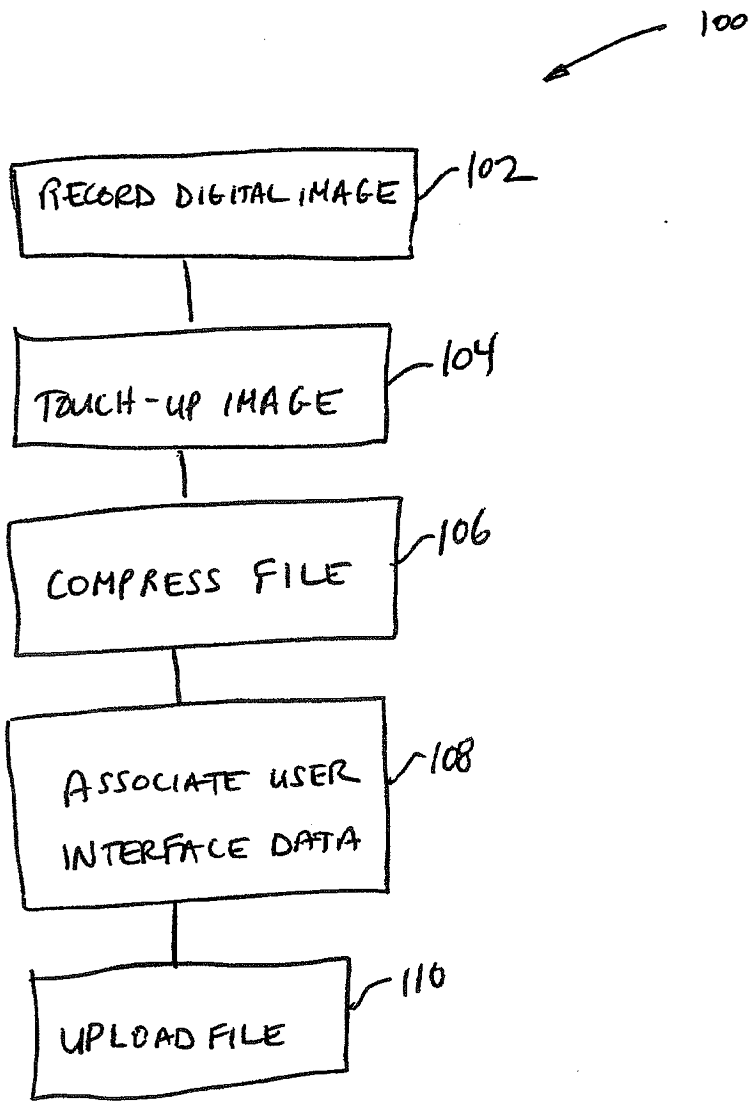

100
RECORD DIGITAL IMAGE
102
TOUCH-UP IMAGE
104
COMPRESS FILE
106
ASSOCIATE USER INTERFACE DATA
108
UPLOAD FILE
110

FIG. 6

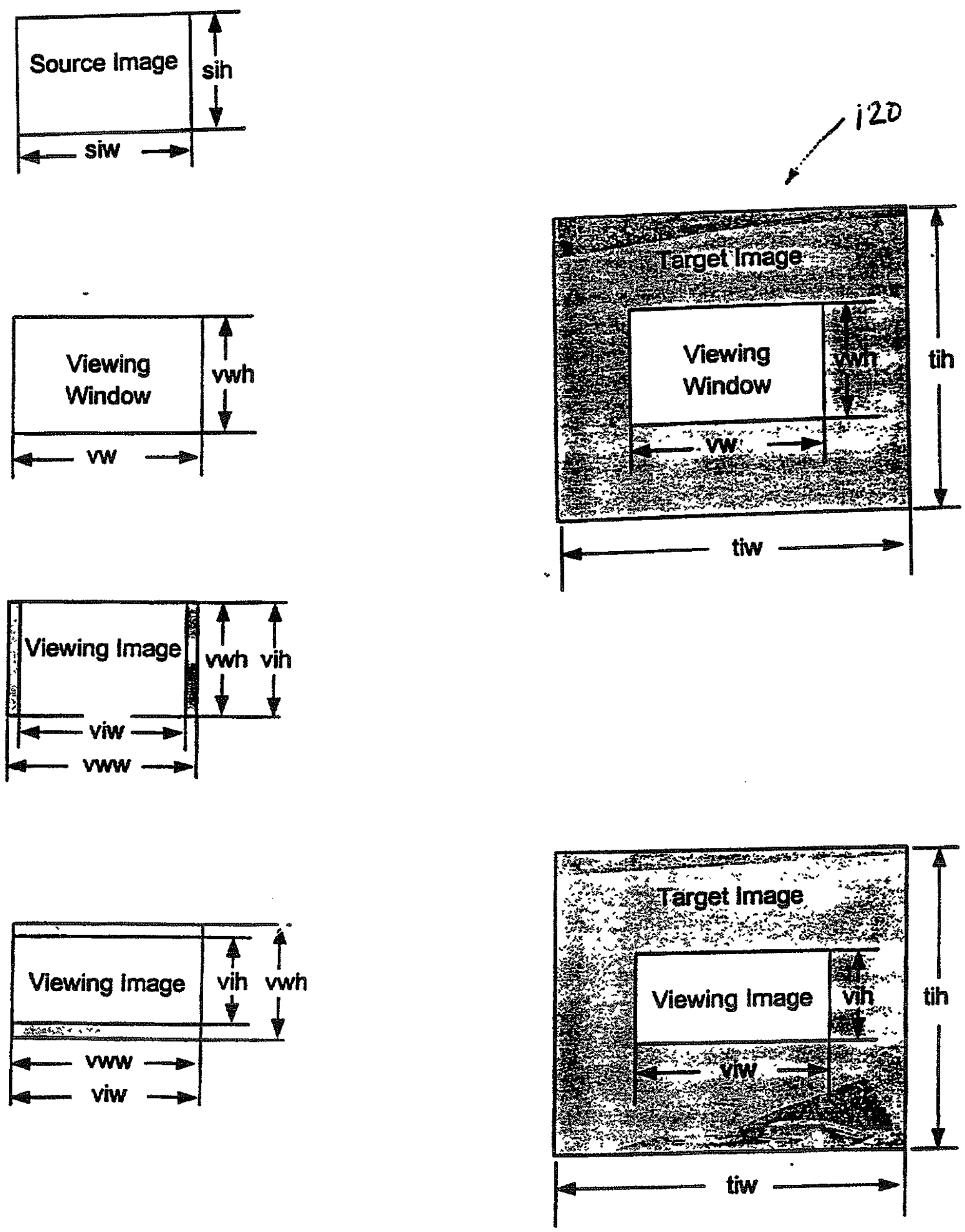

120
Source Image
sih
siw
Viewing Window
vwh
vw
Viewing Image
vwh
vih
viw
vww
Viewing Image
vih
vwh
vww
viw
Target Image
Viewing Window
vwh
tih
vw
tiw
Target Image
Viewing Image
vih
tih
viw
tiw

FIG. 7

Atty. Dkt. No. 57103/122

Copy

U.S. PROVISIONAL PATENT APPLICATION

for

ZOOM AND PAN IMAGING
USING A DIGITAL CAMERA

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ZOOM AND PAN IMAGING USING A DIGITAL CAMERA

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is related to U.S. Patent Application No. 09/630,939, filed August 2, 2000, a copy of which is attached hereto and incorporated herein by reference.

FIELD OF THE INVENTION

The present invention is directed to a system and a method for producing enhanced digital images and, in particular, to a system and a method for producing enhanced digital images having improved resolution for zooming and/or panning within an image downloaded from a digital camera to an external display system such as to a computer display or directly to a monitor.

BACKGROUND OF THE INVENTION

See attached information regarding digital cameras which is incorporated herein by reference.

See Background in related application.

DESCRIPTION OF THE INVENTION

The object of this invention is to enable a digital camera to provide pan and zoom capabilities to the digital pictures taken by the camera. The pictures may be viewed, either on the camera through the viewing screen usually provided, or through a display attached to a computer which has received a file comprising the digital images taken by the digital camera, or through any other display system such as a television or monitor.

See attached Figure A1.

There are several embodiments:

In one embodiment, the software for viewing the images in pan and zoom mode is contained within the camera #1. The photographer selects the image to be displayed on the viewing screen #2 and then selects the pan and zoom mode by use of control buttons which may be existing buttons multiplexed for this purpose. The necessary controls are: pan left, right, up, down, zoom in, zoom out. Including the pan and zoom facility in the camera enables the close inspection of particular features of the image thereby ensuring that the image is meeting the objectives of the photographer.

In another embodiment, the digital file containing the images is transferred to the computer #10 through a cable connection connecting the USB port #3 to USB port #11 or equivalent ports such as a serial port. Alternatively the digital file may be transferred by means of a media device such as a floppy disc or flash card. In this latter case, the file is written onto the media device using data media port #4 and read into the computer using data media port #12. The computer #10 should have already been loaded with user interface software which provides the controls for displaying the digital images on computer display #20 and also for providing the pan and zoom feature controls.

An alternative embodiment is to include into the digital file transferred from the camera #1 to the computer #10 the user interface software necessary to control the display and zoom and pan of the digital images in the computer. In this way no software is necessary to be pre-loaded into the computer #10.

Another alternative embodiment is to pre-load some software into computer #10 and load the remainder from the camera #1 through the digital file containing the images being transferred.

Note that the relationship between the target image and the viewing image is very important, as described in the related application. By panning the viewing window, every portion of the target image may be viewed from each level of zooming. Zoom capability is provided up to a maximum level where the image begins to pixelate.

In the related application, user interface or control data is associated with the enhanced digital image file. The user interface data is a program or code segment (e.g., a Java applet) that provides a graphic user interface on the display upon loading of the image.

In one embodiment of the present invention, the user interface program is associated with the digital image file in the camera and downloaded with the file or files so the computer or other display system can automatically launch the graphic user interface, decompress the digital image data if necessary, and display at least a portion of the digital image data within a viewing window having a predetermined viewing size. The user interface program can be written in C+ or C++ or other common languages. The user interface data may alternatively be a plug-in, applet, or other software program.

The user interface data may be either associated with the enhanced digital image file such that it is downloaded with the enhanced digital image data, or it may be launched independently from the enhanced digital image data as, for example, an applet or plug-in on computer #10. If the user interface data is launched independently of the image data, it may either be first opened by the user before downloading the enhanced digital image file, or it may be automatically opened by the enhanced digital image file, such as, via a script or other code segment within the enhanced digital image file.

The user interface includes a viewing window or frame for displaying the digital image data, and further includes zoom and pan functions as described in the related application.

Note that the amount of zoom capability provided by the user interface will vary depending upon the display size and resolution. Nevertheless, the zoom capability should reach a maximum when the image begins to pixelate as defined in the related application.

For example, if the original image is 1500 (width) x 1200 (height) pixels, and the camera viewfinder display has a 256 x 180 screen size, then the image can be magnified to 39 times, whereas the same image can only be magnified to 3.75 times in an 800 x 600 computer monitor. In either case, at the maximum zoom, the zoomed portion of the original image will be fully detailed pixel-for-pixel.

If the digital image file, including the user interface program, is provided directly to a television or monitor that does not have zoom or pan controls or buttons, the controls or buttons on the camera will be used.

As mentioned in the related application, the digital camera is typically set with a high resolution to acquire at least enough pixels for a magnification of two times the size of the viewing window provided on the display, though higher numbers of pixel data may also be acquired. The same or related mathematical formulas for determining the maximum magnification factor (mmf) in the related application apply in the preferred embodiment.

Note in the preferred embodiment that the display is viewing all or a portion of the entire image that was downloaded to the computer #10, and not downloading portions "on the fly" as they are needed.

In the preferred embodiment, the image can be panned while zoomed in to the maximum.

PAN AND ZOOM IMAGING USING A DIGITAL CAMERA

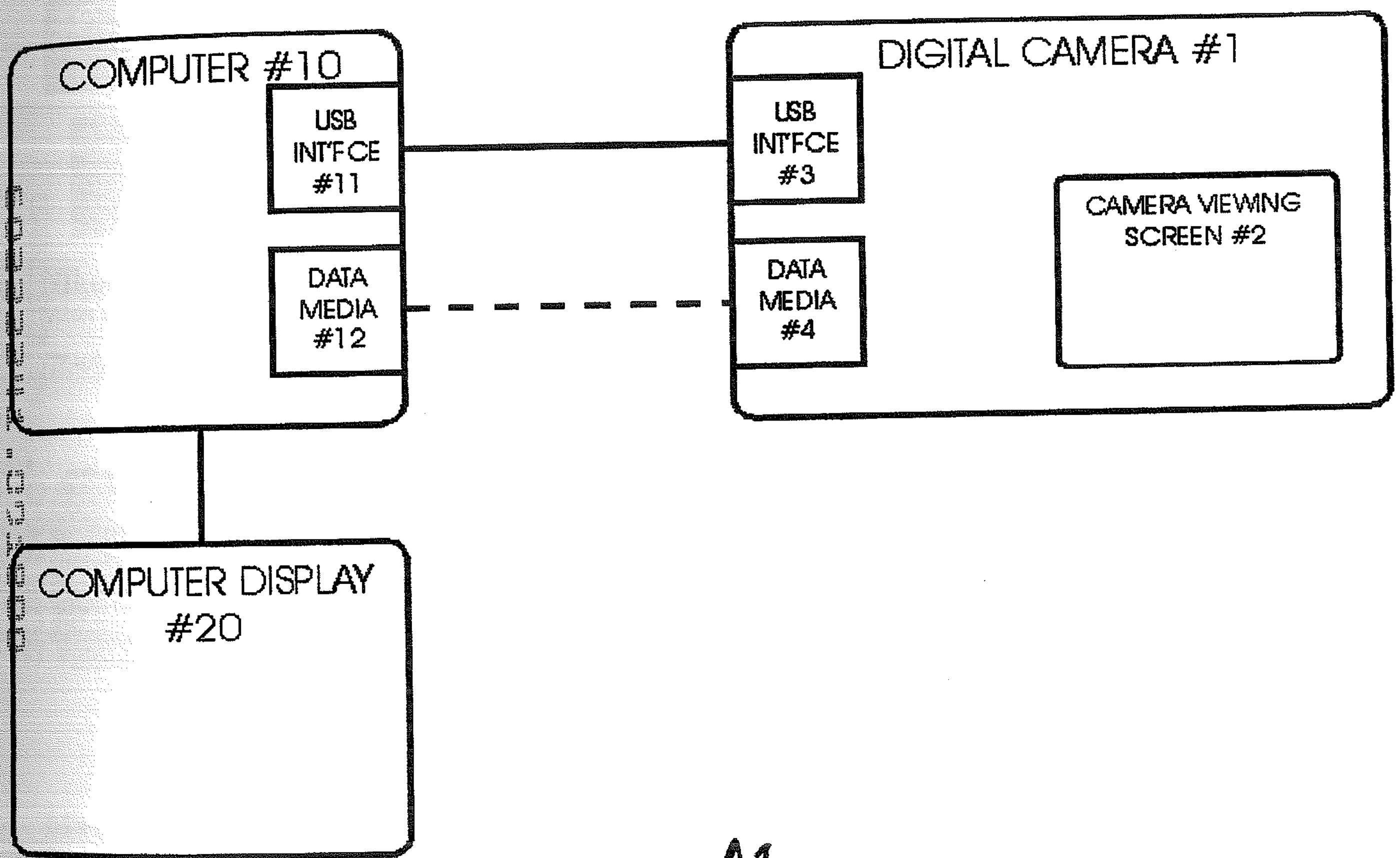


FIGURE A1

This page has been formatted to facilitate printout of the review.

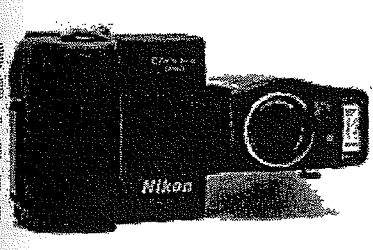
Use your browser's "Back" button to return to the previous page, or the links at the top and bottom of this page to navigate to related information. If you have difficulty fitting the text on this page onto your printer output, simply resize your browser window to a narrower width and print again.

Back to Full Nikon Coolpix 990 Review
Go to Nikon Coolpix 990 Data Sheet
Go to Nikon Coolpix 990 Pictures Page
Up to Imaging Resource Cameras Page

Nikon Coolpix 990

Nikon updates the hugely successful Coolpix 950, with 3.34 megapixels and numerous enhancements

(Review first posted 3/1/2000)



***Full 3.34 megapixel sensor delivers 2048x1536 images**

***Exceptionally well-designed user interface and controls**

***32 Megabyte SDRAM buffer for 2 second cycle time**

***Enormous creative control and flexibility**

***Excellent color and tonality**

Manufacturer Overview

By carefully applying their camera-building expertise honed in the professional and advanced-amateur segments of the film-camera market, Nikon has developed a commanding position in the digicam world, even though their consumer digital camera lineup has consisted of only two models. The key has been the exceptional image quality and picture-taking feature set embodied in their cameras, which have obviously struck a responsive chord with digicam enthusiasts. When the 1.3 megapixel Coolpix 900 first burst on the digicam scene almost two years ago, it was an immediate hit. The 2.1 megapixel Coolpix 950 a year later extended the winning streak, and now the 3.34 megapixel Coolpix 990 appears poised to do the same again. (Meanwhile, the Coolpix 800 has been a popular choice for an inexpensive 2 megapixel digicam with a slightly less robust feature set.)

Besides increasing the 990's resolution to a full 3.34 million pixels, Nikon has also upgraded several camera functions, added numerous features, and improved the camera's physical design.

Highlights

- 3.34 megapixel, 1.13 inch, high-density CCD delivering image sizes up to 2048 x 1536 pixels (including a 3:2 aspect ratio 2048 x 1360 pixel size).
- 1.8 inch, 110,000 dot, low temperature, polysilicon TFT LCD display.
- 3x optical zoom, 8 to 24mm lens (equivalent to a 38 to 115mm lens on a 35mm camera).
- User activated digital telephoto in incremental steps from 1.1x to 4.0x.
- Continuous and Single autofocus modes with multiple focus areas and manual focus with peaking and distance readouts.
- Infinity and Macro focus modes.
- Variable ISO at Auto, 100, 200 or dEF.
- Full Automatic and Manual exposure modes with several manual options (Program, Flexible Program, Aperture Priority, Shutter Priority and full Manual).
- Single, Continuous, Ultra High Speed Continuous, VGA Sequence, Multi-Shot 16 and Movie shutter modes.
- White balance with Auto, Manual, Fine (Outdoors), Incandescent, Fluorescent, Cloudy and Speedlight options.
- Shutter speeds from eight to 1/1000 seconds as well as a Bulb setting for longer exposures.
- 10 or three second self-timer.
- Built-in flash with Auto, On, Off, Slow Sync and Red-Eye Reduction modes.
- External flash sync terminal.
- USB and Serial interfaces.
- Image capture in compressed JPEG or uncompressed TIFF.

What's New

Since many people reading this review will be familiar with the previous Coolpix 950, it makes sense to begin with a list of the new features Nikon has included on the 990. As you can see, engineering the 990 was more than a matter of just slapping a larger sensor into an existing design. Here's a (doubtless partial) list of what's new:

- 3.34 million pixel sensor, up from 2.11 on the 950.
- 5-zone autofocus system, for greater AF accuracy (inherited from Nikon's pro film and digital SLR cameras.
- 50-step manual focus, with "peaking" indicator.
- 7-blade iris diaphragm, providing true 1/3-stop aperture control.
- 256-element Matrix white balance for improved auto white balance accuracy.
- Optional user "fine tuning" of white balance settings.
- Both full-manual and auto-bracketing exposure options.
- A rugged, side-opening CompactFlash memory slot. (BIG kudos for that!)
- "Stepless" digital zoom, from 1.1 to 4.0x magnification
- USB interface option for high-speed file downloads
- Easier menu navigation via a rear-panel jog control
- Spot metering optionally linked to area autofocus system
- Variable image sharpness settings

- Ability to use self-timer function while in macro focusing mode. (A top request!)
- User-selectable NTSC or PAL video output
- Histogram-based exposure confirmation option
- Smaller, but higher-resolution LCD panel
- "Memory" for last-used zoom lens setting
- Optional fixed-aperture zoom mode

Executive Overview

We're pleased to report that the Coolpix 990 takes all the best features of the previous 900 and 950 models and combines them with a host of new ones that make this camera really shine. The swivel-lens design is one of our favorite design elements, as it greatly enhances the camera's optical flexibility. Additionally, the control layout stayed relatively the same but with a few additional features, such as the programmable Function buttons. (These programmable buttons make one handed operation of the camera much more feasible under varying conditions.) The camera provides both a real-image optical viewfinder and an LCD monitor display for image composition. A nice feature on the LCD is the very extensive information display that reports a variety of exposure information, including aperture and shutter speed settings. In Play mode, the LCD gives an equally informative readout on captured images and also offers an index display of thumbnails and a playback zoom option.

Optically, the Coolpix 990 is equipped with a 8 to 24mm, 3x zoom lens (equivalent to a 38 to 115mm lens on a 35mm camera), made up of nine elements in eight groups (all made from environmentally friendly glass, we might add). New to the 990 is the seven blade iris diaphragm design, which greatly extends aperture control over the earlier 950. Zoom is easily controlled via the W and T buttons on the back panel and the settings menu even allows you to select the Fixed Aperture feature, which keeps the aperture constant while the lens zooms. A 4x digital zoom can be turned on and off through the settings menu and offers an "stepless" incremental zoom range from 1.1x to 4.0x. We should also mention here, that the 990 has a nice variety of focusing options, including Continuous and Single autofocus as well as a manual control. Under the autofocus setting, you can set the desired focus area, or let the camera decide on its own (which displays a complex target series on the LCD panel and bases focus on the object closest to the lens). With manual focus, you can select a peaking feature that shows what part of the image is in focus, as well as a distance scale to help in difficult situations.

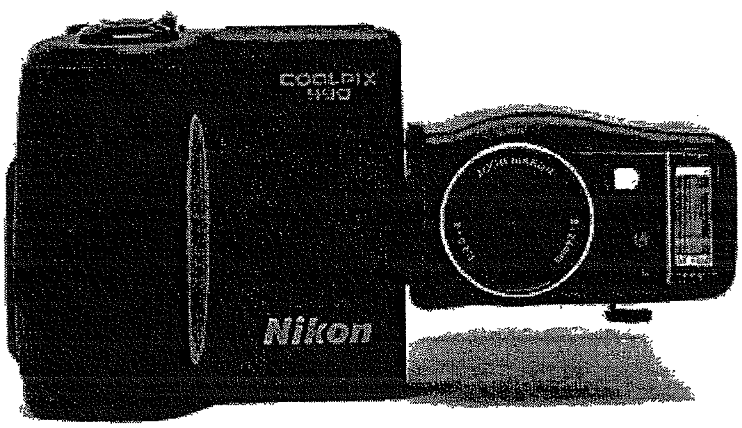
Exposure-wise, we greatly enjoyed the flexible options under the Manual Record setting. When you turn the camera on, you have the option of a completely Automatic or Manual Record mode, in addition to the Play mode. Under the Automatic Record mode, the camera handles everything, from the shutter speed to the white balance, but when you switch to Manual Record, your options multiply greatly. Within the Manual Record mode, you can select either Program, Flexible Program, Aperture Priority, Shutter Priority or Manual exposure modes. Program does exactly as it sounds and selects the aperture and shutter speed, but you now have absolute control over white balance, exposure compensation, etc. Flexible Program does the same but instead lets the user select from a variety of aperture and shutter speed combinations. Aperture Priority and Shutter Speed Priority are also pretty self-explanatory, letting the user select one value while the camera selects the other. Finally, Manual gives you total control over everything, a feature we really like. Shutter speeds are adjustable from eight to 1/1000 seconds (with a bulb setting for longer exposures) and apertures range from F/3.5 to F/9.8.

The Coolpix 950 already offered outstanding features like Best Shot Select and a variety of continuous shooting modes. These are all repeated on the 990 and accompanied by a few new ones. In addition to the Continuous and Multi-Shot 16 shooting modes, the 990 also offers an Ultra High-Speed Continuous (approximately 30 frames per second with a total of 80 QVGA shots) and a Movie mode (up to 40 seconds of QVGA sized images at 15 frames per second). There's also an Auto Bracketing feature that brackets as much as two stops up and two stops below the set exposure, producing a total of five images. We really enjoyed these features and the amount of creativity and flexibility they allow. We were also pleased with the return of the extensive white balance menu from the 950 (Auto, Preset, Fine, Cloudy, Incandescent, Fluorescent and Speedlight) and the variety of metering options (the famous 256-element Matrix mode, Center-Weighted and Spot). Also, under the settings menu, we enjoyed the ability to alter the in-camera sharpening as well as increase or decrease the contrast or turn the image into monochrome black and white. Not to mention the ability to connect an external flash and use with or without the built-in flash. This camera is so feature laden, it's hard to find lack to complain of.

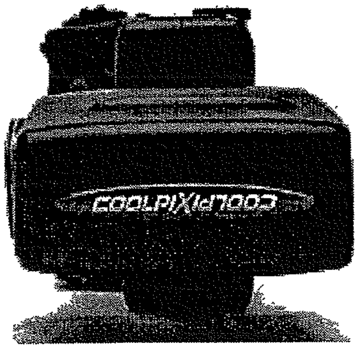
The Coolpix 990 uses CompactFlash for image storage and runs on four AA batteries. We found the camera a little power hungry (partly because of our reliance on the LCD monitor during the studio shots), so we highly recommend keeping a couple sets of spares around or working with the AC adapter when possible. The camera supports both USB and standard serial connections (using a dual purpose port), for quick connection to a PC or Mac. (The availability of a USB connection is decidedly good news on a high-resolution camera, especially one that can make nearly 10 megabyte uncompressed TIFF files like the '990!) There's also an NTSC video cable (European models ship with PAL) for connecting to a television set.

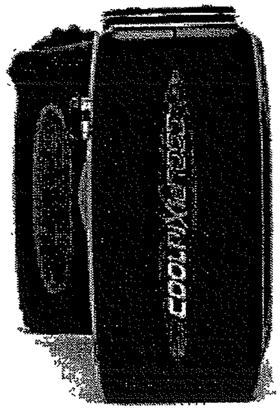
What a camera! We really love the almost excessive amount of control and think that you will too. The Coolpix 990 gives you as much control as you want, but also offers the luxury of sitting back and letting the camera do all the work as well. With its bevy of exposure options, compact portability, and high image quality we think this camera will be very popular.

Design
Nikon continues the swivel-lens design of the Coolpix 900 and 950 models with the Coolpix 990. With its ability to swivel just shy of 360 degrees, the lens can be pointed back towards the user, straight ahead or straight down to the ground, while keeping the LCD screen oriented for easy viewing. The camera body is compact and light weight, measuring approximately 5.9 x 3.1 x 1.5 inches (15 x 7.87 x 3.81 cm) with the lens stowed in its upright position and weighing about 13.1 oz (371.4 g) without the batteries.

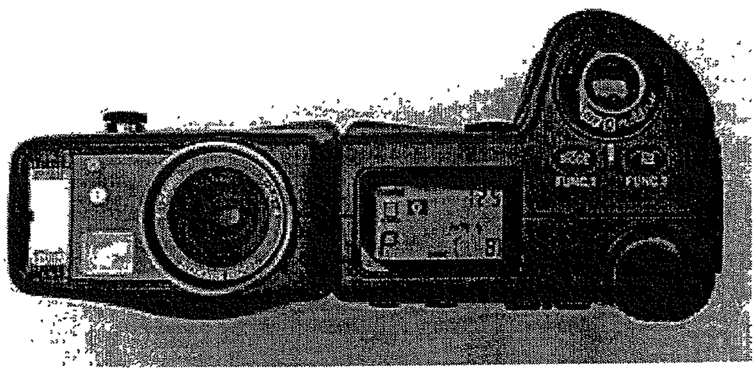


With the lens facing forward in its normal "stowed" position, the design of the front of the camera remains quite minimal. The lens itself doesn't protrude much from its barrel and the built-in flash and front side of the optical viewfinder fit snugly beside it. Beneath the lens barrel are the external flash sync socket and the dioptric adjustment dial for the optical viewfinder. On the very inside of the hand grip is the DC power input jack, covered by a soft rubber flap. Interestingly enough, Nikon swayed from their usual black and red design features to an updated combination of black and purple, and a rainbow reflective logo on the front.

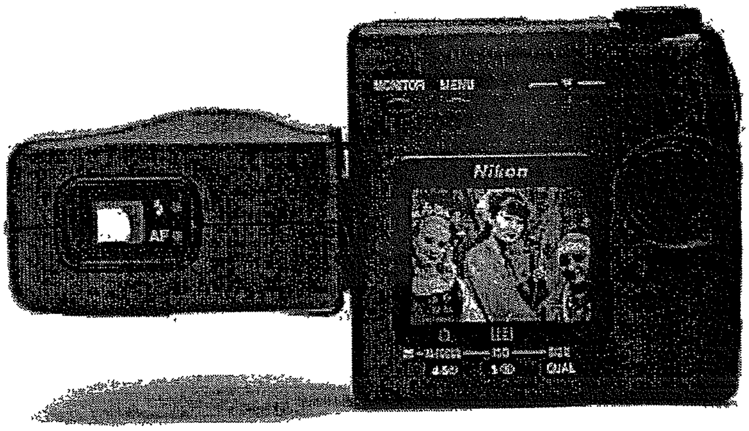




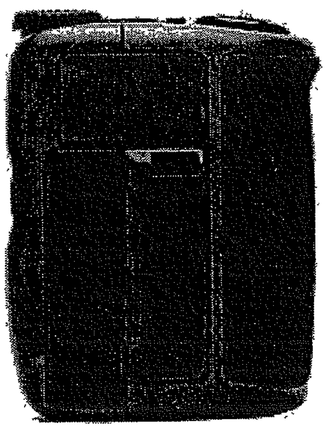
This shot shows the camera with the lens unit rotated to the position most people will use it in. This orientation orients the LCD panel vertically, while the lens, flash, and optical viewfinder face forward.



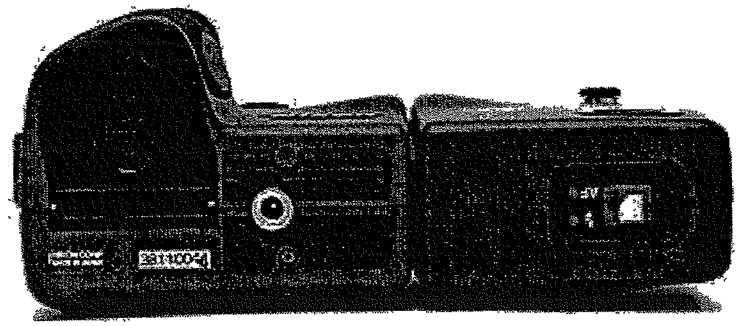
Looking at the top of the camera body, there's a small status display panel (helpful for conserving batteries by not using the LCD monitor), the Power/Mode dial, shutter button, a couple of function buttons and a small command dial that 's used to change certain camera settings. An exceptional feature on the 990 is that the Mode and +/- buttons on the top panel also double as Function buttons, programmable through the Setup menu in Manual exposure mode to access various exposure options. This was designed specifically to allow one handed operation, as you can hold down one of the buttons with your index finger and scroll through the chosen options with the command dial. This is a nice design change from the earlier Coolpix models, which were decidedly two-handed cameras.



The majority of the controls are located on the back panel of the camera, along with the LCD monitor. The layout of the controls is, again, very similar to the preceding Coolpix models. The Monitor and Menu buttons live at the top of the LCD panel, with the zoom controls and rocker toggle button off to the right side. Beneath the LCD are several controls for macro, manual focus, flash, quality, size and a few others. When the lens is pointed frontwards, the optical viewfinder is visible from the back panel. Two LEDs located directly beside the viewfinder report the status of the autofocus and flash.



We like the bulky hand grip on the right side of the camera which enables a firm, secure hold on the camera. (We noted that this feature is somewhat larger on the 990 than the earlier 950, making for a more secure grip.) The soft rubber surface fits directly under your fingers, providing additional friction for a good grip. Located inside the hand grip are the serial and USB I/O jack (a dual interface), the video output jack, the CompactFlash compartment and an attachment for the carrying strap. The digital and video inputs live beneath a soft, flexible rubber flap that quickly and securely snaps into place. The placement of the CompactFlash slot makes it easy to change cards when mounted to a tripod and the plastic door simply flips open and snaps shut. (The sturdy design of the CompactFlash door addresses the single most frequent complaint of 950 owners: The flimsy plastic flap used to cover the memory slot on that model. There is no access light to let you know when the camera is accessing the card, so you'll have to pay attention to the LCD monitor or the small status display to know when it's OK to change cards. (It's important to never remove a memory card while the camera is writing to it, lest you corrupt your images or even damage the card.)



Finally, the flat bottom of the camera holds the battery compartment and a metal tripod mount that are unfortunately too close together to allow battery changes while on a tripod. The battery compartment has a sliding lock that keeps the door tightly shut.

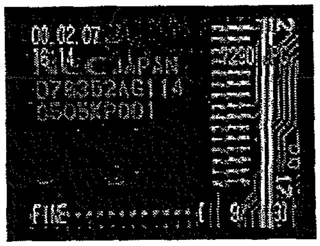
Viewfinder

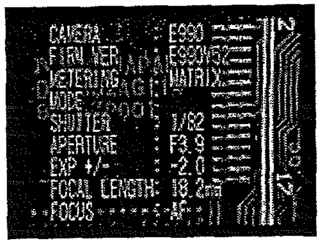
The Coolpix 990 offers both an optical viewfinder and an LCD monitor display. The real-image zoom viewfinder, located on the backside of the lens barrel, provides about 85 percent frame coverage according to Nikon. In our own tests, it ranged from 86 percent coverage at wide angle to 91 percent at telephoto. A center focus target helps line up shots while two LEDs beside the viewfinder indicate the status of the flash and autofocus systems. Additionally, a dioptric adjustment dial lies on the underside of the lens barrel to accommodate eyeglass wearers.

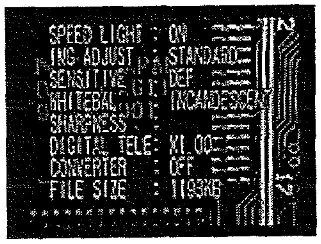
The 1.8 inch, 110,000 dot, low temperature, polysilicon TFT LCD monitor on the back panel operates both as a viewfinder and information display while in any capture mode. The LCD on the 990 is smaller than that on the earlier 950, but is higher resolution. It also sports a very high refresh rate, so images of moving objects are sharp and clear. Nikon estimates its frame coverage at 97 percent, a good deal more accurate than the optical viewfinder, which is usually the case. Our own tests showed it 97 percent accurate at wide angle, and nearly 100 percent at telephoto. When the camera is in autofocus mode, a series of targets can be continually displayed on the LCD. This shows you all the areas that the camera looks at to determine focus (in this autofocus mode, the part of the subject closest to the camera determines the focus). The LCD monitor display can be quickly called up and canceled by hitting the Monitor button just above it and we applaud the amount of exposure information that's displayed. Nearly all the settings are reported, including aperture and shutter speed (when in Manual exposure mode).

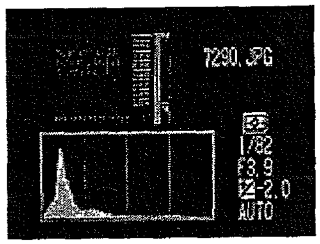
We felt the LCD screen was a minor weakness in earlier Coolpix cameras, as the unit used by Nikon was very difficult to read in sunlight. (This is true of all LCD screens, but seemed more so of the displays on the Coolpix 900 and 950.) We felt the viewscreen on the 990 was much better in this respect: It seemed to trade off a narrower usable viewing angle (you need to look at it pretty much straight on, for the best view) in favor of less tendency to wash out in very bright ambient light. The 990's LCD is also the first we've seen (February, 2000) that had an adjustment in the setup menu to control the screen's color balance, in addition to the common brightness setting. (!) We found this very interesting, perhaps useful as a way to adapt the camera's behavior to surroundings with strong tints in the ambient lighting.

As was the case with the Coolpix 950, an exceptional level of exposure information can also be displayed in Play mode. The screens at right show the three successive information screens that are accessed by rotating the command dial in playback mode. (The image in the screen shots here was deliberately underexposed using Manual capture mode, to make the information display more visible.)



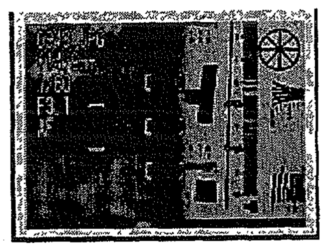




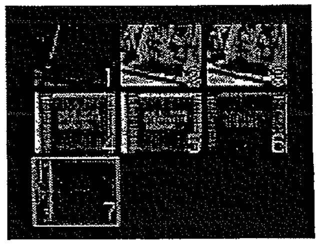


Completely new in the Coolpix 990 (and **very** welcome!) is the histogram display shown at right. This is a feature that has been common in professional digicams for some time now, but that has seldom been seen in "prosumer" models. The graph shows the distribution of brightness values in he image, with the left edge corresponding to pure black, and the right edge to pure white. Once you learn how to read it, a histogram is phenomenally useful in determining whether you've managed a good exposure or not. There's hardly room or time here to go into histograms in full detail, but we thought it would be useful to show you two examples: In the screen shot at top, the image was deliberately underexposed. Note how the peaks in the histogram are all bunched toward the left-hand side of the graph, and how little there is going on at the right side. By contrast, the lower image was overexposed. Note how the graph is bunched against the right edge. Ideally, a well-exposed image would produce a histogram curve that just filled the graph from left to right, indicating that it contained a full range of tonal values. We **really** like the histogram feature, and hope other digicam makers will be motivated to include it in their cameras as well.

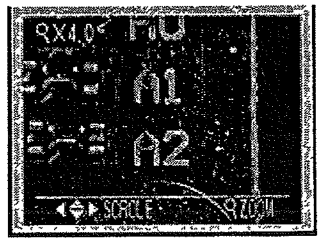
A final Play-mode information display is also new to the 990, showing lens, shutter and focus settings, and indicating (by the green brackets) what the autofocus system had locked onto when the picture was taken. -Another very handy way to check that you actually got the shot you were looking for!

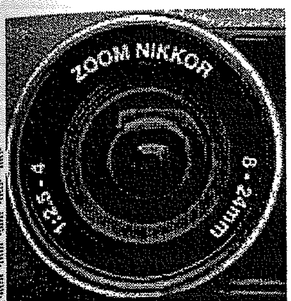


In Play mode, the LCD can also display a thumbnail index page, showing either four or nine images to a page depending on the setting. You can cycle between single-image, four or nine image views by pressing the flash/thumbnail button under the LCD display. You can also mark images for deletion in this mode.



There's also a playback zoom feature, which enlarges captured images up to 3x, letting you get a reasonably good idea of how well-focused the image is, check the framing, and examine details to see if you got the shot you wanted. (Did anyone blink?)





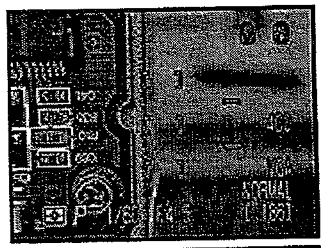
Optics

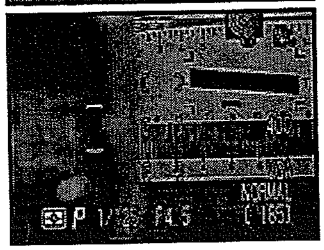
A Nikkor 3x zoom, 8 to 24mm lens comes with the camera (the equivalent of a 38 to 115 mm lens on a 35mm camera), with nine elements in eight groups (all made up of environmentally friendly glass). Aperture ranges from F/3.5 to F/9.8. New to the 990 model is the seven blade iris diaphragm, which gives very fine-grained aperture control, useful for controlling depth of field, but more so for working with external flash and precisely controlling the balance between flash and ambient exposure. The contrast-detect TTL autofocus features a 4,896 step autofocus mechanism with a working range from 0.8 inches (2.0 cm) to infinity (this includes the macro range). When shooting in the Auto exposure mode, the autofocus remains in the Continuous setting while using the LCD monitor but reverts to the Single autofocus mode when the LCD is off (which means you must halfway press the shutter button to set focus). However, the Manual capture mode gives you the freedom to choose between Continuous or Single autofocus, regardless of LCD status.

The Continuous focus mode results in the lens continually "hunting" for the best focus as you move the camera around, settling down when the camera and/or subject stops moving. Autofocus tracking speed isn't terribly high (mentioned in case you were expecting AF tracking as on Nikon's F5 pro film camera), but the continuous option would definitely be a benefit with moving subjects. The downside is that it burns more battery power.

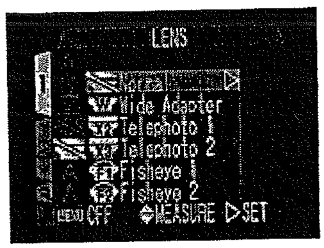
The manual focus option is controlled through the settings menu and offers choices between a peaking scale or a distance readout (extremely beneficial in hard to focus situations). Once enabled, just press the Manual Focus button (lower left of the LCD monitor) and simultaneously turn the command dial to adjust the focus in 50 steps.

As a focus aid in manual focus mode (it can also be enabled in autofocus modes as well), the Coolpix 990 has a clever "peaking" display. This appears to be some sort of on-screen sharpening function that tends to exaggerate the current state of focus of the camera: In-focus objects look extra-sharp on the LCD when "peaking" is enabled. With textured objects, the peaking display mode produces a glimmering, moire-type effect on the display screen. We didn't test manual-focus accuracy extensively, so can't comment on just how well this works, but it is clearly a step ahead of most digicams, in which the LCD screen has far too little resolution to be of practical use in evaluating focus.





We should note here that the 990's autofocus mechanism is quite sophisticated, with several operating modes. It has five possible focus zones (center, top, bottom, left, right), which can be very useful for achieving accurate focus on off-center subjects. The screenshots above right show the camera preferentially focusing on two objects at very different distances, based on the focus area selected. It could also take some getting used to if you're accustomed to lesser cameras with only a single focus zone. The Focus option under the settings menu does allow you to choose modes in which the camera chooses the focus zone, or in which you can explicitly set the location of the focus area (a nice feature that works well when combined with the spot metering mode, which can likewise be directed to determine exposure from the same 5 zones). In the "Auto" option for focus-area selection, the camera chooses the area corresponding to the object closest to the camera. When the area focus option is set to Off, the camera bases focus on the central area. (One playback mode displays a focus-area overlay, and shows which focus area was chosen for each image, by highlighting the appropriate set of marks in green. - This last function wasn't yet operational on our test unit.) Overall, the 990's focusing system is by far the most sophisticated we've seen on any digicam to date



The lens itself has the same filter threads as the preceding Coolpix models, which accommodate Nikkor accessory lenses for wide-angle, telephoto, macro and fisheye focal lengths. Once a lens is attached, you'll need to select the corresponding lens type in the lens settings menu, shown at right. (The camera adjusts its operation for different lens types by restricting the zoom range to avoid vignetting, switching to center-weighted metering for the fisheye adapter, etc.) A digital telephoto feature can be turned off and on through the Zoom option under the Settings menu, enlarging images up to 4x. The 990's digital zoom is different from most in that it provides a smoothly-varying range of magnifications. An indicator on the LCD monitor displays the range of digital zoom at each step (from 1.1x to 4.0x). Like this feature on most digicams, digital telephoto on the Coolpix 990 enlarges the center of the image, resulting in reduced resolution and more artifacts as more digital zoom is used. The camera automatically switches to center-weighted metering and a center autofocus target when digital zoom is active. Also under the Zoom option, you can set the startup position of the lens (either wide or telephoto) and activate the Fixed Aperture function, which keeps the aperture fixed as the lens zooms. The startup position option was another highly-requested feature among '950 users, and can really save precious seconds in fast shooting situations. Likewise, the fixed-aperture zoom option is very useful when working with external flash units, to avoid varying the exposure as a function of lens focal length.

Exposure

Sophisticated, accurate exposure control has been a hallmark of Nikon cameras, both in the film-based and digital realms. The Coolpix 990's exposure system incorporates several enhancements over that of previous models, through the addition of a 7-blade lens aperture, and a 256-element matrix white balance system. Losing no ground in the process, the 256-element matrix exposure metering system of the Coolpix 950 has been retained.

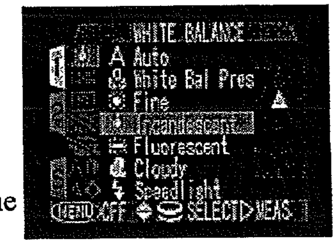
The 990 offers very flexible exposure control, with Program, Flexible Program, Aperture Priority, Shutter Priority and full Manual modes to choose from when set to the Manual exposure mode on the Power/Mode dial. Although it took a little figuring out at first (due in part to the fact that our evaluation model was a prototype and without a manual), we eventually discovered that changing modes and exposure features could be done quickly and painlessly without having to rely on the LCD monitor. The combination of the command dial and the control buttons gave complete access to most of the normal exposure functions. We also enjoyed the variety of Manual exposure mode settings. The main difference between the Auto and Manual exposure options on the Power/Mode dial is the availability of certain functions. For example, in Auto exposure mode, the camera completely controls the exposure, from shutter speed to white balance. The Manual setting provides the full range of options mentioned above, giving you as much or as little control as you need. We'll explain the various modes here.

Program mode gives the camera control over shutter speed and aperture but lets you set the white balance, exposure compensation, etc. The Flexible Program option goes a step further by letting you select from a range of shutter speed and aperture combinations. (The camera determines the required exposure, but you can choose whether it achieves that exposure with a shorter shutter speed and wider aperture, or a longer shutter speed and smaller aperture. This strikes us as a very nice option, achieving much of what people want from Shutter or Aperture priority modes, but without limiting the camera's ability to respond to widely varying light conditions.) Shutter Priority lets you select from eight to 1/750 second shutter speeds while the camera selects the appropriate corresponding aperture. Likewise, under Aperture Priority, you can select apertures from F/3.5 to F/9.8 while the camera selects the best shutter speed. However, in Full Manual mode, the camera increases the shutter options to include a bulb setting for long exposures and a quick shutter of 1/1000 seconds, with the same aperture range as in Aperture Priority. In any mode, if the camera disagrees with your exposure choices, the shutter and aperture values will flash in the display to indicate that this may not be the best exposure option.

Exposure compensation is adjustable from -2 to +2 in 1/3 EV increments by pressing the +/- button and turning the command dial. Additionally, under the Image Adjustment option on the settings menu, you can increase or decrease contrast, lighten or darken the entire image or switch into black and white mode, giving you a few more exposure adjustment options. These tonal compensation adjustments are quite a bit more sophisticated than simple exposure compensation found in most digital cameras. Conventional exposure compensation adjustments simply allow you to adjust overall exposure up or down relative to that selected by the camera's exposure system. By contrast (no pun intended), the "lighten" and "darken" adjustments on the Coolpix 990 preferentially adjust the midtone values of the image, without affecting the white and black values of the image. (That is, "lighten" will brighten the middle brightness values in the image, without blowing-out white areas, or lightening black ones.) There are also options to adjust contrast, and capture images in black and white.

The Coolpix 990's default ISO rating is 80 but is variable when shooting in Manual exposure mode. ISO values of dEF(default), 100, 200, and Auto are available by pressing the ISO button and rotating the command dial. When shooting in the Auto exposure mode, the ISO value is left at its default setting of 80. In addition to the exposure value settings, you can adjust the in-camera sharpening to Auto, High, Normal, Low or Off under the Sharpening option of the settings menu. This is a useful feature, especially in situations where digicams tend to oversharpen such as high contrast boundaries within images. Also, we generally find that post-exposure sharpening in Photoshop(tm) or other image-manipulation program generally gives better results than the in-camera sharpening functions provided by most cameras. Thus, you may find it best to leave the in-camera image sharpening in the Coolpix 990 off for critical images, and apply unsharp masking in the computer later.

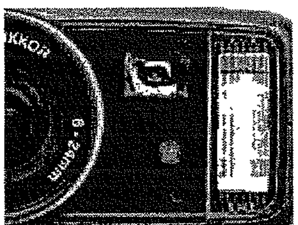
Histogram-based exposure confirmation.
We showed examples of the Coolpix 990's histogram display earlier, under our discussion of the viewfinder functions. Given that prior coverage, we'll make only brief mention here, but do want to underscore the significance of this feature. Shooters moving from the color-negative world will be accustomed to routinely favoring overexposure in their pictures, to insure optimum shadow detail. Digital cameras are quite different though, and need to be exposed more like slide film, with an eye to retaining detail in the highlights: Once the sensor hits an exposure value of 255 (in a system with 8-bit brightness values), any additional illumination has no effect, and all highlight detail is lost. It's thus very important to be able to recognize when parts of the image are being "blown out", as opposed to merely being very bright. LCD viewscreens aren't accurate enough to be trusted for this evaluation, so an explicit graph of brightness values (the histogram display) is exceptionally useful. We don't expect most casual users to routinely use the histogram exposure confirmation display on the 990, but for pros or others working with critical exposure requirements, it's indispensable.



White Balance
The Coolpix 990 offers a lot of flexibility in its white balance settings, with a matrix-based Auto setting as well as Fine (Outdoors), Incandescent, Fluorescent, Cloudy, Speedlight (flash balanced) and Preset (or Manual). We were able to get reliable results with the Auto and Fine settings, although we attempted Preset and had varying results (it's highly possible that this feature was not yet functional on our prototype test unit). Particularly interesting is the ability to "fine tune" the white balance setting in all modes except Auto or Preset. We've frequently found the various white balance options on digital cameras to produce images with an overall warm or cool color cast, depending on the manufacturer's biases, the current lighting conditions, etc. On the 990, Nikon gives you the option of tweaking the white balance to your own preferences. When you access the white balance sub-menu and select a white balance option, rotating the command dial will adjust the white balance up or down over a range of +/- 3 arbitrary units. Positive adjustments shift the color toward bluish hues, while negative adjustments move it toward warmer tones. (In the screen shot above, we've adjusted the incandescent white balance up by 2 units.)

Metering Options
The Coolpix 990 also offers several metering options, with 256 segment Matrix metering (intelligently examining 256 segments across the entire image), Center-Weighted, Spot and Spot AF Area. This last is another option that's entirely unique to the Coolpix 990 (February 2000). Taking advantage of the multi-spot autofocus capability, Spot AF Area exposure setting determines exposure based on a spot reading centered on the location designated as the autofocus target under the Focus Options menu.

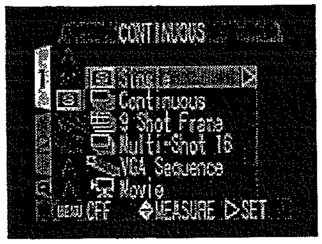
Other Features
We liked the fact that you can save up to three sets of user settings for focus, exposure, and other camera options, which can be a real time saver in rapidly switching between widely different sets of options. We also greatly appreciated the programmable Function buttons, which were designed to allow one handed operation of the camera. (These normally control exposure mode and exposure compensation, but can be reprogrammed to control macro/manual focus, flash settings, white balance, or metering options.) An Auto Bracketing feature brackets five steps (two above and two below) the set exposure value while the (amazing) Best Shot Select (BSS) takes several images and allows the camera to choose only the sharpest (least blurred) to be saved. Best Shot Select makes it feasible to hand-hold the camera for surprisingly long exposures. You can also check your own work immediately as the camera gives you a quick preview of the captured image (when shooting with the LCD monitor) and gives you an option to delete or save the image (this function can be turned off through the Setup menu, under Monitor Options).



Flash Exposure
The Coolpix 990's built-in five mode flash (Auto, On, Off, Red-Eye Reduction and Slow-Sync settings) gives you a lot of flexibility: Through the settings menu, you can adjust the flash power from -2 to +2 EV units (!), as well as completely deactivate it. The Slow-Sync option is useful when shooting subjects with dark backgrounds (such as night scenes) because the camera actually leaves the shutter open longer and then fires the flash before the shutter closes. This lets a good amount of ambient light in and can be used to get a nice motion-blur effect. The "Red-Eye Reduction" mode fires a pre-flash before the main exposure, to try to get people's eyes to "stop down", reducing the internal reflection from the back of their eyeballs. Unfortunately, this is one of the real weaknesses of the 990's flash system (and the 950 too): The flash tube is so close to the lens (as seen in the photo above) that there's essentially no way you aren't going to end up getting red-eye, regardless of how much you get people's pupils to constrict. While an external flash will avoid this, it's a shame to need one to achieve good results on basic

people-pictures. Keep in mind that the flash is automatically switched off when shooting in the Infinity focus mode; the Continuous, 16 Shots or VGA Sequence modes; when using the Best Shot Selector; using a lens converter; or when the AE Lock option is on. An external sync socket means you can connect a more powerful external flash, and the camera allows both external and internal flashes to work together. (The socket connects to Nikon Speedlight models SB-28, 28DX, 26, 25, 24 and 22.) If the 990's internal flash is anything like that of its predecessors', we should be extremely pleased with its performance. One puzzling note: The preliminary documentation we received from Nikon was self-contradictory, in it stated the flash's range as 2 meters (6.6 feet) in telephoto mode, but also gave it a guide number rating of 9/30 (m/ft). In our own tests, the flash worked fine out to a distance of 14 feet, the limit imposed by the dimensions of our test studio.

Continuous Shooting Mode



The Coolpix 990 offers several "motor drive" rapid-exposure modes for capturing quick sequences of images. Our information here is a little sketchy, as the modes on the prototype unit we tested didn't match those in the (equally prototype) documentation we received. Production cameras may behave quite differently than our prototype unit did. Our understanding of the production features is listed in the table at the end of this review section. The documentation showed five modes (Continuous, Multi-Shot 16, Ultra High-Speed Continuous, VGA Sequence and Movie), all selectable under the Continuous option of the settings menu. Our test unit didn't have the Ultra High-Speed setting, but had instead an option named "9 Shot Frame". (We're told that the 9 Shot Frame function may not be on the production cameras.) Several of the Continuous-mode options on our test unit appeared to be mis-labeled, so we'll just describe them using the names from the documentation, ignoring the spurious "9 Shot Frame" label.

The Continuous mode captures frames very quickly, at whatever resolution and image quality the user has selected. We measured continuous-mode frame rates at approximately 1.0 frames per second at full resolution (3 frames maximum in a sequence), 1.62 frames per second for a maximum of 8 frames at XGA resolution, and 1.72 frames per second for a maximum of 21 frames in VGA mode. We're not sure where the 9 Shot Frame mode's name came from: Probably due to a firmware bug, it actually did what we expected the Multi-Shot 16 mode to do: It subdivided the image area into 16 sections and captured a "mini-movie" of small images (400 x 300 resolution), which filled-in a 4x4 array within a single high-resolution image as the shooting progressed, at a rate of 2.0 frames per second on our prototype unit. The mode labeled "Multi-Shot 16" on our test unit actually captured a **long** series of VGA-resolution images at 1.76 frames per second. Depending on the subject characteristics (e.g., how well it would JPEG-compress), it captured 40-50 pictures at a time. (We imagine this will be the production "VGA Sequence" mode.)

The VGA Sequence captures a sequence of VGA-resolution frames, stored as separate files on the CF card, also at a very quick rate. (Maximum sequence length and capture speed are dependent on image information and available CF card space.) New to the 990 is the Ultra High-Speed Continuous mode, which captures approximately 30 frames per second, totaling about 80 QVGA-sized images (320x240 pixels). Finally, the Movie mode is another new feature for the 990 model. Movie mode captures up to 40 seconds of moving images without sound at approximately 15 frames per second (QVGA size). Movie mode worked quite well on our prototype model, especially when combined with the swiveling lens design (we could run the camera and swivel the lens back on ourselves to get into the picture).

Shutter Lag/Cycle Times

When you press the shutter release on a camera, there's usually a lag time before the shutter actually fires. This time is to allow the autofocus and autoexposure mechanisms time to do their work, and can amount to a fairly long delay in some situations. Since this number is almost never reported on, and can significantly affect the picture taking experience, we now routinely measure it, using an electronic test system accurate to 0.01 seconds.

The Coolpix 990 autofocus speed is about average, compared to other digicams we've tested (January, 2000), with a shutter lag of 1.13 seconds in full autofocus mode, 0.18 seconds when the lens is prefocused by half-pressing the shutter button, and 0.49 seconds in manual-focus mode. NOTE: Reader Bryan Biggers wrote in to report that a number of 990 owners have consistently measured shutter lag times of under 0.1 seconds in manual-focus mode. Unfortunately, we had already sent our test unit back to Nikon by the time we heard this, so couldn't repeat the test. We're pretty confident of our result though, since we (a) use an electronic test system that really couldn't produce an error of that magnitude, and (b) repeated this particular test several times, since we ourselves were surprised that the manual-focus delay was so long. We stand behind the number we measured, but given Bryan and others' experience, it's entirely possible that a modification was made in later production units. We tested a production model, but obviously one of the first off the line. A firmware change could easily account for this discrepancy. Thanks for the note, Bryan!

Shot to shot cycle time is very good though, at only 1.7 seconds for the first two shots in highest-quality JPEG mode, at which point the buffer memory is full and you have to wait something on the order of 7 seconds or so for it to empty. Lower resolutions increase the number ßof shots you can take in quick succession, and reduce the amount of time you need to wait for the buffer to clear again. At XGA resolution, you can shoot 7 frames at 1.62 second intervals, after which the next two frames will require 3 seconds each. If you continue shooting at maximum speed, the cycle time will alternate between 1.65 and 3.0 seconds indefinitely. We never found a maximum number of frames that filled the buffer in VGA mode, but it's something over 20. Cycle time in VGA mode was 1.65 seconds. (Note that all these cycle times were measured in manual focus mode: Autofocus mode would add about 0.6 seconds to the cycle times, to allow for focus-system operation.

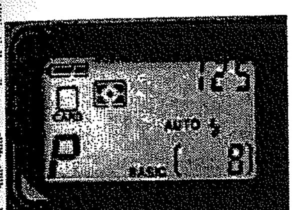
Frame rates in continuous mode also varied as a function of resolution (albeit only slightly), as did the number of exposures we could capture before waiting for the buffer to empty. In high resolution mode, we could capture 3 frames at roughly 1 frame per second. At XGA resolution, we captured 8 frames at 1.62 frames per second. At VGA resolution, we captured 21 frames at 1.72 frames per second. The "VGA Sequence" option captured 40 frames at a rate of 1.76 frames per second. The 16-shot mode captured 16 quarter-resolution frames at a frame rate of 2.0 fps.Ultra high speed mode captured 80 320 x 240 frames at 30 fps (saving the results as individual image files in memory), while the Movie mode also captured 320x240 frames at 30 fps, with the resulting motion sequence saved in a single MOV file. The table below summarizes our cycle-time measurements:

Capture Mode	Interval/ fps	No. of frames
Single-shot, 2048x1536	1.76 sec	2
Single-shot, 1024x768	1.62 sec	7
Single-shot, 640x480	1.65 sec	>20
Continuous Mode, 2048x1536	1.0 fps	3
Continuous Mode, 1024x768	1.62 fps	8
Continuous Mode, 640x480	1.72 fps	21
VGA Sequence	1.76 fps	40
16-Shot Mode (512x328)	2.0 fps	16
Ultra High-Speed Mode (320x240)	30 fps	80
Movie Mode	30 fps	40 secs (w/incl 16MB card)

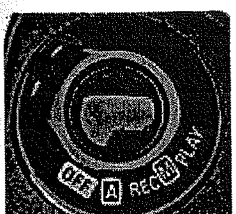
Operation and User Interface

As with the previous 950 model, we greatly appreciated the ease of the user interface on the Coolpix 990. The 950's interface was great, but the 990 goes quite a bit beyond it, making for what we feel is the best user experience in the industry. The LCD menu system is available for novices, or for less commonly-used controls, but experienced users will find they can make virtually all the most necessary adjustments without resorting to the LCD screen. Once you learn where the functions are, operation is quick and intuitive, thanks to the multiple control buttons and the excellent use Nikon makes of the black/white LCD readout. The inclusion of programmable Function keys simplifies operation even more, letting you assign common combinations of settings to a single key. Exposure compensation, exposure mode, ISO value, image quality and size, as well as focus controls (manual focus setting, macro, and infinity focus) and flash mode, can all be adjusted without the LCD. The small topside status display panel provides feedback for all these settings in a very clear fashion. When you do have to delve into the (very extensive) LCD menu system, navigation via the rocker toggle is easy, intuitive, and very rapid. In Record mode, the menu system is split into 3 pages of options(!), and a nice touch is the tabbed interface, by which you can jump between pages with only a few clicks of the rocker toggle, rather than having to scroll through every option to get to one buried on the second or third screen. Most of the camera's functions are controlled by a combination of hitting a button and turning the command dial. Functions that are accessed in this manner are delineated on the camera body with a very light purple lettering. This system makes it extremely fast and efficient to change settings without eating up too much battery power by using the LCD menu system. Control layout is also very logical, allowing one-handed operation for commonly-changed functions, requiring a two-handed approach only for manual focus setting, ISO, flash mode, and size/quality adjustment.

Control Enumeration

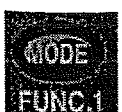


LCD Data Readout: Located on top of the camera, this readout displays status of a wide range of camera functions. More importantly, as noted above, you can manipulate and set most of these functions by using the camera controls and readout display together, letting you avoid the LCD menu system. This both saves power, and makes the camera functions much faster to navigate.



Shutter Button: Located on top of the camera and encircled by the Power/Mode dial, this button sets focus and exposure when halfway pressed and fires the shutter when fully pressed.

Power/Mode Dial: Also located on the top panel of the camera, surrounding the shutter button, this dial selects between Off, Auto Record, Manual Record and Play modes.



Mode/Func.1 Button: Located on the top panel, this button selects the exposure system mode (Program, Flexible Program, Shutter Priority, Aperture Priority and Manual) when held down while turning the command dial with the camera in Manual record mode. This button can also be programmed through the Setup menu to access various exposure functions with a single button actuation.

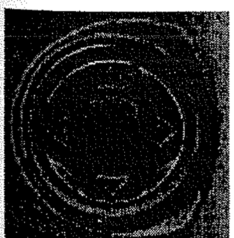
+/- / Func.2 Button: Located directly to the right of the Mode button, this adjusts the amount of exposure compensation (from -2 to +2 EV in 1/3 EV steps) when held down while turning the command dial. This button can also be programmed through the Setup menu to access various exposure functions.

Command Dial: Located on the top right of the camera, this dial is used in conjunction with various controls in Record mode to adjust exposure options. In Play mode, the dial cycles through the five information pages associated with each captured image, giving the user an unparalleled amount of information about the exposure (image information page, camera firmware page, image adjustment page, exposure histogram and focus confirmation).

Monitor Button: Located on the top of the rear panel of the camera, this button recalls or cancels the color LCD screen information display and viewfinder.

Menu Button: Located directly to the right of the Monitor button, this button pulls up the settings menu in all capture modes as well as in Play mode. Pressing it again cancels the menu.

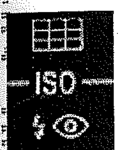
W and T Buttons: Located further to the right from the Menu button, these buttons control the optical zoom in all capture modes. Likewise, when the digital telephoto option is enabled, these buttons control the amount of digital zoom (from 1.1x to 4.0x). In single-image playback mode, pressing the "T" button repeatedly zooms in on the image (you can scroll around in the zoomed image by using the rocker toggle control). Pressing the "W" button cancels zoomed playback.



Rocker Toggle Control: Located on the right side of the LCD monitor, this button features four arrows that allow the user to navigate through the LCD menu system and make selections in Record and Play modes. We found menu navigation on the Coolpix 990 particularly straightforward, in that all menu actions are taken via the rocker toggle: There's no need to confirm a selection by *pressing a different* button. Different menu items are selected via the up/down arrows on the toggle control. Pressing the right arrow selects that item, generally taking you into a sub-menu. Pressing the left arrow takes you back out again. Once in a sub-menu, the up/down arrows again step between items, while a right-arrow selects. This process continues until you arrive at the final point of selection, upon which another right-arrow actuation makes that selection and returns you to the main menu. We were also pleased to see that we could left-arrow from the initial screen, to go to a set of tabs that let you quickly jump from menu screen one to two, or to the setup screen very quickly, without scrolling through all the menu entries first. All this takes much longer to describe than do: The 990's menu design and use of the rocker toggle made it by far the quickest system to navigate we've seen yet.

In Play mode, the right and left buttons scroll through captured images one at a time. As noted above, in zoomed playback mode, this control lets you scroll around within the enlarged image.

Manual Focus/Macro Button: Located directly beneath the LCD display, on the left side, this button has several functions. When held down while turning the command dial, this button controls the manual focus option in Record mode. Also in Record mode, this button (when pressed on its own) cycles through Infinity focus, Macro and Self-Timer modes. In Play mode, this button acts as the Delete command for the currently displayed image (designated by the trash can symbol). In a welcome addition, Macro and Self-Timer modes can be used at the same time, even though they're controlled by the same button. (As you cycle through the modes accessible with this button, one mode has both macro and the self-timer enabled simultaneously.)



Flash/ISO Button: Centered under the LCD panel, this button cycles through the flash modes (Auto, On, Off, Red-Eye Reduction and Slow-Sync). In Manual Record mode, this button cycles through the variable ISO settings (Auto, 100, 200 and dEF). In Play mode, this button pulls up a four or nine image index display of all captured images.

Quality/Size Button: Located directly to the right of the Flash button, this button cycles between image quality options (Basic, Normal, Fine and Hi) in all record modes. In any record mode, this button also cycles through the image size settings (3:2 2048 x 1360, VGA 640 x 480, XGA 1024 x 768 and 2048 x 1536) when held down while turning the command dial. In playback mode, if the currently-selected picture is a movie sequence, this button initiates playback of it.

Dioptric Adjustment Dial: Located directly beneath the optical viewfinder (on the underside of the lens half of the case), this small, black dial adjusts the viewfinder to accommodate eyeglass wearers.

Camera Modes and Menus

Automatic Record Mode: Accessed by turning the Power/Mode dial to the "A" setting, this mode puts the camera in charge of exposure and focus, but still leaves settings like flash, exposure compensation, size, quality and the self-timer under the user's control. Pressing the Menu button in this mode pulls up the following Setup menu:

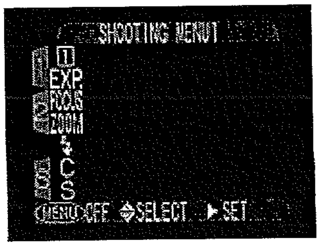
- **Folders**: pulls up a sub-menu that allows users to create, delete and rename image storage folders in separate groups (much like the 950). This also allows users to select which folder images will be saved to.
- **Monitor Options**: pulls up a sub-menu that allows users to adjust the brightness and hue of the LCD monitor display.
- **Shutter Sound**: turns the shutter sound on or off.
- **Auto Off**: allows users to set the auto-off delay to 30 seconds, one minute, five minutes or 30 minutes.
- **Seq. Numbers**: turns the file numbering sequence on or off as well as resets the current sequence.
- **Card Format**: Formats the CompactFlash card and erases all folders and images.
- **Date**: sets the camera's internal date and time.

Manual Record Mode: Accessed by turning the Power/Mode dial to the "M" setting, this mode offers several options for manually controlling exposure (Program, Flexible Program, Aperture Priority, Shutter Priority and Manual). Program puts the camera in charge of aperture and shutter speed, while the user can control things like white balance, motor drive, etc. Flexible does the same, but allows the user to select between various combinations of shutter speed and aperture settings. Aperture and Shutter Priority put the user in charge of either the aperture or shutter speed while the camera controls the other value. And finally, Manual lets the user control both aperture and shutter speed, independent of the camera's exposure system. All of these capture modes are accessible by pressing the Mode button and turning the command dial until the desired mode appears on the status display. Pressing the Menu button in this mode pulls up the following settings menus:

Screen One

- **White Balance**: pulls up a sub-menu with seven white balance options: Auto, White Balance Preset, Fine (Outdoors), Incandescent, Fluorescent, Cloudy and Speedlight (flash balanced).
- **Metering**: offers 256 Segment Matrix, Center-Weighted, Spot and Spot AF Area metering options.
- **Continuous**: offers six "motor-drive" options: Single exposure, Continuous Shooting, Multi-Shot 16, VGA Sequence, Ultra-High Speed, and Movie.
- **BSS**: turns the Best Shot Selector function on or off.
- **Lens**: lets the user select between Normal (built-in lens), Wide Adapter, Telephoto 1 (a 2x adapter), Telephoto 2 (a 3x adapter), Fisheye 1 and Fisheye 2 options to accommodate the specified accessory lens. As noted in the main review, the different options adjust various exposure and zoom setting options to best accommodate the chosen lens.
- **Image Adjust**: allows the user to further alter the image with options of Auto, Normal, More Contrast, Less Contrast, Lighten Image, Darken Image and Black & White. (See discussion under Exposure section of the review, above.)
- **Image Sharpening**: adjusts the in-camera sharpening to Auto, High, Normal, Low or Off.)

Screen Two



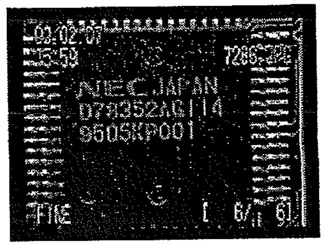
- **User Setting**: allows the user to save up to three different sets of user settings to be recalled at any given time (useful for quickly switching between groups of settings for different shooting scenarios).
- **Exposure Options**: allows the user to turn the AE Lock and Auto Bracketing on or off as well as adjust the exposure compensation. (While exposure compensation can be set from this menu entry, you would more commonly do so via the top-panel +/- button and function wheel.)
- **Focus Options**: selects between AF Area Modes (Auto, tracking/manual/center, or off), Autofocus Modes (Continuous or Single AF), Peaking (On, Off, Manual Focus only), and Distance Units (feet/meters) focusing modes.
- **Zoom Options**: allows the user to activate the digital telephoto, designate the startup position (wide, telephoto, or the last-used position, a feature we found particularly welcome). Also lets you select the Fixed Aperture option, which keeps the aperture fixed as the lens zooms. (This last useful for flash photography, with external strobe units.)
- **Speedlight Option**: allows the user to adjust the flash intensity (+/- 2EV unit range in 1/3 EV steps) and set up the internal and/or external speedlight options (both active or internal flash off).
- **Reset All**: resets all the menu options to factory defaults (it thankfully does give you an option to back out if you decide you want to).

Setup Screen

- **Folders**: pulls up a sub-menu that lets users create, delete and rename image storage folders in separate groups (much like the 950). This also lets users select which folder images will be saved to.
- **Monitor Options**: pulls up a sub-menu that allows users to adjust the brightness and hue of the LCD monitor display.
- **Shutter Sound**: turns the shutter sound on or off.
- **Controls**: allows the user to program the Function 1 and 2 buttons (Mode and -/+ buttons) to set up specific exposure functions. (VERY handy!)
- **Auto Off**: allows users to set the auto-off delay to 30 seconds, one minute, five minutes or 30 minutes.
- **Seq. Numbers**: turns the file numbering sequence option on or off as well as resets the current sequence.
- **Card Format**: Formats the CompactFlash card and erases all folders and images.
- **LED Shot Confirm**: turns the shot confirmation light on and off. (This is a small orange LED on the front of the lens housing that illuminates briefly after the shutter trips, as an indication that the shot has been taken. Useful for self-timer shots taken without flash.)
- **Date**: sets the camera's internal date and time.
- **Video Mode**: sets the video format to NTSC or PAL.
- **Language**: sets the camera language to German, English, French or Japanese.

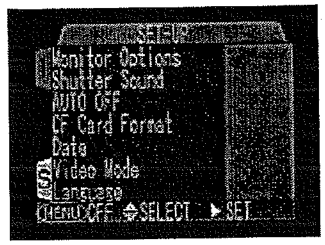
Play Mode: Accessed by turning the Power/Mode dial to the Play position, this mode allows users to view captured images and movies. The right and left arrow buttons scroll through images while the Delete and Index Display buttons (beneath the LCD panel) offer quick image deletion and display. Pressing the Menu button in this mode pulls up the Play settings menu:

Screen One



- **Delete**: lets the user delete a Selected Image, All Images, Erase Folder or Print Set. (A "Print Set" refers to the set of images currently marked for printing, using the DPOF (Digital Print Order Format))
- **Folders**: allows the user to create, delete or rename folders as well as select the playback folder from a list.
- **Slide Show**: starts a slide show playback of all images in a folder and allows the user to set the frame interval.
- **Protect**: allows the user to select individual images for write protection.
- **Hide Image**: allows users to hide selected images from view.
- **Print Set**: allows users to select individual images and mark them on the memory card for subsequent printing by a standalone printer. (This uses the standard Digital Print Order Format (DPOF) protocol.)

Setup Screen



- **Monitor Options**: pulls up a sub-menu that allows users to adjust the brightness and hue of the LCD monitor display.
- **Shutter Sound**: turns the shutter sound on or off.
- **Auto Off**: allows users to set the auto-off delay to 30 seconds, one minute, five minutes or 30 minutes.
- **Seq. Numbers**: turns the file numbering sequence option on or off as well as resets the current sequence.
- **CF Card Format**: Formats the CompactFlash card and erases all folders and images.
- **LED Shot Confirm**: turns the shot confirmation function on and off.
- **Date**: sets the camera's internal date and time.
- **Video Out**: sets the video format to NTSC or PAL.
- **Language**: sets the camera language to German, English, French or Japanese.

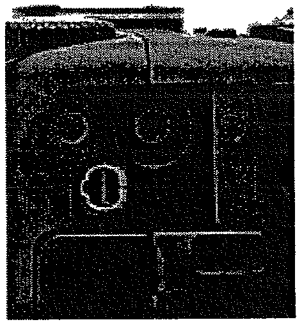
Image Storage and Interface

Like the 950 and the 900 before it, the Coolpix 990 uses CompactFlash memory cards for image storage, shipping with a 16 MB card. We suspect that most users will almost immediately want to purchase a larger card though, as 64 MB cards have become quite reasonable in price, and cards as large as 128 MB are currently available (February, 2000). We were glad to find the new location of the CompactFlash slot in the hand grip (the 950 model's slot was on the bottom of the camera, making it difficult to change cards while mounted to a tripod). The 990 also has a very nice, functional cover door for the CF card slot, a huge improvement over the 950's less-substantial arrangement.) The 990 includes several subtle niceties that make life a little easier, including a folder arrangement that allows users to organize images in the camera, a sequential frame counter option to avoid problems with overwriting files when copying them to your computer, some powerful in-camera tonal adjustment controls and the much appreciated Best Shot Selector option that automatically chooses the least blurry image, when shooting under difficult conditions.

Captured images can be individually write protected through the Play mode settings menu. Write protected files are only immune to accidental deletion, not card reformatting. File formats include several levels of compressed JPEG files as well as an uncompressed TIFF mode (Hi quality setting).

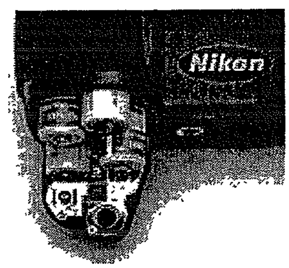
Resolution/Quality vs Image Capacity *(Included 16MB card)*	**Full Resolution**		**XGA Resolution**		**VGA Resolution**	
	Images	Approx. Compression	Images	Approx. Compression	Images	Approx. Compression
Uncompressed	1	1:1	-	-	-	-
Fine Quality	10	6:1	40	6:1	100	6:1
Normal Quality	20	12:1	79	12:1	187	12:1
Basic Quality	40	20:1	150	20:1	332	20:1

Video Out



One significant difference between the Coolpix 990 and its predecessors is that there now appears to be only a single international version of the camera, supporting either NTSC or PAL standards. The US version of the Coolpix 990 includes a video out jack and connection cable, defaulting NTSC-formatted video output. European models will doubtless support PAL timing and connections. You can switch between NTSC or PAL timing through a setting in the Setup menu. Connecting the video output provides a signal to an external device, without disabling the internal LCD display screen. All images that would normally appear on the LCD are also routed to the external video display so that the television screen becomes an enlarged version of the LCD monitor and can be used both for image playback and composition.

Power



The Coolpix 990 runs on four AA batteries, housed inside the hand grip, or an external AC adapter which plugs into the front of the camera. Nikon estimates about 1.5 hours of operating time when using the LCD monitor and four 1.5V LR6 (alkaline AA L40) batteries at a normal temperature of 68 degrees Fahrenheit. (We find this a trifle optimistic.) In our own tests, the Coolpix 990 prototype consumed about as much power as typical 2 megapixel digicams, despite the larger sensor and large SDRAM buffer memory. As always, we highly recommend keeping a couple sets of freshly charged rechargeable NiMH cells nearby. We should note here that the ability to switch the autofocus mode from Continuous to Single saves significant battery power. Enormous power savings are possible if you leave the LCD monitor off, and rely on the small top-panel readout when adjusting camera settings. Power consumption with the LCD screen turned off was very low indeed: You could easily run all day on a single set of batteries in this mode.

Operating Mode	Power Drain
Capture Mode, w/LCD	580 mA
Capture Mode, no LCD	<10 mA
Half-pressed shutter w/LCD	570 mA
Half-pressed w/o LCD	340 mA
Capture Mode, Continuous AF	640 mA
Memory Write (transient)	580 mA
Flash Recharge (transient)	1000 mA
Image Playback	370 mA

Included Software

As of this writing, Nikon had not yet finalized the software bundle for the 990. We'll update accordingly as the information becomes available.

Test Results

In keeping with our standard policy, our comments here are rather condensed, summarizing our key findings: For a full commentary on each of the test images, see the **Coolpix 990's "pictures" page**.

As with all Imaging Resource camera tests, we encourage you to let your own eyes be the judge of how well the devices performed: Explore the images on the **pictures page**, to see how well the Coolpix 990 performed, and how its images compare to other cameras you may be considering buying.

The first thing that struck us about the Coolpix 990 was how **sharp** its pictures were! The earlier Coolpix 950 showed excellent sharpness and detail, but the 990 clearly raises this performance to a new level. Resolution was the best we've seen out of the digicams we've tested to date (early March, 2000), although in fairness, we have a number of 3 megapixel models yet to go. We "called" the 990's resolution at 800-850 lines per picture height in both horizontal and vertical directions, with significant detail visible all the way out to 900-1000 lines. By comparison, the 950 tested out at about 800 lines horizontally (and a bit of a stretch at that), and 650-700 vertically. Overall, a significant step up in resolution, much more than we saw in digicams when going from the 1.5 to 2.1 megapixel level. (These numbers were obtained with the lens at its wide angle setting: Telephoto numbers were slightly lower, as is usually the case.)

Color was very good as well, with excellent saturation across the spectrum. The only weaknesses we could find were a slight tendency to undersaturation in bright yellow hues, and the (very common) problem with the tricky blues in the model's pants and flowers in the outdoor shots. (For whatever reason, many digicams tend to produce rather purplish hues in these colors, and the 990 fell prey to that tendency somewhat as well.) Overall color was very good though.

True to its heritage from Nikon's high-end film cameras, exposure accuracy and control were excellent in the 990. Nikon's apparently added a matrix-evaluating white balance function to the 990, making its auto white balance algorithm a bit more sure-footed. For really tough lighting situations though, we still found ourselves using the manual preset white balance option, a feature we **really** like to see in digicams we test. (Note to other high-end digicam manufacturers: This is a "must-have" feature for high-end prosumer cameras!) The addition of a true iris-based aperture in the 990 was a significant improvement over the 950's three-aperture system, and very welcome.

In our low-light tests, the Coolpix 990 did exceptionally well, producing usable but dark images in light levels as low as 1/16 of a foot-candles, and very usable ones at levels of 1/8 of a foot-candle. Noise was also quite low (camera was stabilized at a temperature of 70 degrees F (~21C) for these shots). For comparison, a well-lit city scene under typical modern street lighting corresponds to a level of about 1 foot-candle. The Coolpix 990 is a great low-light shooter!

As is the case with most digicams, the Coolpix 990's optical viewfinder shows less of the subject than the final image does, displaying a fairly typical 86% of the final area in wide angle and 88% in telephoto mode. The LCD viewfinder was almost 100% accurate though, a very welcome feature for shots involving critical framing (as so many of our test shots do).

Like the '950 before it, the Coolpix 990 is a spectacular macro performer, with a minimum area coverage of only 0.78 x 0.58 inches (19.69 x 14.77 mm). Combined with the 990's 3 megapixel resolution, the detail it can record is literally microscopic!

At the bottom line, the Coolpix 990 delivers a solid upgrade in image quality and resolution relative to the already-excellent Coolpix 950, with some of the best detail and sharpness we've seen yet in a digicam. (At least, as of early March, 2000.)

Conclusion

The Coolpix 990 is an exceptional follow-on to the already excellent Coolpix 950. The list of added features, options, and capabilities is too long to include in a brief conclusion, but suffice to say they're both extensive and eminently useful. Virtually every aspect of the camera's performance has been enhanced or extended, and the result is a true 3 megapixel powerhouse. Despite its incredible array of features though, its fully-automatic Auto record mode makes it easy enough for even the rankest amateur to use. (Set it in "Auto" mode, and hand it to your spouse with no worries or explanations.) For power users, the 990 sports one of the best-designed user interfaces we've had the pleasure to work with. Nikon clearly listened to users of the Coolpix 900 and 950 in developing the 990, and the results show: We're confident in predicting that this will be a **very** popular digicam, among both amateurs and professionals!

Reader Comments!

See what other Imaging Resource readers have had to say about the Coolpix 990, or add comments of your own. ***(Read what's here, then add your own!)***

For even more feedback, read the **User Reviews from PCPhotoREVIEW**

Reader Sample Images!

Do you have a Nikon Coolpix 990 camera? If you'll post an album of your samples that we can point to with a single URL (not all services permit this, some require you visit the main site and type a name and password) and email us at web@imaging-resource.com, we'll list the album here for others to see!

- Sample pictures from PCPhotoREVIEW readers
- Chris Arellano's CoolPix 990 album (Here's Chris's...where's yours?)
- Steve Schnoor's Sample Images
- Rex Steyskal's Sample Images - Very nice pictures taken at the Detroit Zoo! Also, if you go to his main album page, you can find tons of pictures for the CoolPix 950 album. Not what you were interested in, if you're visiting this page, but definitely worth taking a look!

For More Info:

View the Coolpix 990 Sample Pictures Page

View the Imaging Resource Data Sheet for the Coolpix 990

Visit the Comparometer(tm) to compare with other cameras.

Visit the Nikon home page for the Coolpix 990

Back to the Imaging Resource Digital Cameras Page

Or, Return to the Imaging Resource home page.

This page has been formatted to facilitate printout of the review.

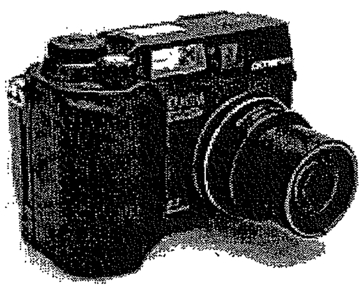
Use your browser's "Back" button to return to the previous page, or the links at the top and bottom of this page to navigate to related information. If you have difficulty fitting the text on this page onto your printer output, simply resize your browser window to a narrower width and print again.

Back to Full Olympus C-3030 Review
Go to Olympus C-3030 Data Sheet
Go to Olympus C-3030 Pictures Page
Up to Imaging Resource Cameras Page

Olympus C-3030

Olympus extends their popular high-end compact to 3.3 megapixels, adds sound to its movies!

(Review first posted 5/10/2000)



***3.14 megapixel resolution (3.34 megapixel CCD) for 2048 x 1536 images**

***Multiple exposure modes, including full manual**

***Total of 5 resolution modes, with uncompressed TIFF format available in all**

***Optional manual focus with distance readout on LCD screen**

***Sync connection for external flash unit**

***Movie recording with sound, up to 300 seconds in SQ (160x120) mode**

Manufacturer Overview

With one of the broadest digicam lineups in the industry, Olympus is a traditional camera manufacturer who's successfully making the transition to the digital era. A little over a year ago (this is being written in May, 2000) they introduced one of the first 2 megapixel digicams on the market, the C-2000 Zoom. It proved to be extremely popular, offering a compelling combination of features and excellent picture quality. They subsequently upgrade it with the C-2020 Zoom, a model offering improved functionality and user interface design. Now, they've extended the same basic (and successful) design to the three megapixel arena, with the C-3030 Zoom. The new model is again evolutionary, rather than revolutionary, but once again, Olympus appears to have listened to customer input and incorporated many of the most-requested features. Overall, the new camera is a very strong entry in the three megapixel arena, and should compete well in that market.

Highlights

- 3.34 megapixel (3.14 effective), 1/2 inch CCD delivering up to 2048 x 1536 pixel images.
- 1.8 inch, TFT color LCD display.

- 3x, 6.5 to 19.5mm lens (equivalent to a 32 to 96mm lens on a 35mm camera) with auto and manual focus.
- 2.5x digital telephoto.
- Apertures from F/2.8 to F/11.
- Shutter speed from 1 to 1/800 seconds in Auto exposure mode (16 to 1/800 in Manual).
- Variable ISO settings of Auto, 100, 200 or 400.
- Exposure compensation from -2 to +2 in 1/3 EV increments.
- Adjustable white balance with Auto, Clear, Cloudy, Tungsten and Fluorescent settings.
- Digital ESP (matrix) and Spot metering options.
- Program AE, Aperture Priority, Shutter Priority and Manual exposure modes.
- Movie recording mode with sound and shutter speeds from 1/30 to 1/10,000 seconds.
- Continuous Shooting, Auto-Bracketing, Black & White, Sepia and other special exposure modes.
- Built-in flash with Auto, Red-Eye Reduction, Fill-In, Off and Slow-Sync modes.
- External flash PC sync.
- 12 second self-timer with remote control.
- JPEG, uncompressed TIFF, Wave and QuickTime Motion JPEG file formats.
- Image capture on SmartMedia.
- USB and serial computer connections.
- Direct print capabilities with optional Olympus printer.

Executive Overview

A few months ago (early 2000), Olympus introduced the C2020 as a welcome upgrade to their previous C-2000 Zoom digicam: Olympus obviously listened closely to users, and implemented many of the most-requested features in the new model. Now, they've taken the same basic (successful) design and created the C-3030, giving it a larger, 3.3 megapixel CCD, sound recording capabilities and several other feature additions and user-interface improvements. The net result is very pleasing, certain to appeal to fans of the former models, or to anyone looking for a high-performance "prosumer" digicam. Design-wise, the C-3030 looks much like its predecessor, with the exception of its monotone black body (the C-2020 featured a silver and black design). The C-3030 retains the lightweight portability of its predecessor, easily slipping into a large coat pocket or purse. The only design complaint we have is the lens cap, which doesn't tether to anything and can be easily lost. It's a minor issue, but one we're compelled to harp on just the same: We've lost too many lens caps in our lives, and a tether strap is just too easy to add for manufacturers to have an excuse not to. On the plus side, we were glad to see that Olympus redesigned the previously awkward battery compartment cover. Now, you just slide a lock and then slide the cover open, without needing superhuman hand strength or more fingers than nature gave us.

The C-3030 offers a 3x, 6.5 to 19.5mm lens (equivalent to a 32 to 96mm lens on a 35mm camera) with both auto and manual focus options. This looks like it's physically the same lens as on the C-2020 Zoom, with the difference in focal length resulting from the slightly larger physical dimensions of the CCD. We were very happy to see the continuance of the distance scale that appears on the LCD when using manual focus, as it greatly helps in hard to focus situations. There's now also a handy focus-assist feature, whereby the LCD display zooms to a larger scale whenever you actuate the manual focus adjustment. Apart from the temporary "zoom" while focusing, the 2.5x digital telephoto is activated through the Record menu, preventing you from accidentally sliding into the digital zoom range, a feature we like to see. The C-3030 sports both optical and LCD viewfinders for composing images. As with its predecessors, power consumption is exceptionally low when the LCD is off, meaning you can leave the camera on all day without worrying about draining your batteries.

Exposure-wise, we appreciate the degree of control the C-3030 provides. Although many of the camera's settings rely on the LCD menu system, you can still set the flash, macro and metering options without resorting to the LCD. Unfortunately, changing the exposure compensation or altering other exposure settings requires accessing the LCD menu system. (In general, we prefer to see digicams that permit significant control via the top-panel data readout, rather than the LCD panel. This really helps to conserve battery power!) However, in Playback mode, functions like Delete, Write Protect and Print can now be controlled by pressing a single button (previously requiring use of the menu system). You get as much or as little exposure control as you want with the C-3030, via Program AE, Aperture Priority, Shutter Priority and Manual exposure modes. In all modes except for manual, you have an aperture range from F/2.8 to F/11 and shutter speeds from one to 1/800 seconds. In Manual mode, the shutter speed range extends to 16 to 1/800 seconds, giving you much longer exposure times. We liked the fact that, in all modes except Program AE, the camera indicates whether an exposure is going to be too dark or too light, giving you a chance to alter the exposure settings before snapping the picture. We also really like the on-screen display of the aperture and shutter speeds the camera has chosen.

White balance and exposure compensation offer the traditional settings and you have a choice between Spot and Digital ESP (matrix) exposure metering. Thus far, Olympus digicams haven't offered a "manual" white balance mode, and the C-3030 doesn't either. We really like to see manual white-balance options (also called "preset" or "one-push" white balance by some manufacturers), especially on cameras as advanced as the C-3030 Zoom. The built-in flash provides the standard Auto, Red-Eye Reduction, Fill-In and Off modes, but can be also combined with slow shutter speeds to achieve various low light exposures through the Slow-Sync setting. In slow sync mode, the flash may be synchronized with either the opening or closing of the shutter. There's also a sync socket for an external flash, which can be used either with or without the built-in flash. You can control flash exposure independently of that for ambient light, via the flash intensity setting, which is adjustable from -2 to +2 in 1/3 EV increments. Combine this with the variable ISO option (100, 200 or 400) and you get an excellent range of exposure control options, especially in low-light situations.

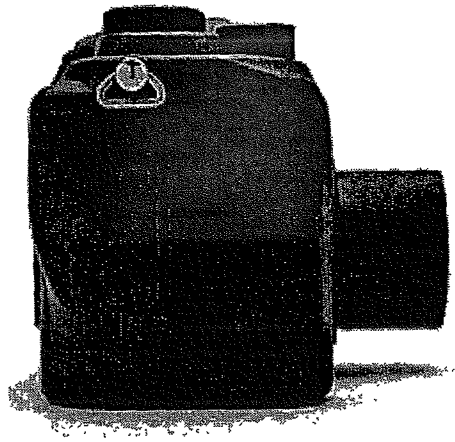
The Sequence, Auto Bracketing and Panorama shooting modes provide a nice range of exposure options and cater to a number of shooting situations. We also like the Picture Effects menu, which offers Black and White, Sepia, White Board or Black Board shooting modes, helpful in a variety of scenarios. A nice bonus on the C-3030 is the ability to record sound, both with movies and still images. This makes movies a little more interesting and can be really helpful in labeling still images. (The lack of sound recording in its movies was a frequent complaint we heard from owners of the earlier C-2020.) Do note though, that the C-3030 Zoom has no internal speaker, so you'll have to download your movies to a computer to hear the audio track.

The C-3030 offers a range of image resolution sizes, from 2048 x 1536 to 640 x 480 (five sizes in all) with a variety of quality settings. Files are saved as JPEGs with an option for uncompressed TIFF at all image sizes. Images are stored on SmartMedia cards and an 16mb card is packaged with the camera. The C-3030 supports both USB and the standard serial interface, accommodating both PC and Mac users. Additionally, an NTSC video cable means that you can play back movies and captured images on your television set, or even use the TV as an expanded LCD monitor for image composition. (European models come equipped for the PAL video standard.)

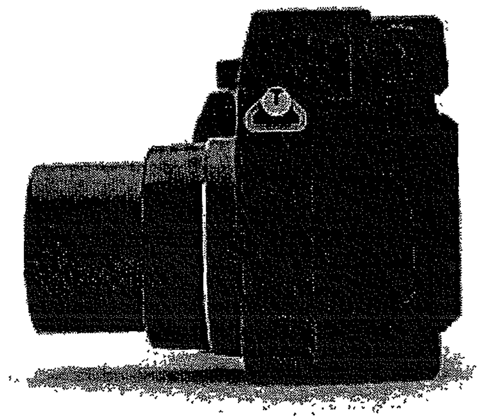
Overall, the C-3030 Zoom is a very worthy extension to the previous C-2020 Zoom: Combining lightweight portability, a 3.3 megapixel CCD, wide array of resolution choices, and excellent exposure controls, it's flexible, user-friendly, and high performance. We own a C-2020 Zoom and use it for all our product shots that appear on the web site: We have to confess to being sorely tempted by the new 3 megapixel C-3030 Zoom, even though our C-2020 is less than six months old. (This is an occupational hazard in the digicam world, where there's **always** something coming out better than the product you acquired just months before...) Whether you're entering the market for the first time, or upgrading from an earlier model though, the C-3030 Zoom presents a wealth of features and capabilities, and excellent image quality in the bargain.

Design
With the C-3030 Zoom, Olympus has kept the familiar lightweight, compact styling of earlier models in the line, but this time with an all black facade. In fact, it incorporates all the features of the C-2020 Zoom, but now with a 3.3 megapixel CCD and sound recording capability (not to mention a wider array of image resolution sizes). The very rugged plastic body gives the camera a low weight of 10.6 ounces (300.5g). Dimension-wise, the camera measures 4.3 x 3.0 x 2.6 inches (107.5 x 76.4 x 66.4mm), so it's easily stashed in a coat pocket or purse. Overall, the design is almost identical to the C-2020 Zoom, with the sole exceptions of a larger handgrip area and a much easier to operate battery compartment lid.

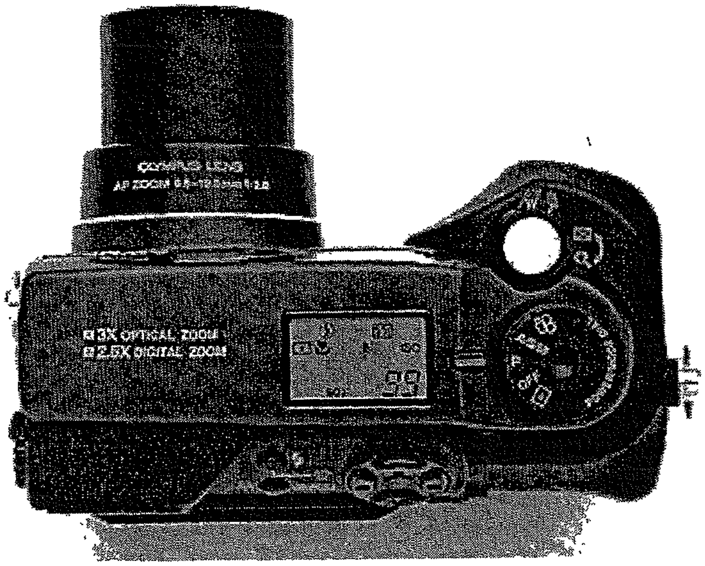
Aside from the monotone body, the C-3030 doesn't look too different from the previous C-2020. The front of the camera is relatively clean, featuring the telescoping lens, built-in flash, optical viewfinder front and the remote control infrared sensor. When fully retracted, the lens only adds about a quarter of an inch protrusion beyond the handgrip to the front of the camera. When the camera is turned on, the lens comes out of hiding and likewise retracts when the camera is switched off. A minor gripe here is that the lens is protected by a removable lens cap that doesn't have a tether or any place to attach one. While this isn't a big deal, lens caps have a habit of disappearing, so we like to see designs that either omit them, or provide some sort of tether.



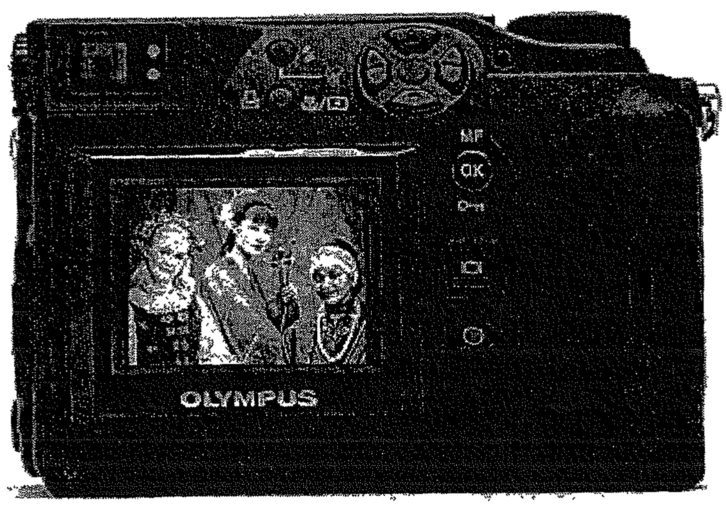
We're glad to see the continuance of the hefty handgrip on the side of the camera which holds the SmartMedia slot (beneath a snug plastic cover that snaps tightly into place). As noted above, the handgrip on the C-3030 Zoom is a little larger than that on the earlier 2020, making for a bit more secure grip.



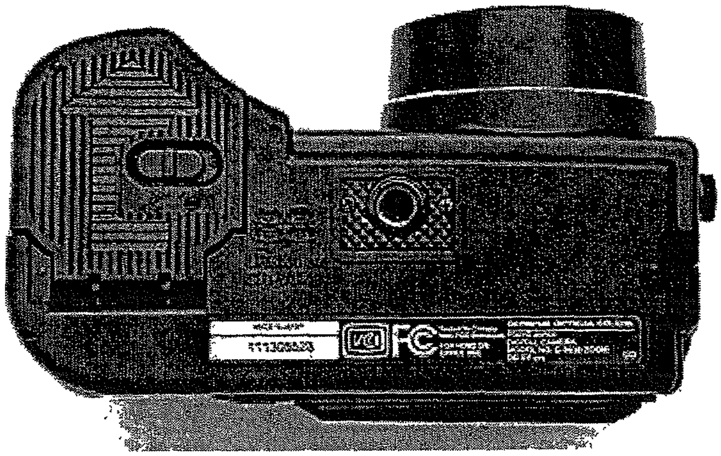
On the opposite side of the camera are the digital, AC and video input jacks, also protected by a snug plastic cover. The dioptric adjustment dial for the optical viewfinder and the external flash sync connector (notably, not a standard "PC" sync connector) are also on this side of the camera. Users will want to be careful with the flash sync cover, as it's tiny and can be easily lost.



Up top is a small information display panel, the mode dial, shutter release button and zoom control. The small information display reports many of the camera's exposure settings, but you still need to rely on the LCD for exposure compensation adjustments, aperture, and shutter settings. (Note to Olympus: Black & White readouts are cheap, both in terms of materials cost and battery power: We'd **really** like to see you make more use of them for routine operating controls!)

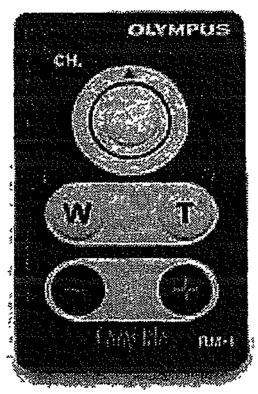


Most of the controls are on the back panel of the camera with the LCD monitor in the center. The flash and macro controls, arrow keys, manual focus, display and menu buttons live back here. There's also a small, red LED on the side closest to the SmartMedia slot that lets you know when the card is in use (and therefore not to open the slot).



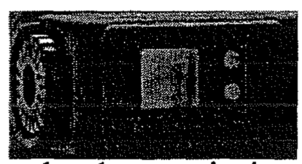
Both the locking battery compartment and plastic tripod mount are located on the bottom of the camera. Unfortunately, they are too close to each other to allow quick battery changes when the camera is mounted on a tripod. Frankly though, we don't know how Olympus could have gotten around that problem on this model, as the bottom of the camera body isn't wide enough to allow any leeway in this area and at the same time keep the tripod mount centrally located. We are glad to report that the battery compartment is now **much** easier to open than the previous design, as you just slide the lock and push the compartment door outwards as it flips open. (The previous model really required both hands to get it open without dropping the camera). A minor quibble on this part of the camera: The C-3030 Zoom uses a plastic tripod socket, albeit a replaceable one. Metal tripod sockets are the exception rather than the rule, but we really like the added durability that metal provides. Accordingly, we try to mention the tripod socket material in our reviews, as an encouragement to digicam makers to use metal more frequently.

We're also glad to see the return of the small infrared remote control which lets you trip the shutter, operate the zoom lens and scroll through recorded images in Playback mode. We really enjoyed this feature and the amount of freedom it gives. (We make continual use of the IR remote on our C-2020 Zoom in all our studio shooting: It's incredibly handy!)

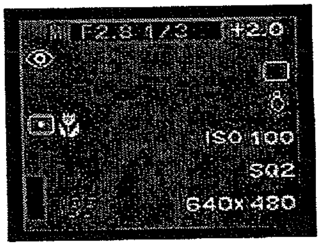


The tiny IR remote provides an amazing level of control without a "tether" connection.

Viewfinder



The C-3030 features both a "real image" optical viewfinder and an LCD monitor for image composition. The optical viewfinder has central autofocus crosshairs to help you line up shots and two small external LEDs that report whether or not the focus and/or flash is ready. There's also a small dioptric adjustment dial on the left side of the optical viewfinder, to assist eyeglass wearers, but the eyepoint is a bit lower than we'd like to see for use with glasses. The viewfinder zooms along with the lens, but naturally doesn't respond to the 2.5x digital telephoto, which is dependent on the LCD monitor.

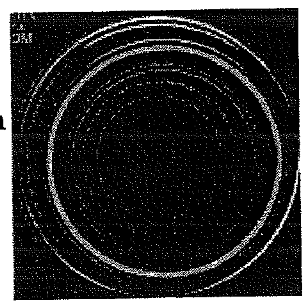


A 1.8 inch, TFT, color LCD monitor provides detailed feedback about the current exposure settings, showing the currently selected f-stop, shutter speed and exposure compensation in a row of numbers across the top. In Aperture and Shutter Priority modes, the aperture or shutter value appears continuously, along with the exposure compensation setting, while the second, automatically determined exposure value (either shutter speed or f-stop) appears whenever the shutter button is half pressed, triggering the autofocus and autoexposure systems. The same goes for Manual mode, except both values are displayed together. When the LCD monitor is turned on in record mode, some of the camera's exposure settings are listed as well, such as flash, exposure, etc.

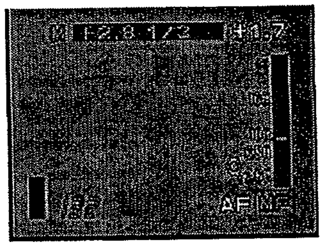
When using the LCD monitor to review captured images, you can actually zoom in on displayed images up to 3x, as shown in the screen shot at right. This is very handy for checking focus, small details or precise framing. When you're zoomed in, the jog dial buttons let you scroll around within the larger image. There's also the index display option, which displays either four, nine or 16 images at a time.

We found the C-3030's optical viewfinder to be a little tight, showing approximately 82 percent frame coverage at wide angle and about 81 percent at telephoto. (Note that we've changed our nomenclature on this to better reflect what you see looking into the viewfinder: We previously would have referred to the C-3030's viewfinder as "loose"...) These numbers are from the 2048 x 1536 resolution size but the smaller 640 x 480 resolution size numbers are similar at 83 percent accuracy for both wide angle and telephoto. We also noticed that the framing here slants just a little to the left vertically, possibly the CCD on our test unit was shifted a little. The LCD monitor proved to be much more accurate, showing about 97 percent frame coverage at wide angle and slightly over 100 percent at the telephoto setting. (The covered area at the telephoto end is just barely inside the darker lines we use to frame the viewfinder accuracy target). As with the optical viewfinder, the smaller, 640 x 480 image sizes weren't too far off from the larger ones (about 96 percent coverage at wide angle and just over 100 percent accuracy at telephoto). We generally like to see the LCD monitor as close to 100 percent accuracy as possible, so the C-3030 does a very good job in that respect. We also shot at the 2x digital telephoto setting (our studio isn't long enough to accommodate the full 2.5x), which probably would have produced close to 100 percent accuracy if framed properly. One problem with the digital telephoto is that framing is difficult because of the softer, slightly distorted image on the LCD. Additionally, the resulting image is somewhat soft, which is a usual side effect of the digital zoom.

Optics



The C-3030 Zoom comes with a 3x, 6.5 to 19.5mm, all glass aspheric lens (equivalent to a 32 to 96mm lens on a 35mm camera) with eight elements in six groups. This appears to be physically the same lens as in the C-2020 Zoom, with the wider-angle coverage being due to the larger size of the 3030's CCD sensor. Further evidence of the tight fit between lens and CCD is the set of small notches cut into the bezel around the lens' front element, to avoid vignetting in the corners of the final images. Despite the cutouts in the lens bezel though, we did notice a slight vignetting (darkness in the corners of the images) when the lens was set to its widest angle. This disappeared fairly quickly as we zoomed toward telephoto settings, but was noticeable in shots of flat-tinted subjects at full wide angle zoom settings. (We confess to being puzzled though, by the smaller f/2.8 maximum aperture of the 3030's lens, compared to the f/2.0 of the 2020.) Apertures can be manually adjusted in both Manual and Aperture Priority mode from F/2.8 to F/11, in 1/3 f-stop increments. The contrast-detect TTL autofocus system covers a range from 31 inches (0.8 m) to infinity in normal mode and from eight to 31 inches (0.2 to 0.8 m) in macro. The green LED next to the optical viewfinder lights solid when the autofocus system achieves a lock on the subject. Low light focusing performance is fairly good, with the camera able to achieve focus down to about 1 footcandle (11 lux, or about the brightness level of a well-lit nighttime street scene). Below that level, you'll need to resort to manual focusing.



A manual focus option is available by simply pressing the MF button on the back panel which displays a small distance readout to help you gauge distance (in meters or feet). The screen shot at right shows the focusing scale in manual focus mode. The up and down arrow buttons adjust the focus along the scale and pressing the MF (or OK) button again cancels the mode. We liked the fact that the distance scale displayed is split into two segments, one ranging from 2.6 feet to infinity, the other from 8 to 31 inches. This provides the necessary resolution to focus accurately, without forcing you to squint and guess at single scale ranging from 8 inches to infinity. One nice feature of the 3030's manual focus operation is that the LCD viewfinder display enlarges by about 2x whenever the manual focus setting is changed. This is very helpful in deciding whether you've achieved good focus or not. (Although it's still difficult to judge critical focus from an LCD panel.) Here's a trick though, for further improving your focus accuracy using the LCD screen: Activate the digital zoom function, to get an additional 2.5x magnification of the subject. Once you're focused, you can back the lens off to frame the picture accordingly. (Actually, we're not certain that the C-3030 Zoom's lens doesn't change focus as you zoom it, but this technique seemed to work fairly well for us.)

As with other Olympus cameras in this series (the C-2000 Zoom and C-2020 Zoom), the C-3030 Zoom has body-mounted threads that accept an accessory lens adapter, the CLA-1. This adapter is a small cylinder that gives you a set of 43mm filter threads just flush with the furthest forward extent of the lens when it telescopes out. NOTE though, that we said "just flush" - If you by chance were able to obtain an accessory lens or filter with 43mm threads on it, it wouldn't fit: You need a millimeter or so ahead of the adapter before the glass starts. This usually isn't a problem, since you'd almost always have a thread adapter tacked on the front of the CLA-1 anyway, the 43mm being such an odd size. Still, you can find 43mm accessories out there, so we thought we should at least mention this...

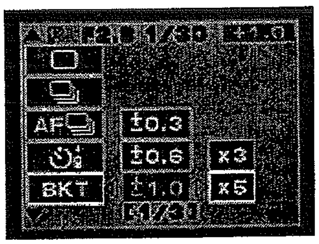
While the C-3030's lens provides up to 3x optical zoom, an additional 2.5x digital zoom can be activated through the Record menu, albeit with noticeable quality degradation in the resulting images at the larger image sizes. (The "digital zoom" options on all digicams simply crop into the CCD array to reduce the angle of view. They thus directly trade resolution for "magnification.") Note that the digital zoom cannot be used with the uncompressed TIFF mode and is only accessible with the LCD monitor on.

With a measured visual resolution of 850-900 lines per picture height in our resolution tests, the C-3030 Zoom is just a hair off the highest we've seen to date (May, 2000). Olympus deserves credit though, for not trying for a snappier-looking picture by over-sharpening the image in the camera. Our philosophy on image sharpening is that the capture device (camera, scanner, whatever) should do the bare minimum, compensating only for the blurring tendencies of its sensor. Once an image has been over-sharpened, detail is irrevocably lost and objectionable artifacts appear. To our eye, the C-3030 Zoom gets it about right, applying some sharpening, but not too much. Even at that, it offers a "soft" image-sharpening option that provides images without any in-camera sharpening, for those times when you need to perform critical manipulations on the image in Photoshop(tm) or other editing program post-capture.

The lens appears to be of good albeit not unusual quality, turning in fairly typical distortion and aberration numbers for lenses at the higher end of the consumer digicam spectrum: Geometric distortion on the C-3030 was moderate at the wide angle end, as we measured a 0.76 percent barrel distortion. The telephoto end showed a smaller, 0.29 percent pincushion distortion. Both numbers are about typical among digicams we've tested, but we do prefer to see lower distortion at the wide angle end. (Just to be clear, roughly 0.8 percent is pretty typical among digicams we've tested, we'd just like to see *all* digicams have lower barrel distortion.) Do note though, that there's an excellent, easy solution to barrel or pincushion distortion available, in the form of the optional "dewarp" plugin for our favorite image tweaker, PhotoGenetics. Read our review of PhotoGenetics for more details. Chromatic aberration was fairly pronounced at wide angle settings, with several pixels of color showing at the edges of elements in the corners of our resolution test target. At the telephoto end of the lens' range though, chromatic aberration was essentially invisible. (This distortion is visible as a very slight colored fringe around objects at the edges of the field of view on the resolution target). The chromatic aberration was more severe at the wide angle end than the average for cameras we've tested, while it was much better than average at the telephoto end. We also noticed some slight vignetting of the image in the very corners, at the widest-angle lens setting. This last disappeared pretty quickly though, as we moved the lens out of the wide angle position.

Exposure

Exposure control is similar to the setup of the C-2020 Zoom, with an LCD menu system that controls most of the camera's settings. Four exposure modes are accessible through the mode dial: Program AE, Aperture Priority, Shutter Priority and Manual. Shutter speeds in all modes except Manual range from one to 1/800 seconds. The range broadens under the Manual setting to 16 to 1/800 seconds. A useful added feature relative to the previous model is that as you scroll through the various aperture/shutter settings in manual mode, the camera's exposure system remains "live". The camera tells you how it judges the exposure setting you've chosen, showing not only whether it thinks you're high or low, but by how much. It does this by displaying what it believes the over- or under-exposure to be using the digits on the LCD screen that normally indicate exposure compensation in automatic exposure modes. If you're more than plus or minus 3 EV units away from the correct exposure, the digits light up red, showing just +/- 3EV. This is really very helpful as it gives you a good idea of what the exposure will be like before snapping the shutter. (Other manufacturers take note: This is a nice feature, and shouldn't be too hard to add, if a camera already has a manual exposure mode.)



Exposure compensation is adjustable in 1/3 EV increments from -2 to +2, in all exposure modes except for Manual, by pressing the right and left arrow buttons. Additionally, the auto exposure bracketing function ensures you'll get a correct exposure by automatically bracketing up to -/+ 2 EV in steps ranging from 1/3 to 1 EV unit. This feature lets you select either 3 or 5 shots in the series, and steps of 0.3, 0.6, or 1.0 EV units. Thus, the bracketing range could be as small as +/1 0.3EV, or as great as +/- 2EV. Once set, you just hold down the shutter button until all 3 or 5 exposures are captured. Very slick!

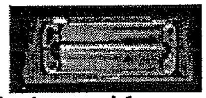
ISO is also adjustable, with available settings of Auto, 100, 200 and 400. The more sensitive settings do produce noisier images, but they provide welcome exposure flexibility. The default setting in Program exposure mode is Auto, whereas Aperture, Shutter, or Manual exposure modes force you to choose one of the explicit ISO settings. In Auto ISO mode, the camera will normally shoot at ISO 100, but will gradually increment the ISO setting in very dim conditions, trying achieve the best tradeoff between shutter speed and image noise. We're not sure what the thresholds are for increasing the ISO rating in Auto mode, but it does seem to be pretty conservative about it: In some brief experimentation, it arrived at a shutter speed of 1/2 second (pretty slow) in a dimly-lit interior scene, yet still only bumped the ISO up to 200. "Automatic" systems like this are always a compromise, but we felt the C-3030 Zoom was doing about what we would have most of the time. It's also interesting to note that the Auto ISO settings aren't restricted to the 100/200/400 available manually - At least one of our experimental shots showed an ISO setting of 180 in the playback picture-info display.

The C-3030 Zoom provides two choices for exposure metering, Spot or the default Digital ESP metering system. Digital ESP is Olympus' name for matrix metering, but we don't know the specifics of it, how many segments it uses, etc. - For those of you unfamiliar with the term "matrix metering", it refers to a sophisticated exposure-metering technique that samples the brightness from multiple points across the image, and then applies some intelligence to set the exposure so as to not blow out highlights, plug shadows, etc.

The C-3030 offers a 12 second self-timer. You can also use the infrared remote to trigger the camera from a distance, which decreases the time delay to only three seconds. (This is one of our few quibbles with the otherwise excellent IR remote unit: Why are we forced to wait three seconds when using the remote? We'd greatly prefer relatively instantaneous triggering of the camera!) White balance can be set to Auto, Clear, Cloudy, Tungsten or Fluorescent to accommodate a variety of lighting situations. White balance is another area where we have a request to make of Olympus: So-called "manual" white balance options are becoming more and more common on high-end digicams, and (properly implemented) they're very useful. Manual white balance options generally let you set the camera's white balance by pointing it at a white card and clicking the shutter (after appropriate menu setup, etc.) This usually provides a more accurate white balance than the automatic or preset options. The C-3030 Zoom is a sufficiently advanced camera that we'd expect to see a feature like this on it. Not a crippling omission by any means, but one that we think would be appreciated by the 3030's targeted audience of enthusiast-photographers.

The C-3030 Zoom incorporates a few entertaining options on the Picture Effect menu, enabling you to capture images in black and white or sepia tone. There are also White and Black Board settings for capturing text on light or dark backgrounds. These could be useful if you needed to grab meeting or lecture notes in a hurry. Oddly though, the resulting images, while purely black and white, are stored as RGB JPEGs, taking about the same amount of memory space as normal full-color images. This is rather odd: Overall, we'd strongly suggest just leaving the camera in color mode, and using a program like Pixid's White Board Photo to clean up the images later. (See our review of White Board Photo for more info on this unique program.)

Flash



The built-in flash on the C-3030 Zoom offers four main modes: Auto, Red-Eye Reduction, Fill-In and Off. According to Olympus' specs, the flash is effective out to 18.4 feet (5.6m) in wide angle and to about 12.5 feet (3.8 m) in telephoto. The internal flash provides good coverage in all but the widest-angle lens position: It's angle of coverage appears to correspond to a lens focal length more on the order of 35mm than the 32mm equivalent of the 3030. (Another holdover from the C-2020 Zoom?) You can adjust the flash intensity setting from -2 to +2 in 1/3 EV increments. Any of the flash modes can be combined with the Slow Sync setting, which allows the ambient lighting to make a greater contribution to the final exposure of the image. You can also produce shots which combine a motion blur on the subject (from the long ambient light exposure) with a sharp initial or final image (caught by the flash exposure). The C-3030 supports both "front curtain" and "rear curtain" triggering in Slow Sync mode, firing the flash at either the beginning of the exposure or at the end. So-called rear curtain sync is necessary to produce motion blurs on moving objects that trail the sharp, flash-exposed image, rather than precede it. A plus with the design of the C-3030 is the inclusion of an external flash sync socket, giving you even more exposure flexibility. It's important to note though, that the sync socket on the C-3030 is a proprietary design, set up for use with Olympus' FL-40 flash unit. Olympus apparently offers an accessory grip/cable combination that serves as an adapter for third-party flashes, but we don't know the model number or details on its availability.

To use an external FL-40 flash unit, the camera should be set to Aperture Priority or Manual exposure mode to control the amount of flash illumination reaching the CCD via the lens aperture setting (standard operating procedure for film cameras as well). The camera will attempt to produce a good exposure with its automatic settings, whether involving its own flash or not. Thus, if you've disabled its internal flash, you'll get a rather long exposure time in Aperture Priority mode, rather like the Slow Sync mode, whether you want that or not. Use Manual exposure mode with faster shutter speeds selected to avoid this problem. The C-3030 Zoom is unusual in that when you couple it to the FL-40 external flash, you have the option of using the internal and external flashes together. - This could be a bit of a help when you're really reaching for a distant subject, or for interesting bounce/direct flash lighting. The FL-40 also cooperates with the camera by allowing its power level to be controlled by the camera's flash exposure adjustment, mentioned above.

The manual is a bit unclear on using the 3030 with flash units other than the FL-40. To use any external flash (FL-40 or other unit), you do apparently need both the optional flash holder and flash cable. Info in the manual about third-party flashes is confusing and contradictory: In one place, it says the external flash must be used with the internal all the time. In another place, though, it says the external flash will always fire, regardless of whether flash is enabled in the camera or not. We'll seek clarification from Olympus, but here's what we think the case is: 1) The external flash will always fire, as the sync contacts are linked to the shutter, and not affected by the internal flash status. 2) Third-party flashes won't accept flash-metering information from the camera, meaning that you'll have to regulate the light either by running the flash in Auto mode and making whatever adjustments it provides onboard, or by essentially operating the flash in "manual" mode, controlling the exposure via the camera's lens aperture.

A few caveats about external flashes with the C-3030 Zoom, or digicams in general for that matter: 1) Some external strobes have the polarity reversed on their sync connectors, and won't fire. (Cameras these days use SCRs to trigger strobes, rather than mechanical contacts, and SCRs are polarity sensitive.) 2) Some flashes put their full voltage on the sync connector, which is virtually guaranteed to blow the inner circuitry of the camera. (!) Always check the voltage on your sync connector before plugging a non-manufacturer flash into your digicam! - If you find more than a few volts there, save yourself an expensive repair, and buy a flash with a lower trigger voltage. (Studio strobe packs are particularly prone to this: Use extreme caution before attaching one to your digicam!) 3) If you're going to be shooting at wide angle, make sure your flash will cover a field of view equivalent to a 32mm lens on a 35mm camera. (Most will, some won't.) 4) If you get unexpectedly dim shots when operating at full flash power (distant subjects or small apertures), it may be that your flash is producing a light pulse longer than 1/200 of a second (Olympus' spec), so not all the light from the flash may be contributing to the exposure.

We didn't test the FL-40 with the C-3030 Zoom, but did have an opportunity to use one earlier, when we reviewed the Olympus C-2500L SLR camera. You can read our review of the C-2500L for more info on how it worked with the flash: We suspect the story with the C-3030 would be much the same. (To save you clicking the link, the short of it was that we liked the FL-40 very much indeed, and found it worked exceptionally well with the C-2500L's internal flash.)

Sequence Shooting Mode

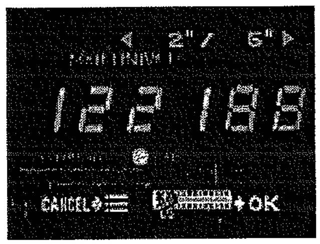
The C-3030 offers a Sequence mode that mimics a motor drive, letting you capture between six and 12 separate pictures (depending on the complexity of the image, selected image size/quality, and the available SmartMedia space) at approximately 1.4 frames per second. In our own measurements, we indeed measured a frame rate of 1.39 frames per second at all resolutions, in autofocus mode. We discovered though, that the non-autofocus mode increased the frame rate to 3.17 frames per second (!), since the camera didn't have to wait for the lens to focus each time. The manual states that the maximum shutter speed in sequence shooting mode is 1/30 of a second, to avoid blurring. (Seems odd, we suspect it has more to do with managing the timing of the shots, rather than a concern over camera shake.) It also notes that the mode is available with all compression levels except for uncompressed TIFF. One obvious limitation of sequence mode is that the camera's internal flash may not be used with it. (The flash can't cycle at nearly 1.4 frames per second.) However, if you have an external flash capable of cycling at the 1.4 frame per second rate and shoot in aperture priority mode, you can use a flash with this mode.

Movies and Sound

The C-3030 continues the ability to record short movies, now extended to include sound. Movie mode is entered as a separate option on the main command dial. Movies may be recorded in either HQ (320 x 240) or SQ (160 x 120) resolution modes. Thanks to the C-3030 Zoom's huge buffer memory, the maximum recording time is limited only by memory card capacity, apparently up to a 32 megabyte limit. (The manual lists maximum seconds of recording time as a function of card size, but just lists "Larger than 32 megabytes" as the highest category, implying that large cards convey no additional recording time. - This makes sense, given that 32 megabytes is the size of the RAM buffer memory the C-3030 Zoom carries on board.) Here's a copy of the recording-time table from the manual:

Recording Mode	Resolution	Memory Card Capacity				
		2MB	4MB	8MB	16MB	Over 32MB
HQ	320x240 (15 frames/sec)	5	11	23	46	75
SQ	160x120 (15 frames/sec)	22	45	92	186	300

The available seconds of recording time appear in the status display panel (and in the LCD monitor if activated), based on the quality mode selected and space remaining on the card. You can use the zoom control while recording movies, but the motion of the zoom is somewhat slower than in still recording, and the zoom is apparently only a digital zoom. (Not an issue though, given the large difference between the CCD resolution and movi recording resolutions - This means that digital zoom in movie mode has the same effect as optical zoom in normal still photography, in that no image degradation should be visible as a result of using the zoom.) Manual focus, exposure compensation, focus lock, the self-timer, ISO setting, white balance and picture effects are also available while in Movie mode.



A first among cameras we've tested (May, 2000), the C-3030 even offers in-camera "editing" of movies in Playback mode. This capability is accessed via the Function->Movie Edit option on the playback menu. In this mode (see screen shot above), you can scroll forward and backward in the movie, and set cut points at the beginning and end of the sequence. Movie content between the two cut points will be preserved, the rest discarded. In a nice touch though, Olympus allows you to choose whether to modify the original movie file, or just save a new copy of it, reflecting the effect of the edit you've made. A very nice feature that we're surprised we haven't seen before. (Kudos to Olympus for thinking of it first.)

You can also record small "sound bites" to accompany images (both in Record and Playback modes). You get approximately eight seconds of record time for each image, assuming of course that there's enough space left on the memory card. This is a handy feature for "labeling" photos.

The only quibble we have with Olympus' implementation of Movie mode on the C-3030 Zoom (and it's a significant one) is that you don't get to hear the movies you've recorded when playing them back on the camera. Adding sound recording is a big feature improvement relative to the C-2020 Zoom, but it sure would be nice to at least be able to hear what you've recorded during playback. (The camera can output both video and sound to a TV or VCR via the included A/V cable, making that an effective playback mode if you have a TV handly. Still, it would be preferable to have some ability to hear a movie's soundtrack without resorting to external equipment.)

Panorama Mode
As with most Olympus digicams, the C-3030 offers a Panorama exposure mode when operating with Olympus' own panorama-enabling SmartMedia memory cards. In this mode, the exposure and white balance for a series of shots are determined by the first one taken. Images are saved individually and can then be assembled on a computer after they've been downloaded. While Panorama mode provides a useful function, it's less of an issue on cameras like the C-3030, which offer full manual exposure control. True, the panorama mode does lock the white balance in addition to the exposure, and does provide outline guides on the LCD screen to help align successive images, but doesn't offer the "ghost" images provided by some cameras to further assist image alignment. (Cameras with this feature retain a small portion of the previous image each time, moved to the other side of the LCD display, to help you line up objects in the scene with those in the frame you just captured.) The C-3030's Panorama mode also limits you to 10 exposures in the series before resetting the white balance and exposure values. Ten pictures is plenty for most situations, but almost certainly not enough if you're interested in stitching full 360 degree panoramas. For those, use Manual exposure mode, and a fixed white balance preset, such as "daylight." Overall, Panorama mode on the C-3030 Zoom is handy, but less useful than it could be, and

in our mind largely obviated by the camera's manual mode.

Shutter Lag/Cycle Times

When you press the shutter release on a camera, there's usually a lag time before the shutter actually fires. This time is to allow the autofocus and autoexposure mechanisms time to do their work, and can amount to a fairly long delay in some situations. Since this number is almost never reported on, and can significantly affect the picture taking experience, we now routinely measure it.

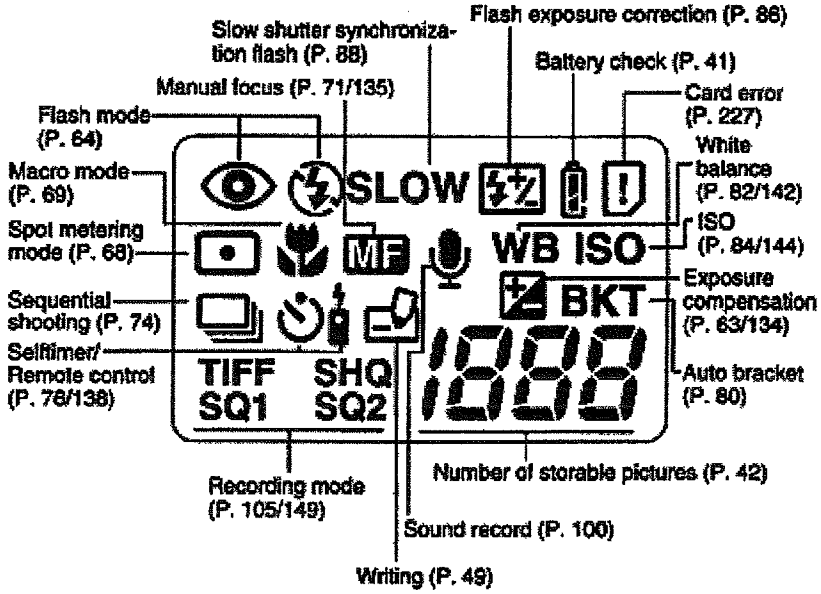
While the C-3030 Zoom is a very fast camera in other respects (see below), it's shutter lag in full autofocus mode is at the slower end of the range: We measured shutter delay at 1.40 seconds using full autofocus. The manual focus option brought the delay down to 0.48 seconds, and prefocusing by half-pressing the shutter button before the exposure dropped the delay to only 0.15 seconds. The camera does have a continuous autofocus mode, which we expected to decrease the shutter delay considerably, since the lens should more or less always be in focus at the time of the exposure. Unfortunately, this turned out not to be the case, with shutter delays in continuous autofocus mode being on the order of 1.15 seconds (varying from 0.9 to as high as 1.3 seconds: 1.15 seconds seemed to be typical of most shots.) The C-3030 Zoom's autofocus delay is longer than most cameras we've tested, manual focus delay is about average (among camera that offer a manual focus option), and the prefocus delay is shorter than average. (Do note though, that for sports shooting, the impact of the long autofocus delay may be considerably offset by the availability of a very fast continuous-shooting mode - see below.)

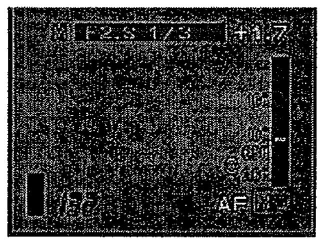
Thanks to an enormous 32 megabyte RAM buffer memory, the C-3030 Zoom is an unusually fast camera from shot to shot. We've heard claims that it can capture a shot every second, but our own evaluations fell a little short of that mark. The fastest single-shot (that is, non-continuous mode) shot to shot time we measured was with manual focus selected. In that mode, the C3030 Zoom could capture an image every 1.75 seconds in its lowest resolution mode, and every 2.2 seconds in high resolution (non-TIFF) mode. It's possible there may be some additional delay if you ever managed to fill up the buffer, but we never encountered this while using the 16 MB SmartMedia card supplied with our test unit. (We filled up the memory card in a about 16.3 seconds, capturing a total of 8 shots at maximum resolution.) In autofocus mode, the lens-focusing delay increased the cycle time by about 0.9 seconds, to 2.65 and 3.1 seconds, for the low and high resolution images respectively.

We mentioned the C-3030's high speed in continuous or "sequence" mode earlier. Sequence mode has two options, normal and autofocus. In normal sequence mode, the camera focuses and calculates exposure and white balance once, as soon as the shutter button is pressed. These settings are then held for the entire series of five rapid-fire shots. In our tests, that series of five shots happened very quickly indeed, clocked at a frame rate of 3.17 frames per second. This is seriously fast for full-resolution images! In autofocus sequence mode, the camera focuses and calculates exposure and white balance for each shot in the series. This doesn't slow it down as much as you might expect though, as the camera apparently only has to make minor adjustments to the focus from one shot to the next. The end result is a frame rate of 1.74 frames per second, a very respectable performance.

Operation and User Interface

The user interface on the C-3030 Zoom relies heavily on the LCD monitor for menu selections and feedback on current settings during use. The resulting interface will be pretty clear to most users, but we do wish there were an "advanced" mode that would make greater use of the top-panel LCD data readout. The camera's non-LCD power consumption is so low that it's a shame to spoil it by requiring the LCD to be used for all but the simplest option selections. The top-panel data readout does display status information for a wide range of camera functions (see the scan below, taken from the manual), but changing most of them requires returning to the rear-panel LCD display. Her's an illustration showing the various elements of the top-panel LCD readout, courtesy of Olympus:

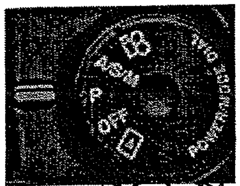




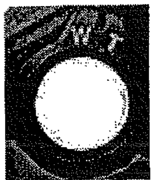
As with the C-2000 and C-2020, we liked the user interface of the C-3030 a great deal. We generally prefer mode dial interfaces like the C-3030's, as they greatly simplify the menu structure and allow faster operation. One of our favorite user interface features is that the camera tells you what aperture and shutter speed it's selected whenever the shutter button is half pressed. For photographers accustomed to knowing what their camera is doing, this sort of feedback is invaluable, and present on very few digicams we've tested. We also especially like the distance display employed in the manual focus option: Too many digicams with manual focus options give you no feedback as to the actual distance the focus is set to. In situations where there's too little light to see the subject well (or when the subject perhaps isn't in position yet), an actual distance readout is invaluable. We also liked the way the manual focus indicator has two ranges, one running from 2.6 feet to infinity, the other from 8 to 31 inches. This makes it much easier to set the focal distance accurately.

As mentioned earlier, we really like the tiny infrared remote control provided with the C-3030 Zoom, as it greatly reduces any disturbance of the camera when taking long exposures on a tripod. (This IR remote has been a feature in the Olympus line since the original C-2000 Zoom, and we've used it heavily in our own studio work, taking product shots for use on our web site.) The remote also allows you to change the exposure compensation setting or zoom the lens in and out. In Playback mode, you can scroll between pictures and move in or out of thumbnail and zoom playback modes (also helpful when viewing images on a television screen). Olympus states the range of the remote as five meters (16.4 feet) when aimed at the camera from straight ahead, and three meters (9.8 feet) when aimed from an angle of 15 degrees to either side of center. These range numbers may be correct in outdoor conditions, with lots of stray IR from the sun bouncing around: In practice, under studio conditions, we've had great luck at what seem to be greater distances, even bouncing the IR signal from the remote off the subject. A very, very handy gadget in the studio, perhaps even more so for those photographers working with children or other subjects requiring a lot of hands-on interaction. (You could connect the camera to a video monitor as a "remote viewfinder", and control most of the picture-taking from the remote.)

Control Enumeration



Power / Mode Dial
Located on the top of the camera, this dial selects the various camera operating modes (Playback, Off, Program, Aperture/Shutter Speed/Manual and Movie). As on the C-2020 Zoom, this dial also controls power, eliminating the frequent confusion between the power button and shutter release that plagued owners of the original C-2000 Zoom camera.

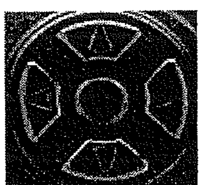


Shutter Button
Located in the center of the optical zoom control lever, the shutter button sets focus and exposure settings when halfway pressed and triggers the shutter button when fully pressed. In Playback mode, the shutter button works in conjunction with the printing function to select the number of prints to make.

Zoom Lever
Located on top of the camera, surrounding the shutter button (see photo above), the zoom lever controls the optical zoom in all exposure modes. In Playback mode, the lever switches back and forth between index view, normal image display and playback zoom.

Flash / Erase Button
Located at the top of the back panel, this button controls the flash mode in all exposure modes. Pressed sequentially, it cycles through Auto, Red-Eye Reduction, Fill-In and Off modes. In Playback mode, this button pulls up the Erase menu which allows you to erase the current image displayed or all images.

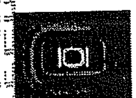
Macro / Spot Metering / Print Button
Directly beneath the Flash / Erase button on the back panel is the Macro / Spot Metering / Print button. In all exposure modes, this button cycles between Macro, Spot and Digital ESP metering modes. In Playback mode, it accesses the Print screen, which allows you to set up the individual images for printing. (While we haven't reported on it, the print-setup function on the C-3030 Zoom is **much** more powerful than we've seen in other cameras to date (May, 2000), even allowing you to specify cropping for each picture!)



Four Way Jog Dial
Not really a "dial", but rather a set of four pushbuttons, arranged in a circular layout. Olympus moved to the four buttons on the C-2020 Zoom, from the rocker-button design of the C-2000 Zoom. The four buttons are **much** more sure-footed to navigate than the earlier toggle design, in that you never have

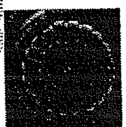
problems of inadvertently actuating more than one direction control at a time. Also located on the top of the back panel, a lot of the camera's operation revolves around this control. In all capture modes except Manual, a left/right actuation increases or decreases the exposure compensation setting (provided the LCD view screen is active). In Aperture or Shutter priority exposure modes, up/down actuation of the jog dial adjusts the setting of the lens aperture or shutter speed, depending on the mode you're in. In Manual mode, the up and down arrows control shutter speed while the left and right control aperture. In Playback mode, left/right actuation moves forward or back among the pictures in memory, or scrolls around the expanded image in zoomed playback mode. In the LCD menu system, the jog control steps between menus and selects settings.

OK / MF Button
Located on the back panel, on the right side of the LCD monitor, this button confirms selected menu settings when in the LCD menu screen. If pressed when not in the menu, it activates the manual focus option, which pulls up a distance scale on the LCD to assist in focusing. In Playback mode, this button write protects individual images from being accidentally erased. (Note though, that "protected" images aren't preserved if the memory card is formatted!)



Display Button
Located beneath the OK button, this turns the LCD monitor on or off.

Menu Button
Located directly beneath the Display button, this activates the menu system on the rear panel LCD monitor (it also activates the LCD monitor if it was disabled).



Dioptric Adjustment Dial: Located on the left side of the optical viewfinder, this dial alters the optical viewfinder to accommodate eyeglass wearers.

Camera Modes and Menus

Movie Mode
Accessed by turning the mode dial to the movie camera symbol, this mode allows you to capture up to 60 second SQ movies and up to 15 second HQ movies with sound. Shutter speed is automatically set anywhere from 1/30 to 1/10,000 seconds.

Aperture Priority: Accessed by turning the mode dial to the A/S/M symbol, and then selecting the "A" option from the A/S/M Mode setup submenu, this mode allows the user to select the desired lens aperture as the camera adjusts the shutter speed to achieve the correct exposure. If the required shutter speed is beyond the camera's capabilities, the aperture status number in the LCD *will flash* and an arrow will indicate if under or over exposed.

Shutter Priority: Accessed by turning the mode dial to the A/S/M symbol, and then selecting the "S" option from the A/S/M Mode setup submenu, this mode allows the user to select the desired shutter speed while the camera adjusts the aperture to achieve the correct exposure. If the required aperture is beyond the camera's capabilities, the shutter speed status number in the LCD will flash and an arrow will indicate whether it's over or under exposed.

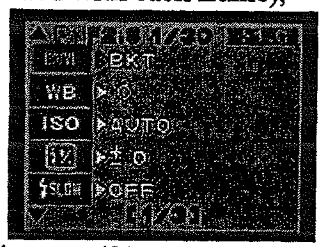
Manual Mode: Also accessed via the A/S/M setting on the mode dial, and then selecting the "M" option from the A/S/M Mode setup submenu, Manual mode allows the user to select both the desired aperture (F/2.8 to F/11) and shutter speed (16 to 1/800 seconds, depending on the ISO setting). As noted earlier, the camera tells you what it thinks of the exposure setting you've chosen, showing not only whether it thinks you're high or low, but by how much. It does this by displaying what it believes the over- or under-exposure to be using the digits on the LCD screen that normally indicate exposure compensation in automatic exposure modes. If you're more than plus or minus 3 EV units away from the correct exposure, the digits light up red, showing just +/- 3EV.

Programmed Exposure: Accessed by turning the mode dial to the P, this mode lets the camera select both shutter speed and lens aperture, but does so in a fairly intelligent manner, opting for faster shutter speeds when the lens is in the telephoto position than when it's working in wide angle mode.

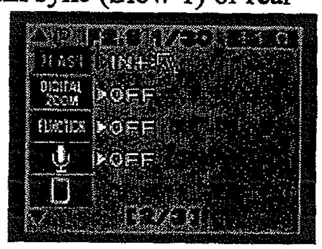
Playback Mode: Accessed by turning the mode dial to the playback symbol, this mode allows the user to view previously captured images. Here, the jog dial advances between successive frames stored in memory. The zoom toggle switches the display to an index mode when moved in the wide angle direction and zooms in on the currently displayed image by 3x when moved in the telephoto direction. When zoomed in on an image, the jog control can be used to move the enlarged view around the full image area, letting you inspect all parts of it.

Capture Mode Menu

- **Drive**: selects between One-Shot, Sequence, AF Sequence (exposure metered with each frame), Self-Timer/Remote and Auto Bracketing.

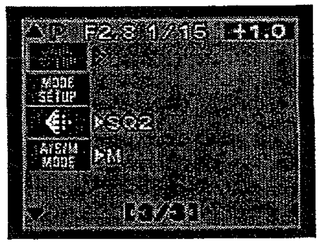


- **White Balance**: selects between Auto, Clear, Cloudy, Tungsten and Fluorescent white balance options.
- **ISO**: sets the ISO at Auto, 100, 200 or 400.
- **Flash +/-**: adjusts the flash intensity from -2 to +2 in 1/3 EV increments.
- **Slow**: accesses the camera's slow-sync mode with options for front-curtain sync (Slow 1) or rear curtain sync (Slow 2)



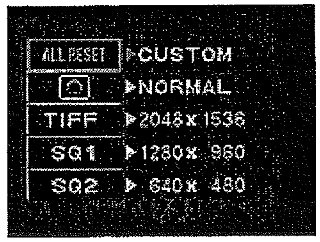
- **External Flash**: sets the camera either to use both the internal and external flashes or just the external.
- **Digital Zoom**: turns the 2.5x digital telephoto feature on or off.
- **Function (Picture Effect)**: allows the user to shoot in Black & White, Sepia, White Board or Black Board modes.
- **Sound**: activates the sound recording function.
- **Panorama**: activates the panorama mode (only enabled with Olympus SmartMedia cards).

- **Card Setup**: formats the SmartMedia card.
- **Mode Setup**: pulls up the mode submenu (shown below)
- **Quality**: sets image quality at TIFF, SHQ, HQ, SQ1 or SQ2.
- **A/S/M**: sets the exposure mode at Aperture Priority, Shutter Priority or Manual.

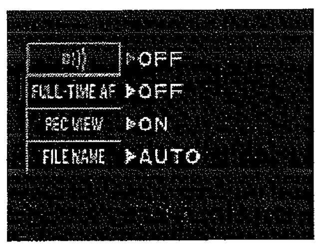


Mode Setup sub-menu (Capture Modes)

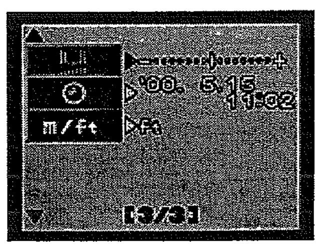
- **All Reset**: turns the all reset function on or off (on resets all settings to factory default whenever the camera is turned on). A new option on the C-3030 is the "Custom" selection here. This takes you to a five screen (!) sub-menu, letting you select default settings that will be selected whenever the camera is powered up. Settable options include flash mode, macro/spot combinations, lens zoom setting (conveniently expressed in 35mm-equivalent terms), f-stop, shutter speed, exposure compensation, manual/auto focus, LCD on/off, "drive" (single, continuous, remote/self-timer, or bracket modes), white balance, ISO, flash exposure compensation, slow sync flash mode, internal/external flash enable, digital zoom, image functions (black/white, sepia, etc), sound recording, still-mode resolution, A/S/M mode, movie-mode resolution, and info display enable.(Whew! - Basically any function of the camera can be programmed to be automatically set up when the camera powers-on. Note though, that some settings will depend on others: If the camera is set to default to aperture-priority mode, the shutter speed will adjust as required, based on the preprogrammed aperture value. Only if manual mode is preselected will the preprogrammed values for both the shutter speed *and* aperture be used.)



- **Sharpness**: sets image sharpness to Hard, Normal or Soft.
- **TIFF**: sets the TIFF resolution size to 2048 x 1536, 1600 x 1200, 1280 x 960, 1024 x 768 or 640 x 480.
- **SQ1**: sets the SQ resolution to 1600 x 1200 or 1280 x 960, High or Normal.
- **SQ2**: sets the SQ resolution size to 1024 x 768 or 640 x 480, High or Normal.
- **Volume**: sets camera volume to Off, Low or High.
- **Fulltime AF**: turns continuous autofocus on or off. Use in situations requiring slightly faster shutter response. Don't use if battery life is critical. In fast-action situations (sports, etc), use Sequence mode to rapidly shoot multiple frames, then discard unneeded shots.
- **Record View**: turns the instant image review function on or off.
- **File Name**: resets file numbers with each new card or continues in sequential order.

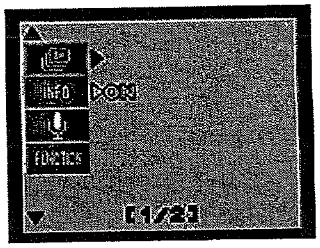


- **LCD Brightness**: adjusts the brightness of the LCD.
- **Date/Time**: sets the camera date and time.
- **M/Ft**: sets manual focus distance display to meters or feet.



Playback Menu

- **Play**: activates a slide show display for still images or plays back movies.
- **Info**: turns the image information display on and off.
- **Sound**: activates the sound recording function.
- **Function**: for use with Olympus special function cards.



- **Card Setup**: formats the SmartMedia card.
- **Mode Setup**: brings up the following submenu:
  - **All Reset**: turns the all reset function on or off (on resets all settings to factory default on power-up), or select a preset group of Custom settings (as described above under the capture-mode setup menu).
  - **Volume**: sets annunicator beep volume to Off, Low or High.
  - **Index Display Adjustment**: sets index display to four, nine or 16 images.
  - **Brightness**: adjusts the LCD brightness.
  - **Date/Time**: adjusts the camera's date and time setting.

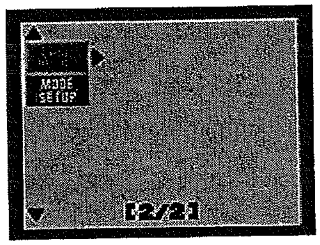
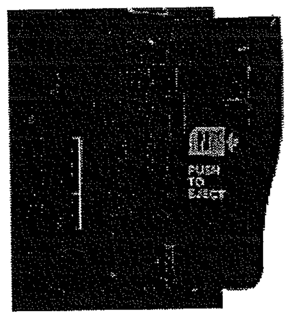


Image Storage and Interface



The C-3030 uses SmartMedia memory cards and comes packaged with a 16 megabyte card. You can upgrade to sizes as large as 64 megabytes. (From third parties, anyway: As of this writing in May, 2000, the largest card sold by Olympus themselves was a 32 meg unit. SmartMedia cards as large as 128 megabytes are planned by the end of 2000.) We like the C-3030's file naming protocol, which optionally numbers each image shot with the camera progressively, also including the month and day at the beginning of the file name. (This last is really handy for those of us who are organizationally-challenged: You can immediately tell when your photos were taken, even if you never took time to organize them by date or event.)

Entire SmartMedia cards can be write protected by placing a write protection sticker over a specific spot on the card. Stickers can only be used once and must be clean to be effective. (We're not wildly enthusiastic about the write-protect capabilities of SmartMedia cards.) Additionally, the C-3030 allows you to write protect individual images by pressing the MF/OK button on the back panel while in Playback mode. It's important to note that write-protecting individual images does not prevent them from being deleted when the card is reformatted, though.

The C-3030 comes with interface software and cables for both Mac and Windows computers, namely, a cable for the super-speedy USB interface, as well as a standard serial cable.

Following are the approximate resolution/quality and compression ratios for an 8mb card (compression numbers based on our own computations):

Resolution/Quality vs Image Capacity	2048 x 1536		1600 x 1200		1280 x 960		1024 x 768		640 x 480	
	Images	Approx. Compression	Images	Approx. Compression	Images	Approx. Compression	Images	Approx. Compression	Images	Approx. Compression
Uncompressed Quality	0	0:0	1	1:1	2	1:1	3	1:1	8	1:1
SHQ	3	4:1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fine Quality	10	12:1	5	4:1	8	4:1	13	4:1	32	4:1
Normal Quality	N/A	N/A	16	12:1	24	11:1	38	11:1	82	9:1

And here's a more comprehensive list, showing capacities of different-sized cards. (Extracted from the C-3030 Zoom's manual.

Number of Still Pictures that can be Taken (without sound)

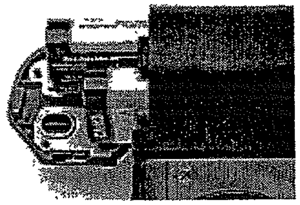
Recording Mode		Number of Pixels	File	Memory Capacity					
				2MB	4MB	8MB	16MB	32MB	64MB
TIFF		2048 X 1536	TIFF	0	0	0	1	3	6
		1600 X 1200		0	0	1	2	5	11
		1280 x 960		0	1	2	4	8	17
		1024 x 768		0	1	3	6	13	27
		640 x 480		2	4	8	17	34	68
SHQ		2048 X 1536	JPEG	0	1	3	6	13	27
HQ		2048 X 1536		2	4	10	20	40	81
SQ1	**HIGH (quality)**	1600 X 1200		1	2	5	11	22	45
	NORMAL			3	7	16	31	64	128
	HIGH (quality)	1280 X 960		2	4	8	17	34	70
	NORMAL			5	12	24	49	99	199
SQ2	**HIGH (quality)**	1024 X 768		3	6	13	26	53	107
	NORMAL			9	18	37	76	153	306
	HIGH (quality)	640 X 480		7	16	32	66	132	266
	NORMAL			20	40	82	165	331	665

Video Out

The C-3030 has a video-out port which supports the NTSC timing format on US and Japanese models (we assume that the PAL standard is supported on European models). The video output can be used for reviewing previously shot images or running slide shows from the camera, but also shows all the LCD menu screens as well as the preview display from the LCD viewfinder. Combined with the very flexible infrared remote control we mentioned earlier, the availability of a live viewfinder display via the video signal opens interesting possibilities for portrait photography, using a video monitor as a remote viewfinder.

Actually, the output cable is a true A/V cable, as it fans out into two RCA jacks, one for video, and one for audio. As noted above, this is the only way to hear the sounds you've recorded directly from the camera, since there's no internal speaker. Plugged into any video monitor (or TV with direct video and audio inputs), the audio capabilities of the C-3030 Zoom make for an unusually effective portable presentation device.

Power



The C-3030 is powered by four internal AA Ni-Mh, Ni-Cd, alkaline or lithium batteries or two CR-V3 (Olympus LB-01) batteries. The camera ships with two of the new CR-V3 batteries in the box, but no rechargeable batteries. Do yourself a favor, and don't even use the CR-V3s in the camera, but instead put them immediately into your camera bag as a backup power source for such time as your rechargeable batteries (inevitably) are dead when just when you need them the most. Go out and buy a couple of sets of high-capacity NiMH rechargeable AA cells and a good-quality charger, and plan to use these for the main power source of the camera. The CR-3V lithium cells provide great battery life, and more or less indefinite shelf life (something like 5 years or so) in your camera bag. They thus make an absolutely excellent backup power source that'll always be ready when you need it. For routine use though, they're just too expensive, at something like $10 apiece. (A pair? - no matter, still way too pricey, IOHO.)

Earlier cameras in this series from Olympus (the C-2000 Zoom and C-2020 Zoom) were surprisingly efficient in their battery usage, particularly if you kept the LCD display screen turned off. The C-3030 Zoom continues this happy tradition: It's "idling" power in capture mode with the display off is almost nil, meaning you can comfortably leave the camera on all day, so it'll always be ready whenever you want to take a picture. This is a very nice feature, and really increases its usefulness. Despite this thrifty battery usage, we still strongly recommend that you pick up a couple extra sets of high-capacity rechargeable batteries and a decent charger. Here's a table showing the C-3030's power consumption in a variety of operating modes. (Overall, it has very good power efficiency for a three megapixel camera: A good set of NiMH AA cells should easily last for a full day's shooting, if you can just avoid the temptation to ogle your pictures on the LCD monitor.)

Operating Mode	Power Drain
Capture Mode, w/LCD	610 mA
Capture Mode, no LCD	< 10 mA
Half-pressed shutter w/LCD	620 mA
Half-pressed w/o LCD	340 mA
Memory Write (transient)	590 mA
Flash Recharge (transient)	(not measured)
Image Playback	460 mA

Memory Retention
We don't normally comment about memory retention in digicams (clock/calendar, settings, etc), but at least one other internet reviewer has knocked the C-3030 Zoom for losing its memory if the batteries are removed for more than an hour or so. So much has been made of this in various discussion forums and newsgroups that we felt compelled to comment. While it is certainly convenient for cameras to have a separate lithium battery to provide backup power to the clock/calendar chip and settings memory, the C-3030 is by no means unique in lacking that feature. The earlier C-2000 had a backup battery, *but the*

C-2020 did not. More to the point, the Nikon Coolpix 990 (with which the C-3030 directly competes) does not either, meaning that it will lose its date/time setting at least as fast as the C-3030 Zoom will. True, the Canon Powershot S-20 does have a clock backup battery, but we don't feel it's fair to single out the C-3030 Zoom on the basis of this one deficiency. For our part, we invariably leave one set of our NiMH batteries in our digicams all the time anyway. It's true that NiMH cells have a relatively short shelf life, but not nearly to the extent that other authors have represented: Some have claimed that NiMH cells lose 5% of their charge per day: While some cells may show this level of self-discharge, we've more often heard quoted a figure of 1% per day, and this matches our own (non-quantitative) experience more closely. Thus, while we would clearly like to see a lithium clock-backup battery in the C-3030 Zoom, we don't feel it deserves any special condemnation for its lack thereof.

Included Software

The C-3030 comes with a very nice complement of software on an included CD. Direct camera control and image downloading are provided by an updated version of Olympus' own Camedia software package (version 2.0) which allows you to download and save images to your hard drive, and provides rudimentary organization capabilities. We confess to slightly mixed feelings on the other half of the package though: On the downside, we were chagrined to see that the excellent panorama-making program QuickStitch (from Enroute Software) is no longer included in the software bundle. On the upside though, the even more useful (at least to the majority of users) Photoshop LE version 5.0 **is** included. (Even better, all software packages provided are fully functional on both Mac and PC.) While there are many other image-processing programs out there, Photoshop is consistently our favorite, thanks to the level of control and features it provides. The "LE" version of Photoshop lacks only a few of the features of the full-retail version (notably color management tools and support for non-RGB color spaces), and is entirely suitable for use by the serious digicam owner. Adobe recently began selling Photoshop LE on the open market (previously, it was only available in software bundles like this), and its $99 retail price is a very valid representation of its value. Thus, if you don't already own Photoshop, buying a C-3030 Zoom could end up saving you a very real $99 relative to where you'd likely end up anyways. So, while we miss the incredible QuickStitch panorama-maker, including Photoshop LE is a huge plus.

Test Results

In keeping with our standard policy, our comments here are rather condensed, summarizing our key findings: For a full commentary on each of the test images, see the **C-3030 Zoom's "pictures" page**.

As with all Imaging Resource camera tests, we encourage you to let your own eyes be the judge of how well the devices performed: Explore the images on the **pictures page**, to see how well the C-3030 performed, and how its images compare to other cameras you may be considering buying.

Overall, the C-3030 Zoom produced exceptional images, befitting its status as a top-of-the-line 3.3 megapixel digicam. Color accuracy was good, although our shots of the MacBeth(tm) chart showed a somewhat warm cast with all white balance settings, and the bright yellow patch had slightly lower color saturation. (A common digicam problem.) Overall, we felt the color was quite good,however.

The Olympus C-3030 performed toward the top of the current range of 3.3 megapixel digicams in the resolution department, with a resolution that we "called" as between 850 and 900 lines per picture height in both the horizontal and vertical directions. While just a hair off from the sharpest performance we've seen to date, the 3030 deserves credit for not applying heavy-handed in-camera sharpening in an attempt to boost the apparent resolution.

As did the 2 megapixel C-2020 Zoom before it, the C-3030 Zoom offers excellent exposure control, with choices of matrix or spot metering, full aperture and shutter control, including an optional manual mode, and ISO speeds ranging from 100 to 400. The C3030 Zoom performed very well in our low light tests, producing very usable images down to light levels of 1/8 of a foot-candle. (We're chiding ourselves for not having gone down to 1/16 of a foot-candle, since it's our guess that we would have obtained usable if not somewhat dim pictures at that level as well.) At these low light levels, with exposure times of 2 to 10 seconds, there is a moderate amount of noise present in the images. (We direct readers to Mike *Chaney's* excellent Qimage Pro program, for a tool with an amazing ability to remove image noise without significantly affecting detail.) To put the C3030's low light performance in perspective, an average city night scene under modern street lighting corresponds to a light level of about 1 foot-candle.

We found the C-3030's optical viewfinder to be a little tight, showing approximately 82 percent accuracy at wide angle and about 81 percent at telephoto. (Note that we've changed our nomenclature on this to better reflect what you see looking into the viewfinder: We previously would have referred to the C-3030's viewfinder as "loose"...) These numbers are from the 2048 x 1536 resolution size but the smaller, 640 x 480 resolution size numbers are similar at 83 percent accuracy for both wide angle and telephoto. We also noticed that the framing here slants just a little to the left vertically, possibly the CCD on our test model was shifted a little. The LCD monitor proved to be quite accurate, showing about 97 percent frame coverage at wide angle and slightly over 100 percent accuracy at the telephoto setting. (The covered area is just barely inside the darker lines we use to frame the viewfinder accuracy target). As with the optical viewfinder, the smaller, 640 x 480 image sizes weren't too far off from the larger ones (about 96 percent accuracy at wide angle and over 100 percent accuracy at telephoto). We generally like to see the LCD monitor as close to 100 percent accuracy as possible, so the C-3030 does a pretty good job in that respect.

The C-3030 does pretty good job in the macro category, capturing a minimum area of 3.35 x 2.52 inches (85.21 x 63.91 mm). This is about an average minimum coverage area among digicams we've tested, but the body threads of the C-3030 in conjunction with Olympus' CLA-1 filter adapter permit the addition of external macro lenses for much tighter focusing.

Overall, we found the C-3030 Zoom to be a very worthy contender at the upper end of the current (May 2000) digicam spectrum. Image quality, resolution, and sharpness are all very good, and the camera provides excellent exposure control as well as very good low light capability: An impressive performance!

Conclusion

Well, from our previous review of it, it's probably pretty clear that we really liked the previous Olympus C-2020 Zoom. (We like it well enough in fact that it's the camera we use to do all our studio photography with.) The C-3030 Zoom is a very worthy upgrade, bringing not only increased resolution but numerous feature and user-interface enhancements as well. It's probably safe to say that if you liked the C-2020 Zoom, you'll love the C-3030 Zoom. All in all, another great digcam from Olympus, and one that we think competes very strongly at the upper end of the current "prosumer" digicam spectrum.

Reader Comments!

See what other Imaging Resource readers have had to say about the C-3030, or add comments of your own. ***(Read what's here, then add your own!)***

For even more feedback, read the **User Reviews from PCPhotoREVIEW**

Reader Sample Images!

Do you have a Olympus C-3030 camera? If you'll post an album of your samples that we can point to with a single URL (not all services permit this, some require you visit the main site and type a name and password) and email us at web@imaging-resource.com, we'll list the album here for others to see!

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For More Info:

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<u>Via Federal Express and Facsimile</u>

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Int. Cl.: 38

Prior U.S. Cls.: 100, 101 and 104

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FIRST USE 3-31-2000; IN COMMERCE 3-31-2000.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Bernstein et al.

Title: System And Method For Playing A Digital Video File

Appl. No.: Unknown

Filing Date: Unknown

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Zakirul A. Shirajee

Enclosed are:

- [X] Specification, Claim(s), and Abstract (29 pages).
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By Steven C. Becker

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57103/115

UNITED STATES PATENT APPLICATION

for

SYSTEM AND METHOD FOR

PLAYING A DIGITAL VIDEO FILE

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TITLE OF THE INVENTION

SYSTEM AND METHOD FOR PLAYING A DIGITAL VIDEO FILE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 60/137,297, filed June 3, 1999, U.S. Provisional Application No. 60/155,404, filed September 22, 1999, U.S. Provisional Application No. 60/169,559, filed December 8, 1999 and PCT International Application No. _______, filed June 2, 2000.

FIELD OF THE INVENTION

The present invention relates generally to video imaging. More specifically, the present invention relates to a system and method for providing high quality digital video files for streaming across a network.

BACKGROUND OF THE INVENTION

Streaming video is a technique by which video is played in real time as it is downloaded over the Internet, as opposed to storing it in a local file first. A video player decompresses and plays the data as it is transferred to a user computer over the World-Wide Web. Streaming video avoids the delay entailed in downloading an entire file and then playing it with a plug-in application. Streaming video requires a communications connection (e.g., a network, Internet, etc.) and a computer powerful enough to execute the decompression algorithm in real time.

In the field of streaming video, the primary design challenge is that the viewer desires perfect video quality over a limited-bandwidth network. Perfect video quality requires an enormous amount of digital data. Today's networks are not capable of providing life-like, full motion, full screen streaming video.

It is known to capture video using a capture device, compress the resulting captured video, store the compressed video, and send the compressed video across the Internet. However, prior attempts have failed to produce high quality streaming video that can be transmitted over the Internet. For example, prior attempts at streaming video have been unable to produce full-screen, real video frame rate video at any acceptable quality.

Several teachings have emerged that attempt to improve the quality and decrease the file size of streaming video. One teaching in the art is to reduce the number of frames per second that are being encoded, from the 25 to 30 fps of standard television to 6 or 7 fps or less for streaming video. While this reduces the amount of data that is being sent, the video appears jittery and corresponding voice appears asynchronous with the jittery video. Another teaching in the art is to capture the video at a small frame size of 160 x 120 or less. The small frame size of 160 x 120 is the widely used standard in Internet streaming video. Further teachings are directed to reducing the amount of data that is provided prior to compressing to reduce the file size resulting from compression. Other teachings in the art have pointed toward compressing a digital video file as much as possible prior to transmission. Full-screen, full-motion video has historically been viewed as requiring far too much data for transmission over a limited-bandwidth network.

Accordingly, there is a need for an improved system and method for providing an enhanced digital video file for streaming across a network. Further, there is a need for a digital video file having high quality at various screen sizes with minimal quality loss when the video is expanded to full screen size. Further still, there is a need for a digital video file having a real video frame rate that can be streamed across a limited bandwidth network, such as the Internet. Further yet, there is a need for a video transmission which, once commenced, need not be stopped.

BRIEF SUMMARY OF THE INVENTION

According to an exemplary embodiment, a method of playing a digital video file over a network includes providing a digital video file to a first storage device; downloading a first portion of the digital video file from the first storage device over a network to a computer having a second storage device and a display screen; expanding the viewing frame size of the computer display screen to at least 640 x 480 pixels; and playing the first downloaded portion on the expanded display screen from the second storage device while substantially simultaneously downloading a second portion of the digital video file to the second storage device.

According to an another exemplary embodiment, a system for playing a digital video file over a network includes means for providing a digital video file to a first means for storing; means for downloading a first portion of the digital video file from the first storing means over a network to a computer having a second means for storing and a display screen; means for expanding the viewing frame size of the computer display screen to a full screen size; and means for playing the first downloaded portion of the digital video file on the expanded display screen from the second storing means while substantially simultaneously downloading a second portion of the digital video file to the second storing means.

According to yet another exemplary embodiment, a method of playing a digital video file across the Internet includes capturing and compressing a source video signal to generate a digital video file; providing a first portion of the digital video file across the Internet to a computer; playing the first portion of the digital video file at substantially full screen size on the computer while substantially simultaneously downloading a second portion of the digital video file to the computer.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will become more fully understood from the following detailed description, taken in conjunction with the accompanying drawings, wherein like reference numerals refer to like parts, in which:

FIG. 1 is a block diagram of a system for generating an enhanced digital video file according to an exemplary embodiment;

FIG. 2 is a flowchart of a method for generating an enhanced digital video file according to the exemplary embodiment of FIG. 1; and

FIG. 3 is a block diagram of a system for playing a digital video file across a network.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, a system 10 for generating an enhanced digital video file is shown. System 10 may be used as shown, or portions of system 10 may be integrated with other video processing systems, such as medical imaging equipment, motion picture production equipment, etc. System 10 generates a digital video file expandable to a full screen size and having a real video frame rate (i.e., life-like, smooth, not jerky, comparable with recorded video formats, such as, NTSC (National Television Standards Committee) at 29.97 frames per second (fps), PAL (Phase Alternative Line) at 25 fps, and SECAM (Séquentiel Couleur Avec Mémoire) at 25 fps)) with a file size that is suitable for streaming over the Internet, for such uses as high definition television, Web television, computers and servers utilized in wireless environments, etc.

As known in the art, video is recorded having certain standard recorded video parameters, such as, frame rate, and number of lines scanned. For example, it is will known that a source conforming to the NTSC (National Television Standards Committee) standard operates at 29.97 frames per second (fps), a source conforming to the PAL (Phase Alternative Line) standard operates at 25 fps, and a source conforming to the SECAM (Séquentiel Couleur Avec Mémoire) standard operates at 25 fps. It is will known in the art that the NTSC standard includes two interleaved frames at 240 lines scanned, while the PAL standard is 270 lines scanned. Note that the number of lines scanned corresponds to the number of vertical pixels in a standard 320 x 240 frame size compatible with standard capture cards, such as, a Dazzle LAV-1000S capture device manufactured by Dazzle, Inc. of Fremont, California.

System 10 includes one or more sources, including recording devices 12 or playback device 25, a capture device 14, a computer 16, and a network server 18. Recording devices 12 include a camcorder 20, a digital video camera 22, and a reel-to-reel camera 24, each of which may be hand-held or mounted on a tripod or stand. System 10 may include a playback device 25 (e.g., tape player, VHS (Vertical Helix Scan) player, Beta player, DVD (Digital Versatile Disk) player, etc.). Camcorder 20 may be a VHS recorder, Beta recorder, or other camcorder, and is configured to store video on magnetic tape. Digital video camera 22 may be any type of digital video camera configured to generate video in a digital format. In this exemplary embodiment, digital video camera 22 stores the digital video data to a tape. Digital video camera 22 is configured to provide digital video data in real time or via the tape in a digital format, such as, Beta digital, AVI, MOV, MPEG (Motion Picture Experts Group), or other format compatible with the IEEE 1394 standard, etc., to capture device 14. AVI is an audio/video standard designed by Microsoft Corp., Redmond, Washington. According to one exemplary embodiment, a digital video camera including 3CCD technology is used to record the video. The 3CCD technology (3-chip charge-coupled device) includes a dichroic prism and three CCDs, each CCD being aligned to detect only the red, green, or blue color. A 3CCD camera will provide enhanced color resolution. Reel-to-reel camera 24 includes recording equipment that uses magnetic tape which must be threaded through the equipment and onto an empty reel. According to one alternative embodiment, a separate audio recording device, such as a microphone, may be utilized in conjunction with recording devices 12, in which embodiment recording devices 12 are used to record only video. Other recording devices may be used, such as, devices optimized for live video-conferencing.

Computer 16 includes a processor, memory, magnetic storage device, input/output devices and circuitry, etc. Computer 16 may include multiple computer at multiple sites, with different portions of the process described hereinafter operating on different computers.

Capture device 14 is coupled to one or more of sources 11. Capture device 14 is shown external to computer 16, but may alternatively be an internal capture device coupled within the housing of computer 16 or an internal capture device within the housing of one of recording devices 12 or playback device 25. In this exemplary embodiment, a Dazzle LAV-1000S capture device is utilized, though other capture devices may be used, such as a Pinnacle DC10PLUS or Pinnacle DC30PRO device, both manufactured by Pinnacle Systems, Inc., Mountain View, California, or a MotoDV Mobile capture device, manufactured by Digital Origin, Inc., Mountain View, California. Capture software 26, such as Amigo 2.11, manufactured by Dazzle, Inc. or Adobe Premier 5.1, manufactured by Adobe Systems Inc., San Jose, California, is operable on computer 16 to interface capture device 14 with computer 16. Other capture software may be utilized, such as, RealProducer G2, manufactured by RealNetworks, Inc., Seattle, Washington.

In conjunction with capture software 26, capture device 14 is configured to receive a video signal from one of recording devices 12 or playback device 25, to digitize the video signal, and to store the video signal as a digital video file. The parameters of the video capture will be discussed below with reference to FIG. 2. The digital video file is an MPEG-1 file in this exemplary embodiment, but may alternatively be generated in other digital video formats, such as, MPEG-2, AVI, etc. Capture device 14 is a combined audio/video capture device, but may alternatively include discrete audio and video capture devices, the audio capture device configured to digitize any audio which corresponds to the video being captured by the video capture device. As a further alternative, audio captured device may be utilized alone without a video capture device. The audio capture device may be, for example, a Montego II device, manufactured by Voyetra Turtle Beach, Inc., Yonkers, New York, and configured to generate a digital audio file in a digital audio format, such as, PCM (Pulse Code Modulation).

Editing software 28 is operable on computer 16. In this exemplary embodiment, Adobe Premier 5.1 is utilized, though other video editing software may be used. Editing software 28 receives the captured digital video file and enables an operator to edit the digital video file by adding or deleting frames, adjusting the color, contrast, and brightness of the frames, etc. The edits are then saved to the digital video file or can be exported to AVI or MOV file types.

Encoding software 30 is operable on computer 16. In this exemplary embodiment, RealProducer G2 is utilized, though other encoding software may be used. Encoding software 30 receives the edited digital video file and encodes the digital video file into an encoded format, such as, an RM format. Encoding software 30 may also compress the digital video file, if needed, to reduce the size of the digital video file, using a video compression algorithm, such as MPEG-1, MPEG-4, etc.

Markup software 32 is operable on computer 16. In this exemplary embodiment, a hypertext markup language (e.g., HTML, Dynamic HTML, Cold Fusion) is utilized. An operator marks up the encoded digital video file in HTML to prepare the digital video file for uploading to the network server 18. In this exemplary embodiment, a code segment representing a full screen frame size, such as 640 x 480 pixels, is associated with the digital video file in the HTML code. The full screen frame size code segment may alternatively include other screen sizes, such as 800 x 600 pixels, 1024 x 768 pixels, 1280 x 1024 pixels, and 1600 x 1200 pixels. During a subsequent video streaming step, the full screen frame size code segment causes or enables a video player program, such as RealPlayer, manufactured by RealNetworks, Inc., to enlarge the streaming video to a full screen frame size, such as 640 x 480 pixels.

References herein to frame sizes in pixels, such as, 320 x 240 pixels, 640 x 480 pixels, are intended to include equivalent frames sizes thereto. For example, it is known that a frame size of 320 x 240 pixels may include an additional number of unneeded pixels (e.g., which can be as much as 10% of the total pixels) attributed to overscan. Thus, one equivalent to a 320 x 240 pixel frame size is 304 x 228 pixels. As a second example, when rectangular pixels are used, the exact pixel count differs from the stated frame size. Thus, one equivalent to a 320 x 240 pixel frame size is 352 x 240. Accordingly, references to frame sizes in pixels are intended to included these and other equivalent frame sizes, and the teachings herein include any and all such insubstantial variations.

The uploading process utilizes uploading software 33, such as, a Web FTP (file transfer protocol) software (e.g., WS FTP PRO, manufactured by Ipswitch, Inc., Lexington, Massachusetts.) The digital video file is uploaded to network server 18, which includes a computer configured to generate a web page on an internet-protocol network, such as the Internet or a company-wide intranet. A web page is a block of data written in a markup language, such as HTML, and any related files for scripts and graphics. Network server 18 may alternatively be coupled to a non-internet-protocol network, such as, an ethernet, a local area network, a wide area network, a wireless network, etc.

A user computer 34 may access the web page provided by network server 18 via a network, such as, the Internet. Upon actuating a user input device (e.g., a web page button, hypertext link, etc.) associated with the uploaded digital video file, the HTML code launches a suitable video player program (e.g., RealPlayer) at user computer 34, activates the full screen frame size at user computer 34, and streams the video from the digital video file to user computer 34. Alternatively, the video player program may initially play the streaming video at a smaller frame size (e.g., 320 x 240), and the user may actuate a user input device on the video player to enlarge the streaming video to a full-screen size, such as 640 x 480. Notably, capture software 26, editing software 28, encoding software 30, markup software 32, and uploading software 33 may be operable on one computer or on different computers during different steps in the process.

According to one alternative embodiment, the encoded digital video file is stored directly to a storage device, such as, a compact disk, a digital video disk, a magnetic storage device, etc., for subsequent viewing on another computer, on a personal digital assistant (e.g., a Palm Pilot manufactured by Palm, Inc., Santa Clara, California), etc. According to another alternative embodiment, digital video data is provided on a storage device (e.g., a floppy disk, a hard disk storage, etc.) which has been pre-captured. The pre-captured digital video data is provided in a compressed or uncompressed digital video format to encoding software 30 for subsequent processing.

Referring now to FIG. 2, a method 50 for generating an enhanced digital video file according to the exemplary embodiment of FIG. 1 is shown. Method 50 is operable using one or more of the elements of system 10, as needed. While the steps of method 50 are explained with reference to captured video, it is understood that captured audio may be processed along with the captured video, or perhaps processed independently in a similar manner. As will be seen, the recorded video will be captured and encoded at near-optimal levels, as determined by the selected parameters in these processes, thereby preserving the highest quality video content. While exemplary values are presented herein for such parameters, it is understood that one of ordinary skill in the art will recognize other combinations of parameters based on these teachings.

According to one exemplary embodiment, a customer provides pre-recorded video saved to a disk or other storage device. At step 52, if the video has been pre-recorded by the customer, the method proceeds to step 58. If the video has not yet been recorded, at step 54, video is recorded using one or more of recording devices 12 or playback device 25. The video is recorded into any suitable format, such as, VHS or Beta, and is played back using a television standard, such as, NTSC (National Television Standards Committee), PAL (Phase Alternative Line), SECAM (Séquentiel Couleur Avec Mémoire), a digital format, such as, AVI, MOV, MPEG, a digital format compatible with the IEEE 1394 standard, or another format, etc. At step 56, the video is captured by coupling one of recording devices 12 or playback device 25 to capture device 14, which is an external Dazzle LAV-1000 capture device in this exemplary embodiment, but may alternatively be an internal card or other capture devices, such as a Pinnacle DC10 device.

Capture software is also utilized, such as, Amigo 2.11, Adobe Premier 5.1 or Real Producer G2. Capture device 14 and capture software 26 generate a digital video file based on the recorded video. If the recorded video is in an analog format, capture device 14 digitizes the analog video to create digital video data. If the recorded video is in a digital format, capture device 14 merely receives the digital video data and formats a file in the appropriate standard (e.g., AVI, MOV, MPEG1, etc.). According to one exemplary embodiment, capture software 26 is set for real video capture, i.e., having a frame rate of a television or movie standard, such as, 29.97 frames per second. Real video capture may further have a frame rate of between 24 and 30 frames per second, or at least substantially more than the 6 to 9 frames per second conventionally used in streaming video applications. Further, the video is captured with at least approximately 76,800 pixels per frame (at least approximately 69,000 pixels taking into consideration overscan). For a 4:3 aspect ratio, the frame size of the video capture is at least 320 x 240 in this exemplary embodiment (at least 304 x 228 taking into consideration overscan), or at least more than the 160 x 120 used in conventional streaming video applications. Frame sizes of 480 x 320 and 640 x 480 may also be utilized in the video capture. However, particularly advantageous results are associated with the 320 x 240 capture frame size.

In an alternative embodiment, a separate audio capture device is utilized in parallel with the video capture device. In the alternative embodiment, corresponding audio capture software is operable on computer 16 to digitize the audio into a digital audio format, such as PCM. The sampling rate is between 44 and 48 kiloHertz (kHz); the bus size is 16-bit, allowing an audio resolution of 16-bits; and the audio is sampled in stereo. These parameters may also be set using the video capture software in an embodiment wherein video and audio are captured using one capture device.

The captured video data may be stored as a data file in a storage device (e.g., a hard drive) or may be stored in memory and fed directly to an encoder. The captured video data may further be compressed, for example, to an MPEG-1 file before being saved to the storage device.

At step 58, the digital video file is edited using a video editing software, such as, Adobe Premier 5.1. Adobe Premier 5.1 generates an output file in a MOV or AVI format, but may alternatively generate an output file in any digital video format. The edited digital video file may be stored in the storage device. Step 58 is optional but, if included, preferably Adobe Premier 5.1 maintains a frame size of at least 320 x 240 pixels and a real video frame rate.

At step 60, the edited digital video file is converted or encoded using a video encoding algorithm to create a streaming video file. The edited digital video file is first retrieved from the storage device (unless the digital video data is provided directly from capture device 14). In this exemplary embodiment, the digital video file is encoded to a RealMedia format (i.e., RM) using a RealNetworks encoding algorithm. RM is an audiovisual file format proprietary to RealNetworks, Inc. As a further alternative, Windows Media Encoder, manufactured by Microsoft Corp., may be utilized to encode the captured digital video file, for example, to an ASF format (Advanced Streaming Format) or ASX format. Further still, QuickTime, manufactured by Apple Computer, Inc., Cupertino, California, may be utilized to encode the captured digital video file, for example, to an MOV format.

Encoding may additionally include compression, if a smaller file size is desirable, as indicated by steps 62 and 64. The amount of compression may be selected by the operator using encoding software 30 or alternative compression software. During the encoding process, the digital video file is encoded to have a data rate of between approximately 35 kbps (kilobits per second) to 750 kbps, and a frame rate of between approximately 24 fps (frames per second) and 30 fps (e.g. 29.97 fps.). The number of pixels per frame is set to at least approximately 76,800 (again, at least approximately 69,000 pixels taking into consideration overscan) which, for a 4:3 aspect ratio, is 320 x 240 pixels (again, at least 304 x 228 pixels taking into consideration overscan), or at least more than the 160 x 120 pixels of conventional usage. However, editing, encoding, and compression are optional steps.

At step 66, the digital video file is marked up with a markup language, such as, HTML. At step 68, a full screen frame size is associated with the digital video file. A full screen frame size is at least 640 x 480 pixels, and may also be 800 x 600 pixels, 1024 x 768 pixels, 1280 x 1024 pixels, 1600 x 1200 pixels, etc. In this exemplary embodiment, the markup language associated with the digital video file includes a code segment that causes the digital video file to stream at the desired full screen frame size. While the markup language is used to associate the full screen frame size code segment with the digital video file in this exemplary embodiment, the full screen frame size code segment may be associated with the digital video file in another step of the method, such as the encode step 60, compression step 62, or another step.

At step 70, the digital video file is uploaded to an Internet web page using uploading software, such as, WS FTP PRO. At step 72, a script (e.g., an ASCII file (American Standard Code for Information Interchange)) is associated with the marked-up digital video file. The script calls the video to stream in response to a user actuation from user computer 34. The script is written in a RAM format, such as from a Microsoft Notepad software program. The script is included in the markup language associated with the digital video file. In this exemplary embodiment, an actuatable user input device (e.g., a hypertext link) is associated with the HTML code.

Thus, a user from anywhere in the world may access network server 18 via the Internet, actuate the user input device, and call the video to stream. Upon actuation, the HTML codes launch video playing software (e.g., RealPlayer) at the user computer, enlarge the viewing window of the software to full screen mode (i.e., at least 640 x 480), and begin streaming the video to the user computer. Alternatively, the user may expand the viewing screen to full screen mode by actuating an input device on the video player software. Other methods of expanding the viewing screen to a full screen are contemplated. The transmission speed of the digital video file is dependent upon the bandwidth of the user's network connection, but may range from approximately 35 kbps to 750 kbps, or as low as 28.8 kbps, with a frame rate of between approximately 24 fps to 29.97 or 30 fps.

According to one alternative embodiment, network server 18 is configured to query user computer 34 to ascertain the network connection used by computer 34 (e.g., 28.8 kbps modem, T1 line, ISDN, etc.). Thereafter, network server 18 determines the appropriate transmission rate based on the ascertained network connection.

EXAMPLE A

A Sony DCR VX-1000 digital video camera, having 3CCD technology, manufactured by Sony Electronics, Inc., Park Ridge, N.J., was utilized to record a video signal. The video camera generated an output signal of 6MHz in NTSC format.

A Dazzle LAV-1000S external capture device was coupled to the video camera. Amigo 2.11, Dazzle's capture software was used. The Dazzle capture device and capture software were programmed with several parameters. The frame size was left at the default setting of 320 x 240 pixels. The frame speed was set to 29.97 frames per second. The bit rate was set to 3.0 Megabits (Mb) per second. The audio capture was set to 44 kHz, 16 bit sampling rate. An MPEG-1 file was generated based on the video signal using the capture device and software programmed with these parameters.

When the captured MPEG-1 file was provided to RealEncoder G2, the resulting encoded file failed to retain the real video frame rate. Therefore, Adobe Premier 5.1 was utilized to receive the MPEG-1 file and export it to a MOV or AVI or MPEG file., based on several parameters. The frame rate in Adobe Premier 5.1 was set to 29.97 fps. The frame size was set to 320 x 240. The "Quality" setting, representing the number of colors to appear in the edited file, was set to a high setting (e.g., 100%). Adobe Premier

5.1 generated an AVI file or an MOV file or a MPEG file, depending upon the operator selection.

RealEncoder G2 software was used to encode the AVI or MOV file into a streaming video file in RM format. The RealEncoder G2 software was programmed with several parameters. The bitrate was set to 220 kbps. The frame rate was set to 30 fps. The "Surestream" option was selected. "Surestream" technology adjusts the playing speed of the encoded digital video file to accommodate the network connection speed of the user. For sound quality, "stereo/music", the highest quality, was selected. For image quality, "sharpest image", the highest quality, was selected. Regarding frame size, this version of RealEncoder generated an output signal having a frame size equal to that of the frame size of the MOV or AVI input file. RealEncoder compressed the MOV or AVI input file using the RealNetworks compression algorithm. An RM file was generated based on the these parameters.

The RM file was uploaded to an Internet server. Using Microsoft Notepad, a script was written in RAM format to 1) identify the location of the RM file, 2) launch RealPlayer on the user computer, 3) resize the viewing screen on the user computer to 640 x 480, and 4) begin the video stream. The result was unexpectedly high-quality, full-screen, real video frame rate, streaming video. The RM file was subsequently streamed to a client computer via a telephone modem and via other broadband connections. The same unexpectedly high-quality, full-screen, real video frame rate, streaming video was experienced. The streaming playback was intermittent due to the need to buffer to accommodate the lower bit-rate of transmission.

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The RM file was uploaded to an Internet server. Using Microsoft Notepad, a script was written in RAM format to 1) identify the location of the RM file, 2) launch RealPlayer on the user computer, 3) resize the viewing screen on the user computer to 640 x 480, and 4) begin the video stream. The result was unexpectedly high-quality, full-screen, real video frame rate, streaming video. The RM file was subsequently streamed to a client computer via a telephone modem and via other broadband connections. The same unexpectedly high-quality, full-screen, real video frame rate, streaming video was experienced. The streaming playback was intermittent due to the need to buffer to accommodate the lower bit-rate of transmission.

EXAMPLE B

According to another example, an NTSC analog signal is provided to a Pinnacle DC-10PLUS capture device. The Pinnacle capture device and associated software generate a digital video file in AVI format based on several parameters. The capture type is set to NTSC. The frame size is set to 320 x 240 pixels, or "1/4 full frame size". Brightness, sharpness, and color are adjusted, as desired. The compression rate is set to 2.5:1. The frame rate is set to 29.97. Square pixel ratio is selected. Audio is set to stereo format, 44 kHz, 16 bit sampling. The data rate is set to 1739 kbps. The capture device utilizes a Miro codec to create a digital video file in AVI format.

Optionally, a header and footer is provided to the beginning and end of the digital video file. The header and footer include a trademark for the assignee of the present application. Adobe Premier is used to render the header, footer, and watermark to the digital video file. A parameter within Adobe Premier is set to a frame size of 320 x 240. Adobe Premier further utilizes a Miro codec to create a digital video file in AVI format.

The edited AVI file is encoded by RealProducer software. The following parameters are programmed in the RealProducer software. One set of parameters was used for a low-speed network connection at the user computer (hereinafter designated "LO"), and another set of parameters was used for a high-speed network connection at the user computer (hereinafter designated "HI"). RealNetworks "Surestream" technology is selected. Alternatively, "single-stream" can be selected, and an RAM file can be generated to query the connection speed of the user computer and stream the video at the proper connection speed. The encoding speed is set to, for LO, 28 kbps or 56 kbps, and for HI, LAN, DSL, Cable Modem, or T1. Sound quality is set to "voice only" or "stereo music" or "CD quality". Video quality is set to "sharper image". Frame rate is set to 29.97 fps. Target bit rate is set to 350 kbps. The target player is specified as RealPlayer G2. Frame size is set to 320 x 240. Based on these parameters, the RealEncoder software generates an RM file or other streaming video data file, which is subsequently uploaded to RealServer.

The exemplary embodiments disclosed herein provide greatly enhanced streaming video suitable for streaming over a limited-bandwidth network, such as the Internet. Several discoveries have enabled various aspects of this technology. The first discovery was that the efficiency of encoding from a captured digital video file to a streaming video file is increased with an increase in the frame size of the captured digital video file. Thus, while conventional teachings pointed toward minimizing the capturing and encoding frame sizes (typically to 160 x 120 pixels, which has widely become an Internet standard for streaming video) to reduce the size of the resulting file, the present inventors turned away from these teachings and increased the capturing and encoding frame sizes to 320 x 240 pixels. Second, one goal of the present inventors was to achieve full-screen, real video frame rate, streaming video. Conventional teachings would point toward encoding at a frame size of 640 x 480 pixels to achieve full-screen streaming video. However, with today's technology, enlarging the frame size of a captured digital video file during encoding to 640 x 480 (for example, from 160 x 120 pixels) pixels causes an enormous increase in the amount of data in the resulting encoded digital video file and requires enormous bandwidth to stream. Therefore, the present inventors discovered that encoding at 320 x 240 pixels (or its equivalent) provided greatly improved results when doubled to full-screen for viewing.

These conventional teachings were evidenced in the capabilities of the encoder used at the time of invention, namely, RealProducer G2. RealProducer G2 taught away from real video streaming since digital video files that were captured at a real video frame rate (e.g., 30 fps) would be automatically reduced to a lower, non-real video frame rate (e.g., 15 fps) to reduce the size of the streaming video file. Furthermore, digital video files which were captured directly from a capture device using RealProducer G2 were encoded at a frame rate of only 6-7 fps and had no option to adjust frame size. Therefore, to obtain a real video frame rate, the inventors followed the steps in EXAMPLE A above to achieve the first high quality, full-screen, real frame rate streaming video file.

Referring now to FIG. 3, a system 80 for playing a digital video file across a network is shown, and a corresponding method is described. System 80 includes a network server 82 having a processor 84, a storage device 86, and a network interface 88. A capture device 90 is coupled to network server 82 and is configured to capture a video signal, as described hereinabove. Processor 84 controls capture device 90 and provides various parameters to capture device 90 regarding frame size, bit rate, etc. For example, one or more of the methods for capturing video and generating a digital video file described hereinabove may be implemented by processor 84, storage device 86, and capture device 90. Processor 84 and capture device 90 generate a digital video file in a digital video format (e.g., MPEG, AVI, etc.) and store it to storage device 86. As used in this description of FIG. 3, the term "storage device" includes such devices as magnetic tape, a hard drive, a floppy disk, magnetic disk, or other similar non-volatile storage media, but not including random access memory or other temporary memory. The capture process may alternatively be carried out on another computer, after which the resulting digital video file is stored in (e.g., uploaded to) storage device 86.

Network server 82 is coupled through network interface 88 to a network 92, such as the Internet, a LAN, etc. Processor 84 is configured to generate a web page having a hypertext link to the digital video file stored in storage device 86. A network client 94 includes a processor 96, a storage device 98, an input device 100, a display 102, and a network interface 104. Network client 94 is operable via a user to access the web page generated by network server 82 and to actuate the hypertext link to begin downloading the digital video file from storage device 86.

One drawback of downloading video files is that, for very large files, the delay before any portion of the digital video file can be viewed can be on the order of minutes, hours, or longer. Thus, according to one advantageous aspect of system 80, while the digital video file is being downloaded to network client 94 and stored in storage device 98, some of the digital video file which has already been downloaded and stored is being simultaneously played on display 102. A suitable player which supports AVI, MPEG, and other digital video formats is utilized for the video play. This procedure may be referred to as viewing/downloading. Stated another way, a first portion of the digital video file is played from storage device 98 while later portions of the digital video file are still downloading from storage device 86 via network 92 to storage device 98.

One method of launching the player and beginning the play of the first portion is for a user to simply select these steps via input device 100 (e.g., a mouse, a keyboard, etc.) a certain time after the downloading has begun. Alternatively, an algorithm may be provided, either attached to the digital video file (e.g., HTML, Java, a macro, etc.) or as part of the player (e.g., QuickTime, RealPlayer, etc.) which begins playing the digital video file at a predetermined time after the download to storage device 98 has begun. This predetermined time may be pre-programmed or adjusted in real-time based on inputs from client server 94 or network server 82. According to one example, the algorithm calculates the predetermined time based on the download speed (e.g., including network connection speed of network interface 104, etc.), the viewing speed (e.g., frames per second, etc.), and the size of the digital video file. For example, if the viewing speed is four times the download speed, the algorithm monitors the amount of the file (e.g., in bytes) which is downloaded until 75% of the file is downloaded. When 75% of the file is downloaded, the algorithm begins playing the digital video file from storage device 98. By playing the file at this predetermined time, the digital video file will play substantially without delays for buffering. Of course, other predetermined times are contemplated, including those earlier and later than that set forth in this exemplary embodiment.

Thus, one can view a digital video file shortly after clicking on the hypertext link and before the entire digital video file has downloaded to storage device 98. Once the entire digital video file is finished playing, network client 94 retains a copy of the digital video file in storage device 98 for later playing.

According to one alternative, the digital video data is captured in real-time and streamed in real-time across network 92 (i.e., without first storing to storage device 86) to storage device 98.

While the embodiments and applications of the invention illustrated in the FIGS. and described above are presently preferred, it should be understood that these embodiments are offered by way of example only. For example, while the steps of the exemplary embodiments contemplate recording audio and video at one time and streaming the audio and video at another time, the audio and video may alternatively be fed through system 10 in real-time, thereby facilitating real-time audio/video transmissions. Furthermore, the exemplary software programs mentioned may be replaced by newly developed versions and/or programs in the future. Accordingly, the present invention is not limited to a particular embodiment, but extends to various modifications that nevertheless fall within the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A method of playing a digital video file over a network, comprising:

providing a digital video file to a first storage device;

downloading a first portion of the digital video file from the first storage device over a network to a computer having a second storage device and a display screen;

expanding the viewing frame size of the computer display screen to at least 640 x 480 pixels; and

playing the first downloaded portion on the expanded display screen from the second storage device while substantially simultaneously downloading a second portion of the digital video file to the second storage device.

2. The method of claim 1, further comprising capturing a video signal to generate the digital video file.

3. The method of claim 2, further comprising compressing the captured video signal such that the digital video file is compressed.

4. The method of claim 3, wherein the digital video file is stored in an MPEG file format.

5. The method of claim 1, wherein the network is the Internet.

6. The method of claim 1, wherein the playing of the first portion of the digital video file is started a predetermined time after

the downloading of the first portion of the digital video file has started.

7. The method of claim 6, wherein the predetermined time is based on the viewing speed and the download speed of the digital video file.

8. The method of claim 6, wherein the playing of the digital video file ends at approximately the same time as the download of the digital video file.

9. The method of claim 7, wherein at least 50% of the digital video file is downloaded before the first portion of the digital video file is played.

10. The method of claim 1, wherein the second storage device includes a magnetic storage device.

11. The method of claim 10, wherein the second storage device is a hard drive.

12. A system for playing a digital video file over a network, comprising:

means for providing a digital video file to a first means for storing;

means for downloading a first portion of the digital video file from the first storing means over a network to a computer having a second means for storing and a display screen;

means for expanding the viewing frame size of the computer display screen to a full screen size; and

means for playing the first downloaded portion of the digital video file on the expanded display screen from the second storing means while substantially simultaneously downloading a second portion of the digital video file to the second storing means.

13. The system of claim 12, further comprising means for capturing a video signal to generate the digital video file.

14. The system of claim 13, further comprising means for compressing the captured video signal such that the digital video file is compressed.

15. The system of claim 14, wherein the digital video file is stored in an MPEG file format.

16. The system of claim 12, wherein the network is the Internet.

17. The system of claim 12, wherein the playing of the first portion of the digital video file is started a predetermined time after the downloading of the first portion of the digital video file has started.

18. The system of claim 17, wherein the predetermined time is based on the viewing speed and the download speed of the digital video file.

19. The system of claim 18, wherein the playing of the digital video file ends at approximately the same time as the download of the digital video file.

20. The system of claim 19, wherein at least 50% of the digital video file is downloaded before the first portion of the digital video file is played.

21. The system of claim 12, wherein the second storage device includes a magnetic storage device.

22. The system of claim 21, wherein the second storage device is a hard drive.

23. A method of playing a digital video file across the Internet, comprising:

capturing and compressing a source video signal to generate a digital video file;

providing a first portion of the digital video file across the Internet to a computer;

playing the first portion of the digital video file at substantially full screen size on the computer while substantially simultaneously downloading a second portion of the digital video file to the computer.

24. The method of claim 23, further comprising:

downloading the first portion to a storage device;

automatically launching a video file player at the second computer; and

automatically playing the first portion of the digital video file after the first portion has been downloaded.

25. The method of claim 24, wherein the playing of the digital video file ends at approximately the same time as the download of the digital video file.

26. The method of claim 24, wherein the entire digital video file is stored on a storage device coupled to the computer after the playing step.

ABSTRACT OF THE DISCLOSURE

A method of playing a digital video file over a network includes providing a digital video file to a first storage device; downloading a first portion of the digital video file from the first storage device over a network to a computer having a second storage device and a display screen; expanding the viewing frame size of the computer display screen to at least 640 x 480 pixels; and playing the first downloaded portion on the expanded display screen from the second storage device while substantially simultaneously downloading a second portion of the digital video file to the second storage device.

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I HEREBY DECLARE:

THAT my residence, post office address, and citizenship are as stated below next to my name;

THAT I believe I am the original, first, and sole inventor (if only one inventor is named below) or an original, first, and joint inventor (if plural inventors are named below or in an attached Declaration) of the subject matter which is claimed and for which a patent is sought on the invention entitled

System And Method For Playing A Digital Video File

(Attorney Docket No. 57103/115)

the specification of which (check one)

_X_ is attached hereto.

___ was filed on _______ as United States Application Number or PCT International Application Number ______ and was amended on ______ (if applicable).

THAT I do not know and do not believe that the same invention was ever known or used by others in the United States of America, or was patented or described in any printed publication in any country, before I (we) invented it;

THAT I do not know and do not believe that the same invention was patented or described in any printed publication in any country, or in public use or on sale in the United States of America, for more than one year prior to the filing date of this United States application;

THAT I do not know and do not believe that the same invention was first patented or made the subject of an inventor's certificate that issued in any country foreign to the United States of America before the filing date of this United States application if the foreign application was filed by me (us), or by my (our) legal representatives or assigns, more than twelve months (six months for design patents) prior to the filing date of this United States application;

THAT I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment specifically referred to above;

THAT I believe that the above-identified specification contains a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention, and sets forth the best mode contemplated by me of carrying out the invention; and

THAT I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I HEREBY CLAIM foreign priority benefits under Title 35, United States Code §119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number	Country	Foreign Filing Date	Priority Claimed?	Certified Copy Attached?

I HEREBY CLAIM the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

U.S. Provisional Application Number	Filing Date

I HEREBY CLAIM the benefit under Title 35, United States Code, §120 of any United States application(s), or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Application Number	Parent Filing Date	Parent Patent Number

I HEREBY APPOINT the following registered attorneys and agents of the law firm of FOLEY & LARDNER to have full power to prosecute this application and any continuations, divisions, reissues, and reexaminations thereof, to receive the patent, and to transact all business in the United States Patent and Trademark Office connected therewith:

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DAVID J. BATES	Reg. No.	39,902
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EDWARD W. BROWN	Reg. No.	22,022
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CHRISTOPHER M. TUROSKI	Reg. No.	44,456
JAMES A. WILKE	Reg. No.	34,279
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WALTER E. ZIMMERMAN	Reg. No.	40,883

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09587025.060500

I UNDERSTAND AND AGREE THAT the foregoing attorneys and agents appointed by me to prosecute this application do not personally represent me or my legal interests, but instead represent the interests of the legal owner(s) of the invention described in this application.

I FURTHER DECLARE THAT all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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Inventor's signature	
Date	

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Residence	Boca Raton, Florida
Citizenship	Bangladesh
Post Office Address	9485 Boca Cove Circle, #708, Boca Raton, Florida 33428
Inventor's signature	
Date	

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1/1

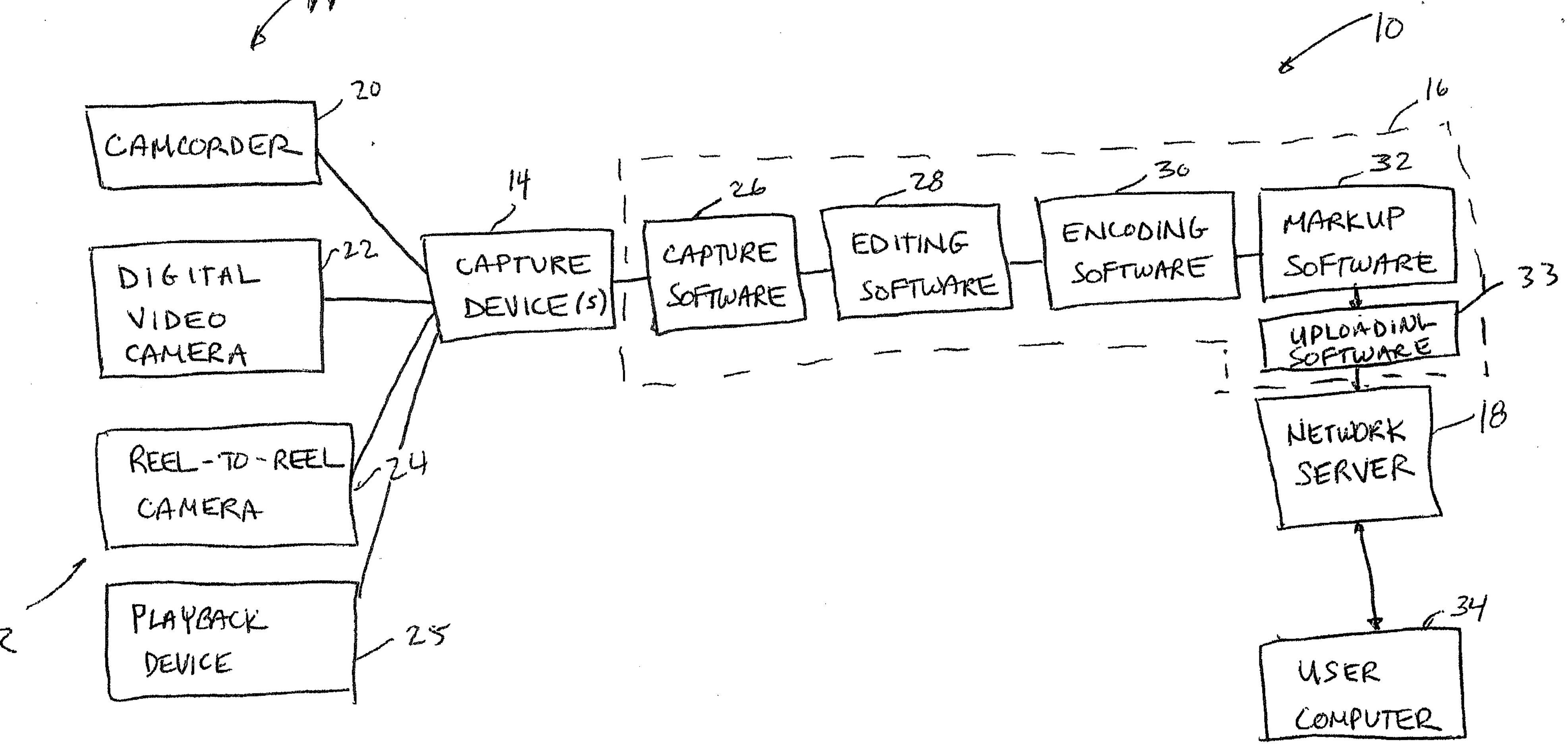

FIG. 1

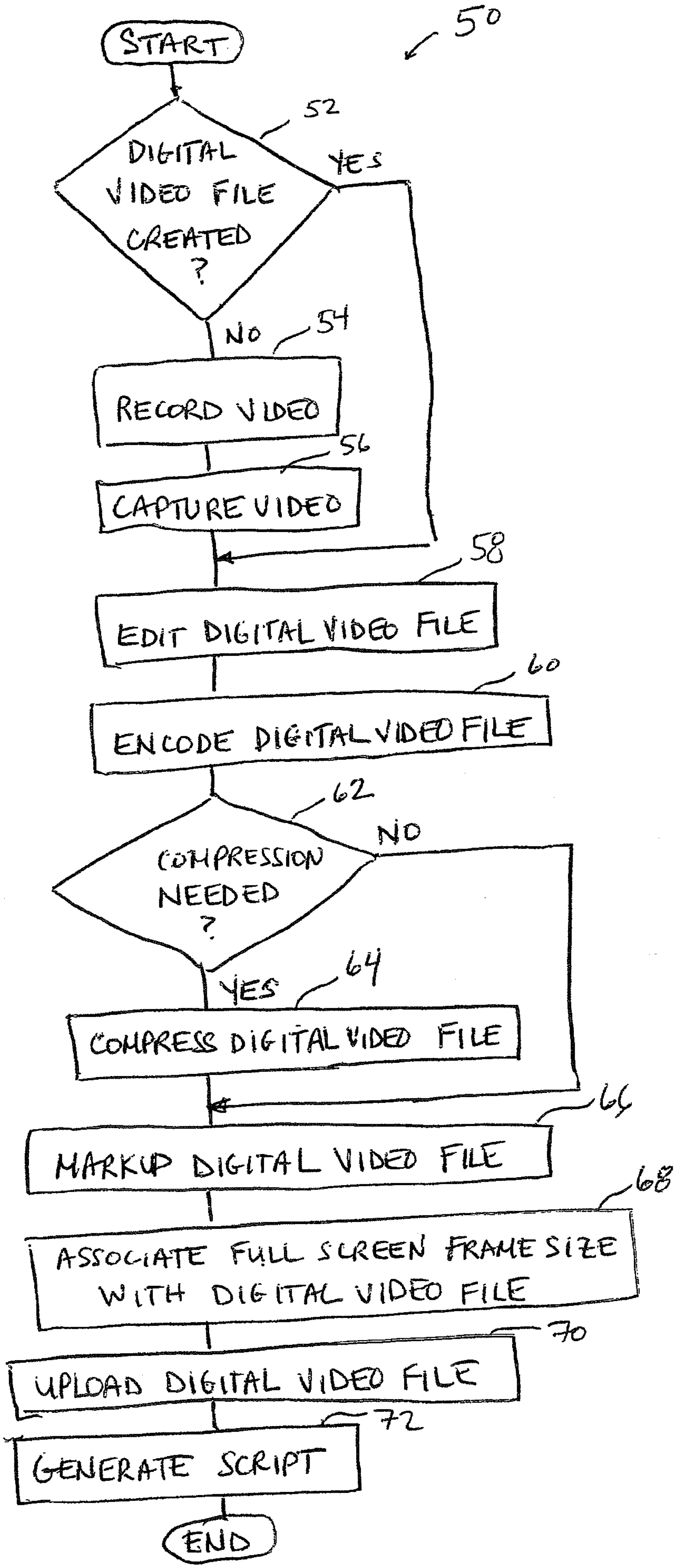
50
START
52
DIGITAL VIDEO FILE CREATED ?
YES
NO
54
RECORD VIDEO
56
CAPTURE VIDEO
58
EDIT DIGITAL VIDEO FILE
60
ENCODE DIGITAL VIDEO FILE
62
COMPRESSION NEEDED ?
NO
YES
64
COMPRESS DIGITAL VIDEO FILE
66
MARKUP DIGITAL VIDEO FILE
68
ASSOCIATE FULL SCREEN FRAME SIZE WITH DIGITAL VIDEO FILE
70
UPLOAD DIGITAL VIDEO FILE
72
GENERATE SCRIPT
END

FIG. 2

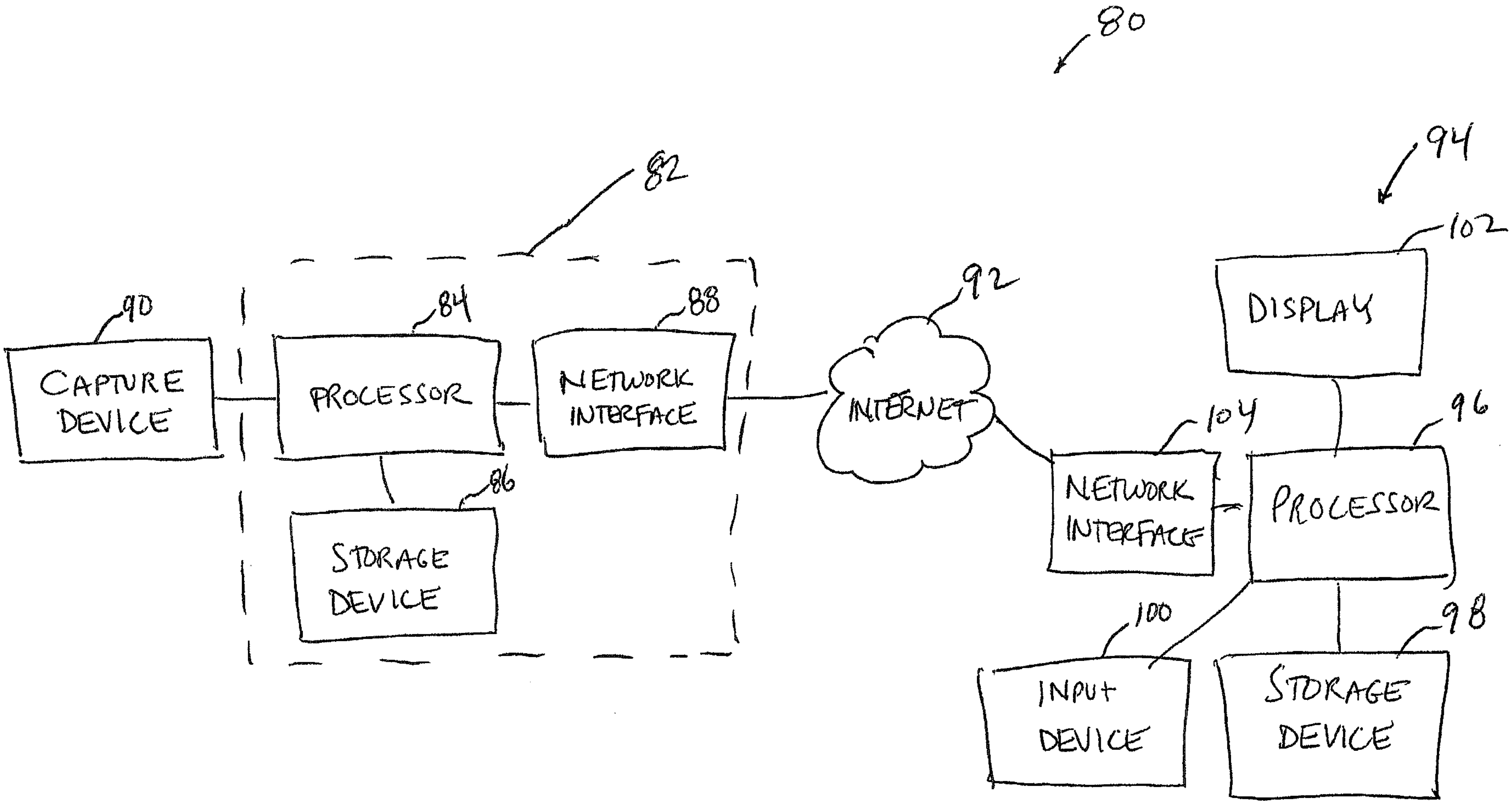
80
82
90
CAPTURE DEVICE
84
PROCESSOR
86
STORAGE DEVICE
88
NETWORK INTERFACE
92
INTERNET
94
104
NETWORK INTERFACE
102
DISPLAY
96
PROCESSOR
100
INPUT DEVICE
98
STORAGE DEVICE

FIG. 3

PA 1150500

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

April 06, 2004

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: ***09/587,730***
FILING DATE: ***June 05, 2000***

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

L. Edelen

L. EDELEN
Certifying Officer

5λ

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/587,026	06/05/2000	Eliot I. Bernstein	57103/115	8633

7590 04/19/2004

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10158 STONEHENGE CIRCLE
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EXAMINER	
KELLEY, CHRISTOPHER S	
ART UNIT	**PAPER NUMBER**
2613	8

DATE MAILED: 04/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.

EXAMINER

ART UNIT	PAPER
	8

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

Pursuant to applicant's request filed on 2/26/04, action by the Office is suspended on this application under 37 CFR 1.103(a) for a period of 6 months. At the end of this period, applicant is required to notify the examiner and request continuance of prosecution or a further suspension. See MPEP § 709.

CHRIS KELLEY
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

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Alexandria, Virginia 22313-1450

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.

EXAMINER

ART UNIT	PAPER
	14

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

See Attached

John W. Miller
SPE
Art Unit: 2614

1. Pursuant to applicant's request filed on 2/26/04, action by the Office is suspended on this application under 37 CFR 1.103(a) for a period of 6 months. At the end of this period, applicant is required to notify the examiner and request continuance of prosecution or a further suspension. See MPEP § 709.

JOHN MILLER
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/630,939	08/02/2000	Eliot I. Berstein	5707P018	8688

7590 03/04/2004

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SUITE 801
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EXAMINER	
BRINICH, STEPHEN M	
ART UNIT	**PAPER NUMBER**
2624	15

DATE MAILED: 03/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

The request for deferral/suspension of action under 37 CFR 1.103 has been approved.