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(54) **USING METADATA STORED IN IMAGE FILES AND A SEPARATE DATABASE TO FACILITATE IMAGE RETRIEVAL**

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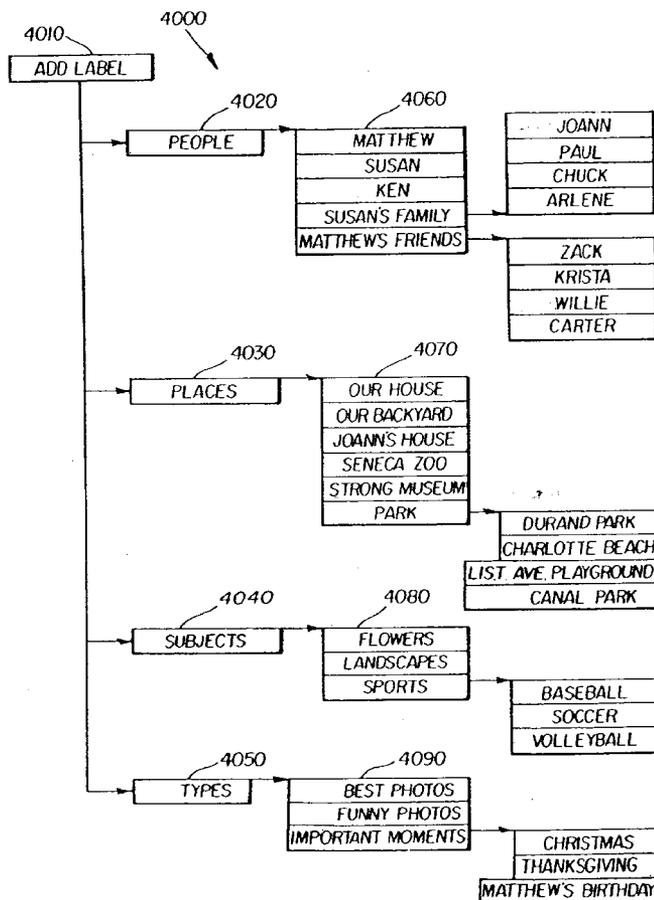
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(57) **ABSTRACT**

A digital camera for capturing images and for adding personal image metadata labels to the captured images, including an image sensor for capturing a plurality of images; an analog-to-digital converter for digitizing the plurality of captured images, from the image sensor, to produce a plurality of captured digital images. Also, included in the digital camera is a memory location for storing the plurality of captured digital images; a display coupled to the memory location for displaying at least one of the plurality of captured digital images. The digital camera has a user control for selecting a personal image metadata label which corresponds to a emotional or aesthetic category as judged by a user; and a processor responsive to the user control for associating the personal image metadata label with the at least one of the plurality of displayed captured digital image.

USER INSERTS AUTOLAUNCH CD-ROM INTO CD-ROM DRIVE

100

110

USER IS ASKED WHETHER THEY WISH TO CREATE "LABEL" FOR THEIR PICTURES TO HELP LOCATE THEM

120

USER RESPONSE

NO → STOP

130 YES

USER TYPES IN NICKNAMES OF FAMILY AND FRIENDS

140

USER SELECTS OR TYPES IN PICTURE CLASSIFICATIONS, LOCATIONS, AND SUBJECTS

150

USER LABELS STORED IN METADATA DATABASE

160

USER TAKES PHOTOGRAPHS AND CONNECTS CAMERA OR MEDIA TO COMPUTER TO TRANSFER IMAGES

170

THUMBNAILS OF IMAGES ARE DISPLAYED

175

ADD MORE LABELS TO PICTURES ?

NO

YES

180

USER SELECTS ONE, MANY, OR ALL IMAGES FROM THUMBNAIL DISPLAY

185

IS LABEL IN MENU ?

NO

YES

195

USER TYPES IN LABEL, WHICH IS ADDED TO METADATA DATABASE

190

USER SELECTS LABEL BY CLICKING ON MENU ITEM

200

SELECTED LABEL IS ADDED TO METADATA FOR ALL SELECTED IMAGES, THUMBNAIL DISPLAY INDICATES METADATA TYPE

210

METADATA STORED WITHIN EACH IMAGE FILE, AND IN SEPARATE DATABASE

220

USER SELECTS LABELS TO RETRIEVE IMAGES OF INTEREST
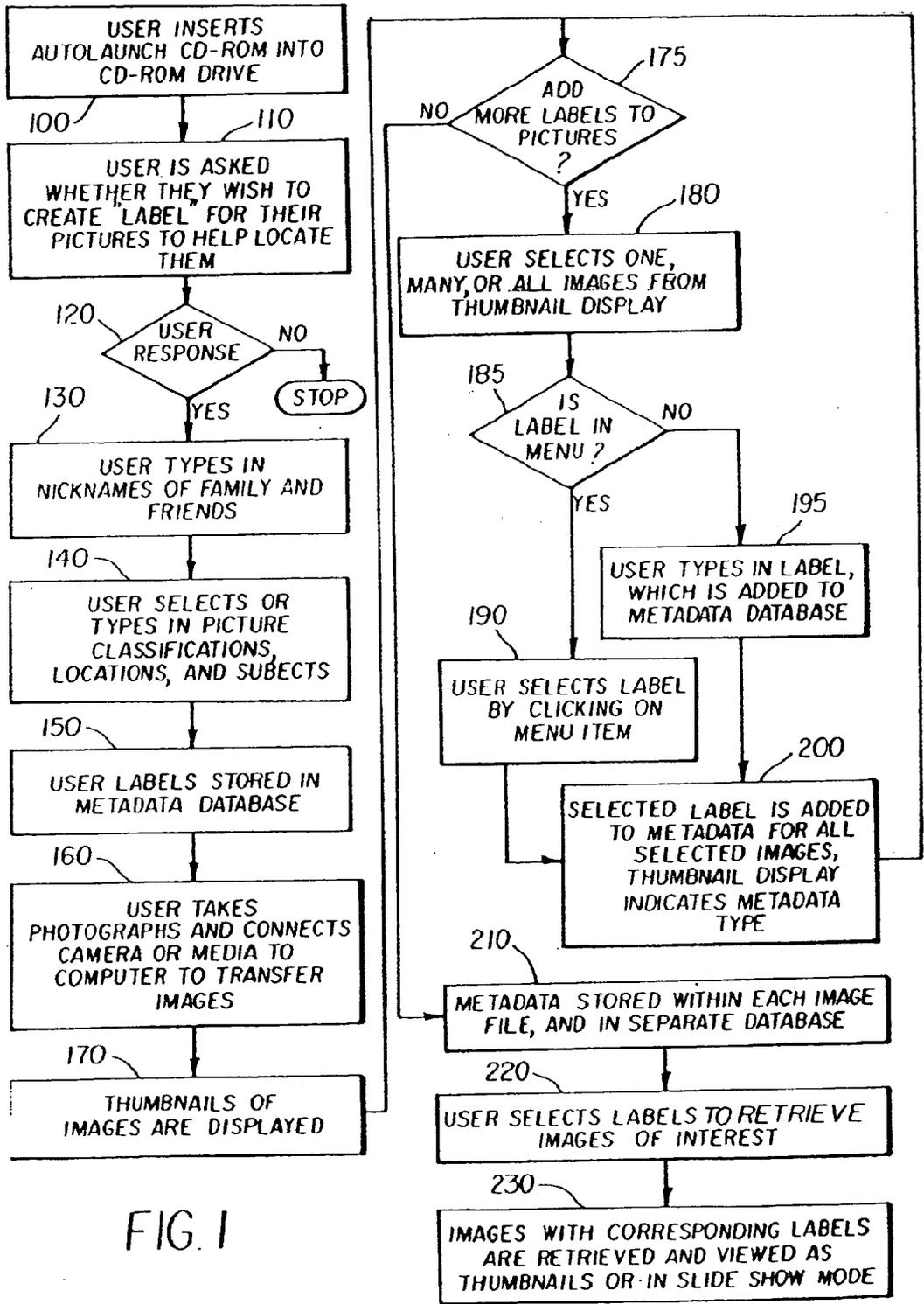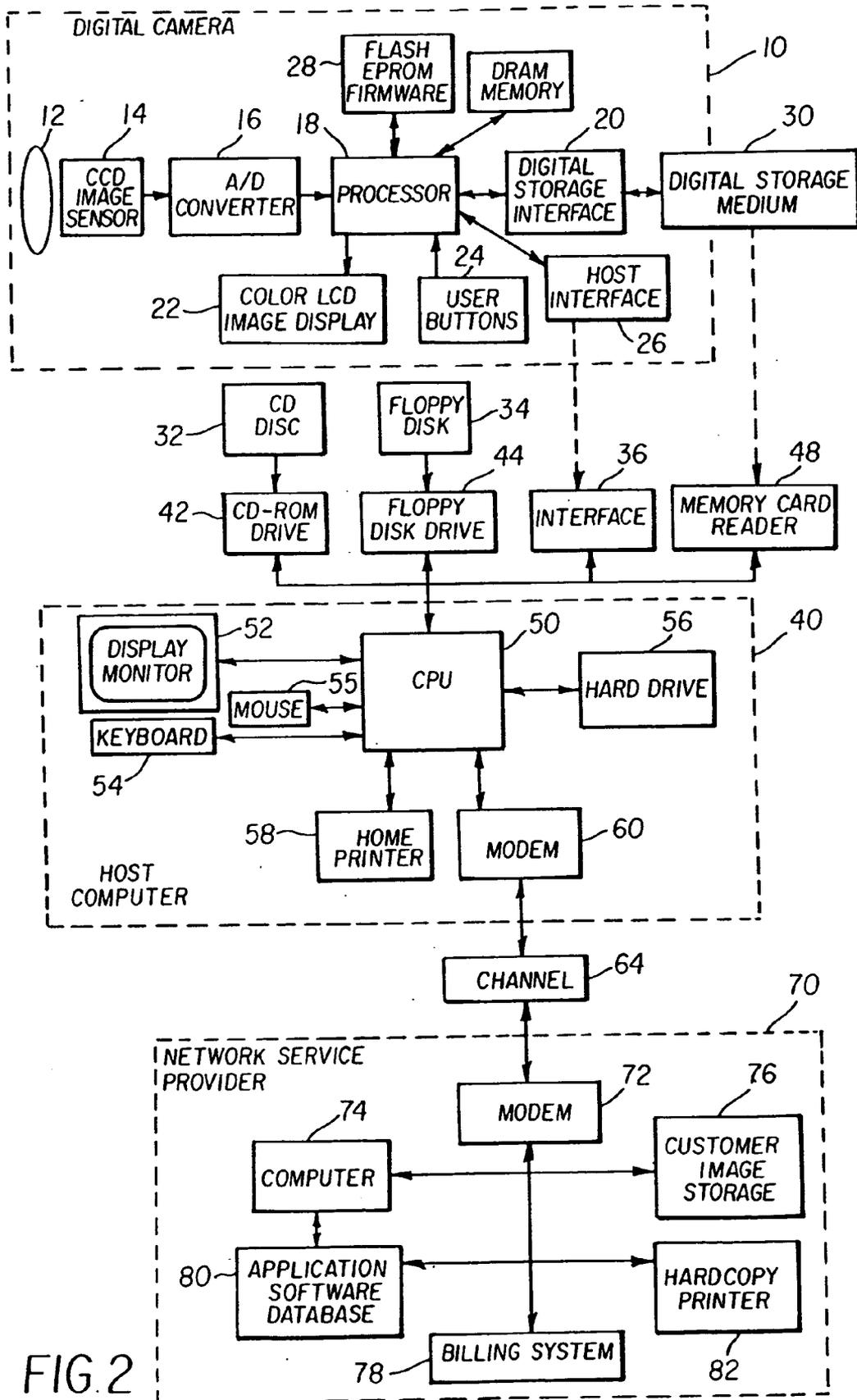
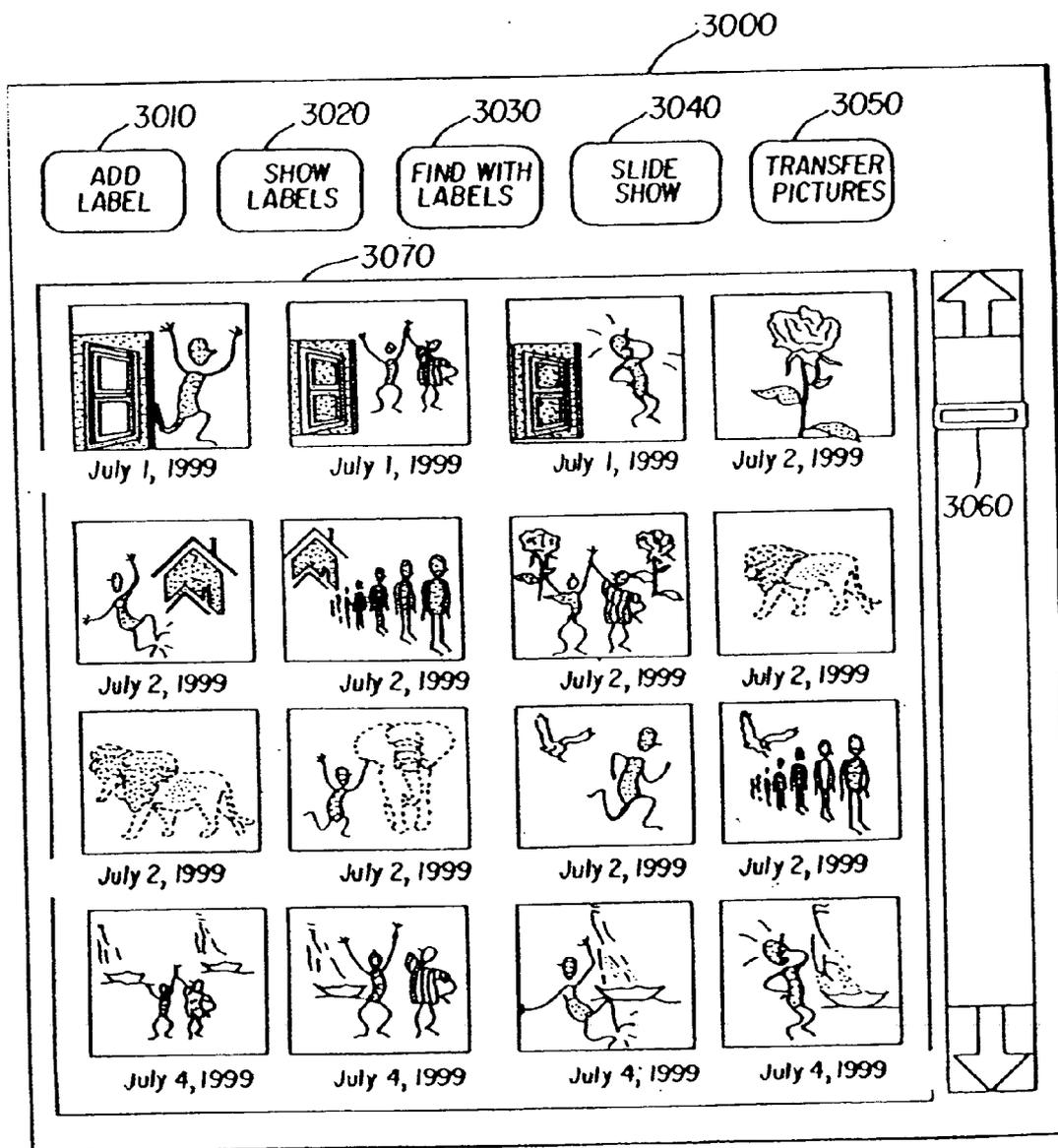230

IMAGES WITH CORRESPONDING LABELS ARE RETRIEVED AND VIEWED AS THUMBNAILS OR IN SLIDE SHOW MODE

FIG. 1

FIG.2

FIG. 3

FIG. 4

FIG.5

6000

3020

ADD LABEL

SHOW LABELS

FIND WITH LABELS

SLIDE SHOW

TRANSFER PICTURES

July 1, 1999

July 1, 1999

July 1, 1999

July 2, 1999

6020

6010

July 2, 19

July 2, 1999

July 2, 1999

CURRENT LABELS

MATTHEW

KEN

OUR BACKYARD

FLOWERS

BEST PHOTOS

July 2, 19

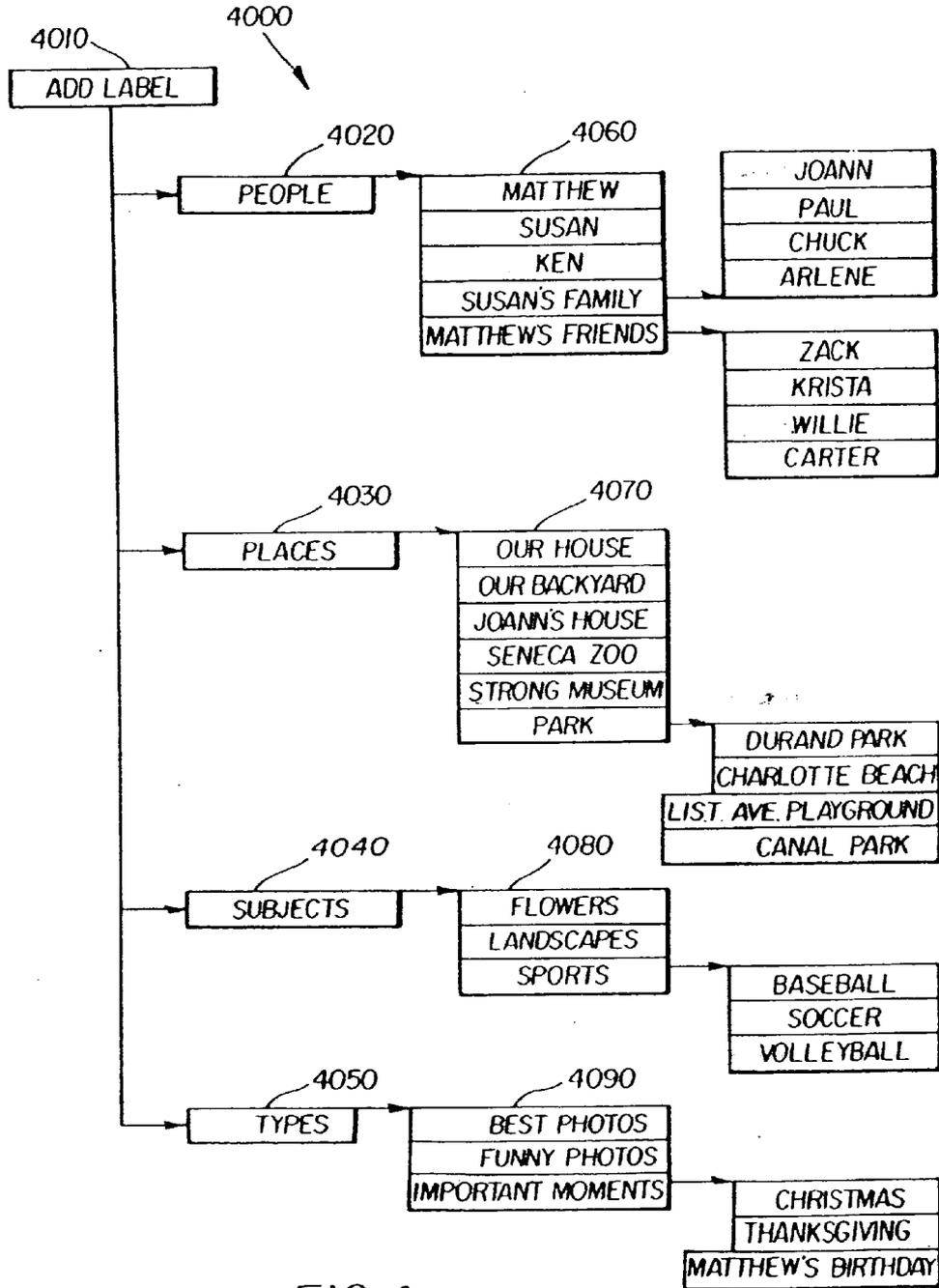July 2, 1999

July 2, 1999

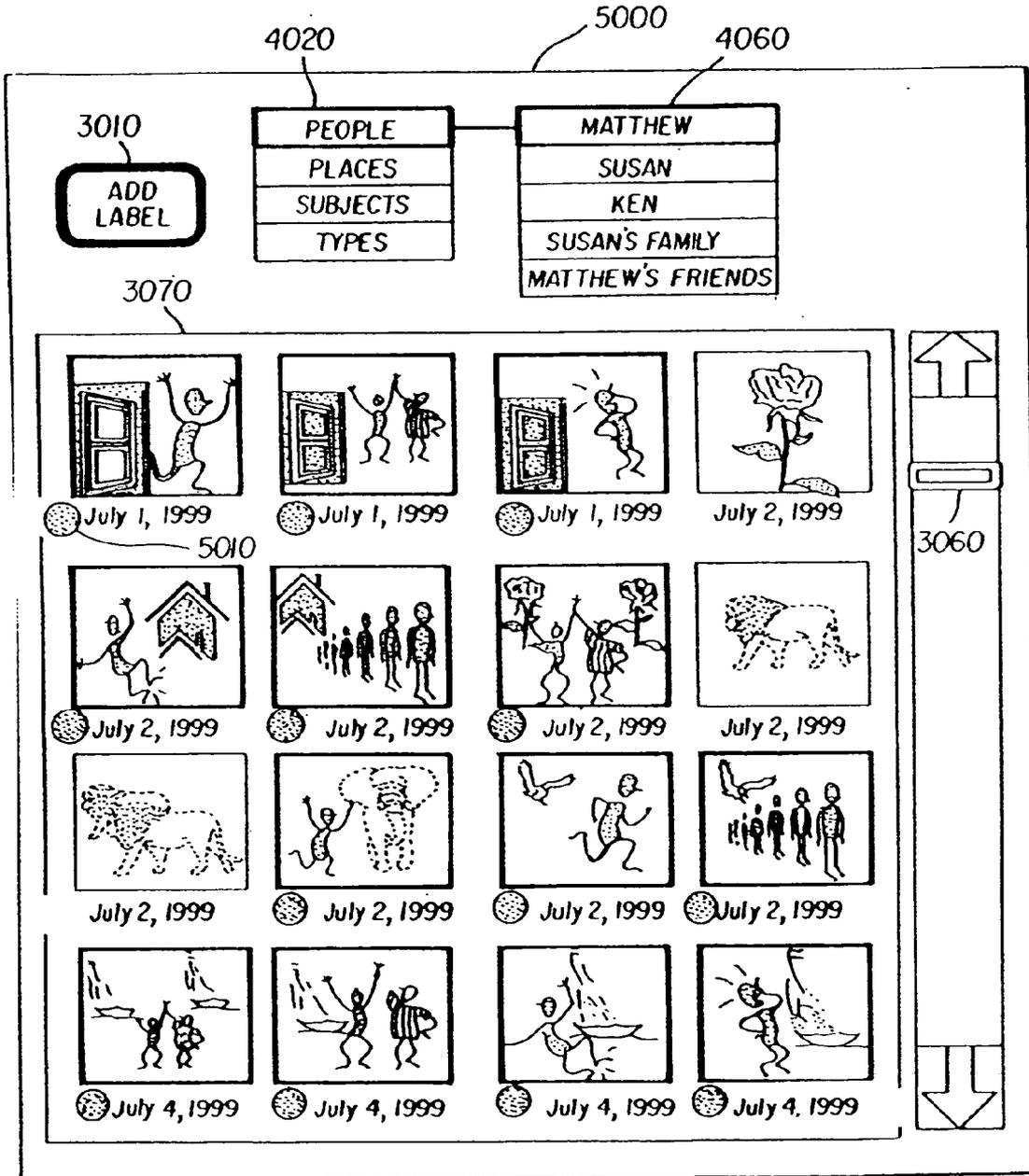July 4, 1999
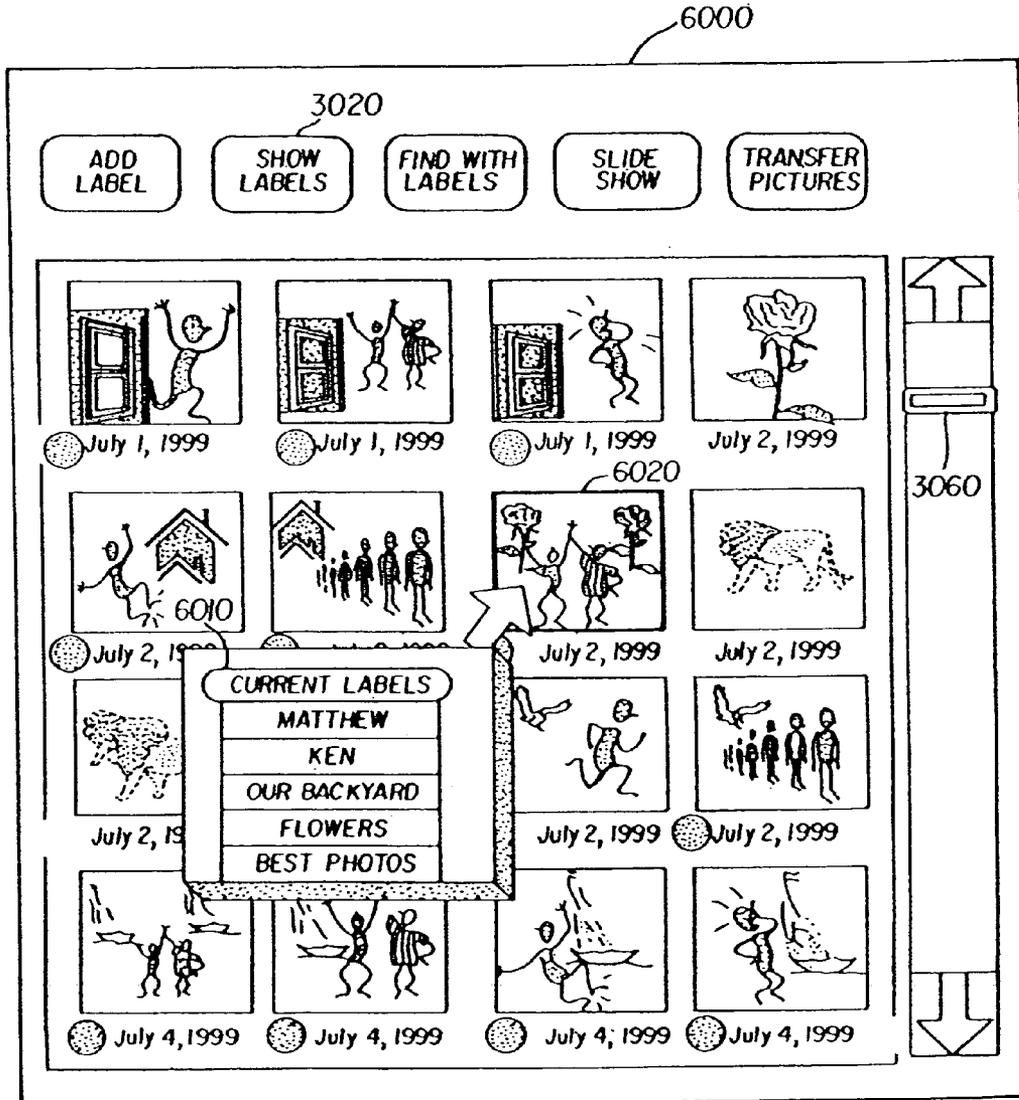
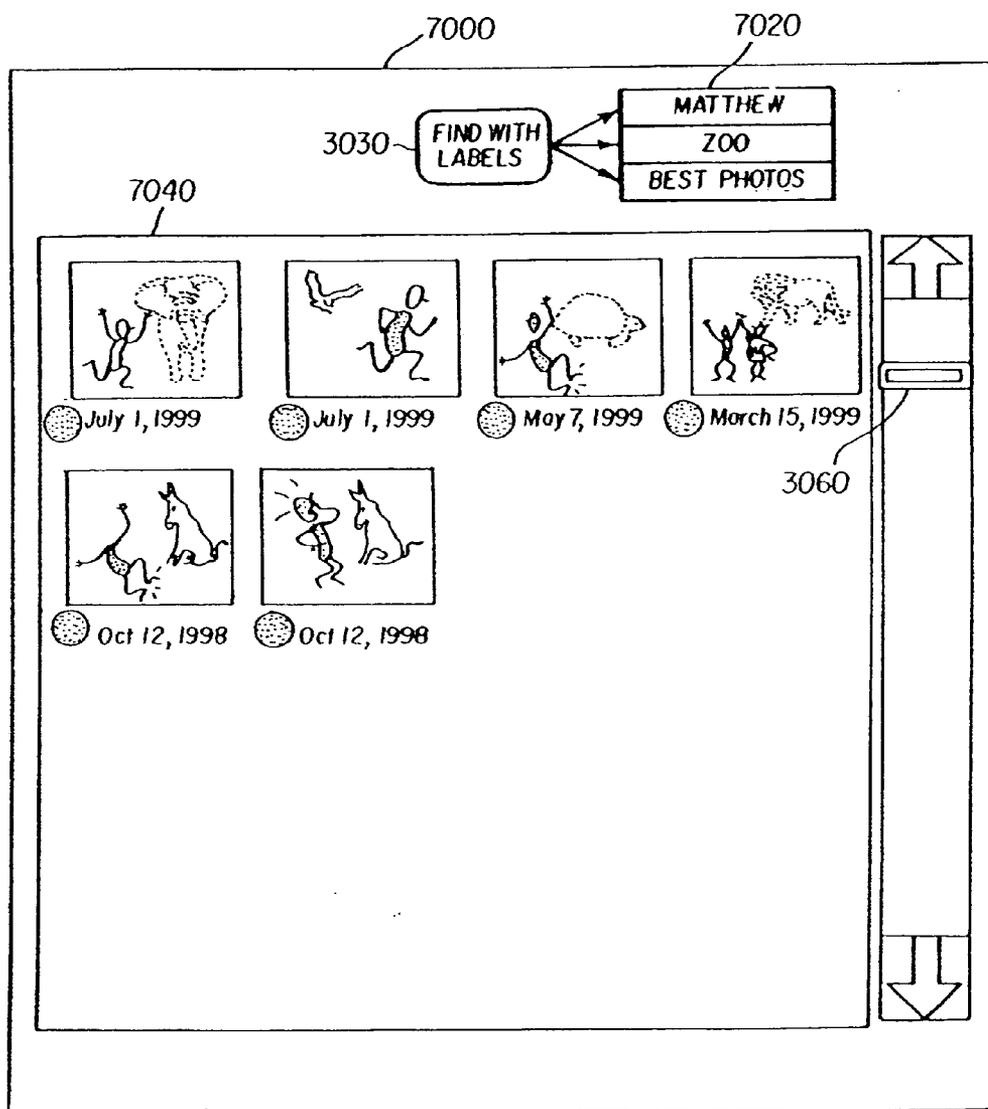July 4, 1999

July 4, 1999

July 4, 1999

3060

FIG. 6

FIG. 7

USING METADATA STORED IN IMAGE FILES AND A SEPARATE DATABASE TO FACILITATE IMAGE RETRIEVAL

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a Regular Continuation of U.S. Ser. No. 10/635,837 filed Aug. 6, 2003, titled "Digital Camera For Capturing Images And Selecting Metadata To Be Associated With The Captured Images " by Kenneth A. Parulski, et al., which is a Continuation of U.S. Pat. No. 6,629,104, filed on Nov. 22, 2000, titled "Method For Adding Personalized Metadata To A Collection Of Digital Images" by Kenneth A. Parulski, et al.

FIELD OF THE INVENTION

[0002] The invention relates generally to the field of photography, and in particular to collecting and categorizing images. More specifically, the invention relates to a personal database of metadata labels constructed prior to image capture.

BACKGROUND OF THE INVENTION

[0003] Image metadata is well-known, and is useful in retrieving desired images from a large collection of images. The Kodak DC265™ camera formulates many metadata items, such as the date/time, camera lens setting, scene light level, etc. when the picture is taken, and stores this metadata within the Exif/JPEG digital image file. Unfortunately, this metadata cannot identify the subject of the photo, or whether this particular photo is one of the user's "favorite" photos. It is this latter type of information that is most useful in quickly and easily retrieving desired images from a large collection of pictures.

[0004] Many software applications allow the user to manually type in text, such as a "picture title" or "picture description," and store this text within the image file. This could be used to add a description including the people, events, or type of photo. The text strings from all images in the database could later be searched to retrieve images having the names, events, etc. of interest. Unfortunately, this is an extremely tedious method of adding metadata. In addition, since the user may type in different text to describe the same item (e.g. Matt, Matthew, or X-mas, Christmas) the database may not contain consistent names for the same picture categories. Some particular software applications, such as Image Expert 2000™ developed by Sierra Imaging Inc., allow the user to add keywords to captured images. The keywords are categorized as "location,""occasion,""photographer," and "subject." While viewing a group of thumbnail images, a user can create keywords in these categories and assign the keywords to one or more captured images by selecting the thumbnails and keywords. The keywords from all images in the database can later be searched to retrieve images that were assigned to those particular keywords.

[0005] Unfortunately, these conventional software applications make it difficult for an untrained consumer to categorize their images in a way that enables them to later locate their favorite images of a selected subject. What is needed is a simple, fast method for the user to add emotional or aesthetic based type metadata to a collection of images, and to use this emotional or aesthetic based metadata to retrieve images of interest.

SUMMARY OF THE INVENTION

[0006] The present invention is directed to overcoming one or more of the problems set forth above. Briefly summarized, according to one aspect of the present invention there is a method of using a digital camera to assign personal image metadata labels to captured images including the steps of: capturing a plurality of images with an image sensor; digitizing the plurality of captured images, from the image sensor, with an analog-to-digital converter to produce a plurality of captured digital images; storing the plurality of captured digital images in a memory location; displaying at least one of the plurality of captured digital images on a display coupled to the memory location; selectively assigning a personal image metadata label, employing a user control, which corresponds to an emotional or aesthetic category, as judged by a user; and associating the personal image metadata label with the at least one displayed captured digital image by employing a processor responsive to the user control.

[0007] The present invention has the advantage of allowing a user to preemptively categorize photos that are particularly noteworthy to the user. The application can display a menu of metadata labels, including labels such as "favorite photos,""funny photos," etc. The metadata labels, or alternatively metadata label identifier codes, are then stored within the image files and/or in a database separate from the image files, but referencing the appropriate images. At a later time, when the database contains hundreds or thousands of images, several metadata labels can be selected together to easily retrieve images. For example, by selecting the categories "Matthew," Matthew's Birthday," and "favorite photos," the user can get a thumbnail display or slideshow of the "best" photos of Matthew taken on his birthday every year, rather than searching through a collection of hundreds or thousands of captured digital image files.

[0008] These and other aspects, objects, features and advantages of the present invention will be more clearly understood and appreciated from a review 10 of the following detailed description of the preferred embodiments and appended claims, and by reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is an example flow diagram of the method of this invention;

[0010] FIG. 2 shows a block diagram of a system that implements this invention;

[0011] FIG. 3 shows an example of a main user interface screen;

[0012] FIG. 4 shows an example menu for selecting labels;

[0013] FIG. 5 shows an example of the main user interface screen as labels are selected;

[0014] FIG. 6 shows a user interface screen displaying a selected picture with its corresponding metadata labels; and

[0015] FIG. 7 shows the user interface screen displaying an image retrieved using selected labels.

DETAILED DESCRIPTION OF THE INVENTION

[0016] Referring to FIG. 1 a flow diagram of an exemplary embodiment of the present invention for adding personal-

ized metadata to a collection of images is shown. Operation block **100** discloses a user inserting an auto-launch CD-ROM into a CD-ROM drive of a computer in order to install software that implements the method of the present invention. Operation **110** discloses prompting a user to create "labels" for their pictures (i.e., images), prior to capturing any images, for the purpose of locating (i.e., retrieving) the pictures at a later time. An inquiry operation **120** asks the user to respond affirmatively or negatively. Should the user respond negatively, all operations cease. In contrast, should the user respond affirmatively, she would be prompted to enter nicknames of her family and friends by operation **130**. As will be described later, the user entries are prompted by questions including "please enter first names of family members and pets" and "please enter nicknames of friends you often photograph." Subsequently, the user is prompted to either select or enter picture classifications, locations, and subjects according to operation **140**. As will be described later, the user entries concerning classifications are prompted by questions concerning the types of situations and occasions that they generally photograph.

[0017] Operation **150** causes user labels to be stored in a metadata database. This completes the process of developing the database of pre-assigned metadata labels personalized for the particular user. Some time later (e.g., immediately thereafter, or several hours later, or several days later), a user can capture one or several images and transfer the captured images to the computer in operation **160**. Upon transfer of the images in operation **160**, operation **170** causes thumbnail images to be displayed.

[0018] Operation **175** queries the user whether more labels should be added to the images. Simultaneously, operation **200** adds a selected label to metadata for all selected images. Operation **180** receives an affirmative response from the query of operation **175**. The user selects one, many, or all of the images from the thumbnail display in operation **180**. A final query operation **185** asks whether the label is part of a pull down menu. An affirmative response is an input for operation **190**, wherein the user selects a label by clicking on a menu item. Next, operation **200** adds the selected label to metadata for all selected images. A negative response to the final query operation **185** causes operation **195** to prompt the user to enter in a label, which is then added to the metadata database.

[0019] A negative response to query operation **175** causes operation **210** to store metadata within each image file and in a separate database. Some time later (e.g., immediately thereafter, or many days later, or many years later), operation **220** prompts the user to select labels in order to retrieve images of interest. In the final operation **230**, images with corresponding labels are retrieved and viewed as thumbnails (so that the corresponding full resolution images can be selectively printed, transmitted, etc.) or may be viewed as a slide show.

[0020] FIG. **2** is a block diagram of a digital imaging system useful in practicing the method of the present invention, which enables users to easily customize the interface and features of their digital camera prior to taking pictures. The digital imaging system includes a digital camera **10** which is supplied along with metadata categorization software provided on a compact disc **32**, CD-ROM **42**, a floppy disk **34**, or other digital media. The digital imaging system

also includes a host computer **40**, such as a Dell Dimension XPS M200™, and a Network Service Provider **70**. In accordance with one preferred embodiment of the present invention, metadata categorization software is executed external to the digital camera **10**, and is executed on the host computer **40**. However, the metadata categorization software can alternatively be executed by an Internet appliance, set-top box, or other external device, or can be executed internal to the digital camera **10**, provided that the digital camera has an appropriate user interface for displaying and responding to questions. The metadata categorization software can be provided along with the camera customization software described in commonly-assigned U.S. Ser. No. 09/549,356 filed Apr. **14**, **2000** by Prabhu et al., titled "Method And Apparatus For Providing A User Customizable Digital Camera."

[0021] The digital camera **10** produces digital images that are stored on a removable memory card **30** or other digital storage device. The digital camera **10** has a zoom lens **12** that is controlled by a zoom switch (not shown) having telephoto (T) and wide angle (W) positions, and having zoom and focus motor drives (not shown), and an adjustable aperture and shutter (not shown) for focusing light from a scene onto an image sensor **14**. The image sensor **14** can be, for example, a single-chip, colored, charge-coupled device (CCD), using the well-known Bayer color filter pattern. When the user depresses a shutter button (not shown), the analog output signal from the image sensor **14** is converted to digital data by an analog-to-digital (A/D) converter **16**. The digital data is processed by a processor **18** that is controlled by firmware stored in a reprogram able memory, such as a Flash EPROM **28**.

[0022] The processed digital image file is provided to a digital storage interface **20** which stores the digital image file on the removable memory card **30**, or on another type of digital memory device, such as a floppy disk or magnetic hard drive, or smart media. The removable memory card **30**, which is well-known to those skilled in the art, can include, for example, a memory card adapted to the PCMCIA card interface standard, as described in the *PC Card Standard, Release* 2.0, published by the Personal Computer Memory Card International Association, Sunnyvale, Calif., September 1991. The removable memory card **30** can also be adapted to the Compact Flash interface standard, such as described in the *CompactFlash Specification Version* 1.4, published by the CompactFlash Association, Palo Alto, Calif., July 1999, or to other memory devices such as the well-known SSFDC (Solid State Floppy Disc Card) or Memory Stick formats.

[0023] The processor **18** performs color interpolation followed by color and tone correction, in order to produce rendered sRGB image data. The processor **18** can include internal buffer memory to store a portion of the image, or to store one or more entire images. Alternatively, the processor **18** can use a separate external memory, such as DRAM memory **19**. The rendered sRGB image data is then JPEG compressed and stored as a JPEG image file on the removable memory card **30**. The processor **18** also provides a lower resolution or "thumbnail" size image data to a color image display **22**, such as a color liquid crystal display (LCD), which displays the captured image for the user to review. The low-resolution image can be created as described in commonly-assigned U.S. Pat. No. 5,164,831

issued Nov. 17, 1992 to Kuchta et al., titled "Electronic Still Camera Providing Multi-Format Storage Of Full And Reduced Resolution Images." Several camera user buttons **24** are used to control the digital camera **10**. The camera user buttons **24**, together with text and icons displayed on the image display **22** (not shown), form the camera graphical user interface (GUI). This GUI is controlled by the user interface portion of the firmware stored in the Flash EPROM **28**.

[0024] The digital camera **10** determines various metadata items, such as the date/time the picture was taken from the real-time clock (not shown) provided by the processor **18**, the camera lens settings, scene light level, etc. These metadata items are stored within a so-called "Exif" image file as defined in "Digital Still Camera Image File Format (Exif)" version 2.1, June 1998 by the Japan Electronics Industries Development Association (JEIDA), Tokyo, Japan. This format includes an Exif application segment that stores particular image metadata, for example the date and time the picture was captured, the lens f/number and other camera settings. It can also include user-selected custom metadata labels, as will be described later.

[0025] After a series of images has been taken by the digital camera **10** and stored on the removable memory card **30**, the removable memory card **30** can be inserted into a memory card reader **48** communicatively attached to, as shown, or incorporated within (not shown) the host computer **40**. Alternatively, an interface cable **36** can be used to connect between a host interface **26** in the digital camera **10** and a camera interface **46** which may be external or internal to the host computer **40**. The interface cable **36** may conform to, for example, the well-known universal serial bus (USB) interface specification.

[0026] The captured images from the digital camera **10** can be downloaded to the host computer **40** and stored on a hard drive **56** under the control of a central processing unit (CPU) **50**. The CPU **50** is coupled to a display monitor **52**, which is used to view the images, and a keyboard **54**. A mouse **55** permits the user to readily communicate with the CPU **50**. The CPU **50** communicates with a CD Rom drive **42** in order to read the information on the compact disc **32**. The CPU **50** also communicates with the floppy disk drive **44** in order to read the information on the floppy disk **34**. The CPU **50** communicates with a local printer **58**, such as an Epson Stylus Photo 700™ printer, which produces hard copy prints of the images that were captured by the digital camera **10**.

[0027] The digital camera **10** that is supplied to a user includes firmware that provides normal camera features and remains stored in the Flash EPROM **28**. In an alternative embodiment of the present invention, the user can customize the firmware stored in Flash EPROM **28** of the digital camera **10** using the metadata categorization software provided with the digital camera **10**, so that the metadata labels entered or selected by the user in blocks **130** and **140** of FIG. **1** are stored in Flash EPROM **28**. The color LCD image display **22** and user buttons **24** are then used to assign metadata labels to images, substituting for blocks **175** through **210** of FIG. **1**, as the images are captured or reviewed using the digital camera **10**. The CPU **50** uses the metadata categorization software in accordance with the present invention to provide custom metadata labels within

the firmware code that is downloaded under the control of processor **18** of the digital camera **10** via the removable memory card **30**, and stored in the Flash EPROM **28**, as described in commonly-assigned U.S. Pat. No. 5,477,264 issued Dec. 19, 1995 to Sarbadhikari et al. titled "Electronic Imaging System Using a Removable Software-Enhanced Storage Device," or via the interface cable **36** as described in commonly-assigned U.S. Pat. No. 5,734,425 issued Mar. 31, 1998 to Takizawa et al. titled "Electronic Still Camera With Replaceable Digital Processing Program."

[0028] The metadata categorization software provided on the compact disc **32** or the floppy disk **34** can also include digital image application software, such as the Picture Easy™ version 3.1 software developed by the Eastman Kodak Company. Alternatively, instead of being provided on a compact disc or floppy disk **34**, the metadata categorization software could be downloaded from the Network Service Provider **70** via a modem **60**. The modem **60** communicates via a channel **64** with another modem **72** at the Network Service Provider **70**, which is connected to a computer **74**, and a customer image storage device or system **76**. A billing system **78** can charge the user (e.g., via a credit card) for downloading the metadata categorization software. The computer **74** operates an application software database **80** that can also provide input to one or more hardcopy printers **82** for subsequent printing of images captured by the digital camera **10**.

[0029] As shown in block **100** of FIG. **1**, the user begins by installing the program on her computer. The program may be provided on a compact disc **32** which may be a Photo CD also having digitized images (so that the digital camera **10** is not needed), or can alternatively be included as part of application software provided with the digital camera **10**. As part of this installation process, the user is prompted to answer a number of questions (blocks **130** and **140** of FIG. **1**) that produce a personalized database of metadata "labels." At least some of the database of metadata labels is derived from the user's emotional judgment about the content of the images that she usually captures. The present invention allows a user to develop emotional or aesthetic based metadata that is useful in categorizing several of the user's captured images according to the user's own emotional or aesthetic judgment regarding the captured images.

[0030] The emotional or aesthetic based metadata is derived from a user answering queries about her family, friends, and her aesthetic judgment of the typical images that she captures. Consequently, the user is able to preemptively categorize "how much they like a picture" by using emotional or aesthetic based metadata labels such as "favorite photos," "best photos," "cute photos," "important moments," or "funny photos." These metadata labels are then stored within the captured image files and/or in a database that may be separate from the image files, but still references the appropriate categorized images. Labels assigned to each digital image file may be stored as ASCII text strings or as other types of metadata label identifiers, such as digital code values assigned to a particular metadata label. For example, a user's "best" pictures may be stored with the ASCII text "BEST," for "user image value," or may be stored with the digital value "10" (using a 10 point scale where 1 is lowest and 10 is highest) as the metadata label identifier in the "user image value" field. After describing how the answers will be used, the following types of personal queries may be asked:

[0031] Type the nicknames of immediate family members

[0032] Type the nicknames of friends you often photograph

[0033] Are these good ways to classify your pictures? (select, deselect, or add)

[0034] Best photos, funny photos, cute photos, important moments

[0035] Where do you often take pictures (select, deselect, or add)

[0036] Our house, our yard, (friend's name's house), zoo, _____ park, etc.

[0037] 1What type of pictures do you often take (select, deselect, or add)

[0038] Portraits, landscapes, flower & plants, sports

[0039] In block 150, the user's responses to these questions are used to configure and store a database of pre-assigned metadata labels for the user in a digital memory, normally hard drive 56 of computer 40.

[0040] In block 160, the user then proceeds to use the metadata categorization software to display images either stored in or downloaded from the digital camera 10, or provided from a compact disc 32, or another image source. For example, in block 130 to 140 of FIG. 1, the user may develop metadata labels that relates to family members, that family member's birthday party, as well as emotional metadata labels, for example images that the user 'feels' are her favorite photos. For an explicit example, a user selects categories labeled "Matt,""Matt's Birthday," and "favorite photos." Adding labels to the appropriate images as part of blocks 175 through 210 of FIG. 1 will enable the user to later (in blocks 220 through 230) quickly and easily access a thumbnail display or slideshow of the "best" photos featuring Matt taken on his birthday every year that pictures were taken, rather than searching through a collection of hundreds or thousands of captured digital image files taken over many years.

[0041] As part of block 160, the images from the camera (or full size or thumbnail size images from the compact disc) are transferred to the computer hard drive 56. In block 170, the CPU 50, running the metadata categorization software displays thumbnail size images of each new downloaded picture on the computer monitor, as depicted in FIG. 3, along with a message such as "Label your photos now, so you can find them later." The user selects one, several, or all of the thumbnail images by clicking on the images. The user then selects, from a pull-down menu, a metadata category (e.g., "People—who's in the picture,""Subject—who's in this picture,""Type—What type of picture is this?" Then, for the selected category, they select one or more metadata items using blocks 175 through 200 of FIG. 1. For example, if they select "Subject—who's in this picture," the application may display a menu listing "Ken, Susan, Matthew, JoAnn, etc." and allow them to click on one or more names. If necessary, they can type in new names (block 195 of FIG. 1), which are added to future display lists. When the user selects "Type—what type of picture is this," the application displays a menu including a number of emotional or aesthetic categories such as "best photos,""funny photos," etc."

[0042] Example display and pull-down menu embodiments for blocks 175 through 200 of FIG. 1 are shown in FIGS. 3-6. Referring to FIG. 3, a "Main User Interface Screen"3000 includes the following toolbar buttons: an "Add Label"3010, a "Show labels"3020, a "Find with Labels"3030, a "Slide Show"3040, and a "Transfer Pictures"3050. The main user interface screen 3000 has a slider or scrollbar 3060 for scrolling up and down through a group of thumbnail images. Many thumbnail images 3070 (e.g. 16 thumbnail images) may be displayed for the user to view and choose.

[0043] The interface screen shown in FIG. 3 provides an efficient way for the user to enter metadata for images, a "group" of thumbnails at a time. A typical digital memory card 30 can contain, for example, 24 pictures taken over 3 "picture taking sessions." For example, over the course of a weekend, the group of images on the digital memory card 30 may include 12 shots taken at Matthew's birthday party at home, 8 shots taken during a visit to the zoo, and 4 taken during a stop at JoAnn's house. The thumbnail images 3070 shown in FIG. 3 are 16 images from this set, corresponding to the position of scroll bar 3060 within the set of images. The thumbnail images 3070 are provided using the thumbnail image data stored within the Exif image file. The date each image was taken is also read from the Exif image file metadata and displayed beneath each image. In order to label images, the user selects the "add label" icon 3010.

[0044] Referring to FIG. 4, a screen entitled, "Menu for Selecting Labels"4000 lists an example of pre-assigned metadata labels configured in blocks 130 to 150 of FIG. 1, which can now be selected by the user in block 190 of FIG. 1. The list includes the following menu selections: an "Add Label"4010, a "People"4020, a "Places"4030, a "Subjects"4040, a "Types"4050. At the next level, the selections correspond with the user's input to the previous selections. For example, selection 4060 corresponds with the user's input to menu selection 4020 (e.g. the list of family members and friends that are often photographed). Selection 4070 corresponds to the user input for menu selection 4030. Selection 4080 corresponds to the user input for menu selection 4040. Selection 4090 corresponds to the user input for menu selection 4050. One of ordinary skill can envision further levels as well.

[0045] Referring to FIG. 5, a display screen 5000 showing how the "main user interface screen labels are selected" is disclosed. A user selects "Add Label"3010, and uses the pull down menu to select "People"4020, whereby a second pull down menu with the user's input 4060 is shown. The display includes a scroll bar 3060 and several thumbnail images 3070 as well as icons or text 5010 that indicate which of the thumbnail images 3070 have associated metadata labels.

[0046] FIG. 6 displays a screen 6000 that depicts a selected picture 6020 with its associated metadata labels 6010. The current labels 6010 correspond to the labels selected during steps 175 through 200 of FIG. 1. The selected picture 6020 includes the labels 6010"Matthew" (people), "Ken" (people), "Our backyard" (place), "Flowers" (subjects) and "Best photos" (type).

[0047] In block 180, the user selects one or more thumbnail images using the thumbnail images 3070. For example, the user can quickly highlight the first 12 images, and then select (in block 190) Event→Matthew's birthday to label all

of these images using the list shown in FIG. **4**, and proceed to highlight and label the other groups if they wish (repeating blocks **175** through **200** of FIG. **1**). As another example, also shown specifically in FIG. **5**, in block **180** of FIG. **1** the user can highlight all the images on the roll with one click, deselect those few that do not include Matthew, and then select People→Matthew in block **190** to further label the appropriate images. As another example, in block **180** the user can highlight the one or two of the pictures they judge to be their very best images of the group, and select Type→Best Photos in block **190**. If an appropriate label does not exist, the user can create a new label in block **195**, which is stored in the metadata label database for future use.

[0048] As labels are added to each image, graphics **6010** (or text) coded to indicate the category of labels provided for the image, are positioned in the corner of the corresponding thumbnail image display, as shown in FIG. **6**. When the "show labels" button **3020** is selected by the user, the labels are displayed adjacent to the selected image, so that it is apparent what labels have been applied to a particular image, as shown in FIG. **6**. In this mode, the user can also add additional labels or change previous-applied labels for that particular image.

[0049] In block **210**, the metadata text labels or other metadata label identifiers are then stored within the image files and/or in a database separate from the image files. At a later time, when the database contains hundreds or thousands of images, the metadata can be used to easily retrieve images. FIG. **7** discloses a "Find with Labels" feature **7000** that allows a user to locate images using the pre-assigned metadata labels configured in blocks **130** through **150** of FIG. **1** and assigned to particular images in blocks **175** through **210** of FIG. **1**. Toolbar button "Find with labels"**3030** is selected. The user then selects, from the menu depicted in FIG. **4**, labels of interest, for example the labels "Matthew,""Zoo," and "Best photos"**7020**. A scroll bar **3060** allows a user to scroll the images **7040** found by the label search. In the example of FIG. **7**, by selecting the categories "Matthew,""Zoo," and "Best photos," the user can get a thumbnail display or slideshow of the best photos featuring Matt taken on his birthday over the course of several years, rather than searching through a collection of hundreds or thousands of digital image files stored on hard drive **56**.

[0050] In an alternative embodiment, blocks **170** through **210** of FIG. **1** are implemented in the digital camera **10** of FIG. **2**. In another alternative embodiment, the user identifies only certain types of images, such as favorite images, important events, or funny images, when the images are captured on digital camera **10**, by selecting the appropriate labels using user buttons **24** while reviewing captured image thumbnails on the color LCD image display **22**. The metadata labels associated with these emotional or aesthetic judgments are then stored within the Exif image files. Additional metadata labels can optionally be added when these images are transferred from the digital camera **10** to the computer **40**, as described earlier in relation to blocks **170** through **210** of FIG. **1**.

[0051] Computer program products, such as readable storage medium, can be used to store the customization software, and also the desired firmware components in accordance with the present invention. The readable storage medium can be a magnetic storage media, such as a mag-

netic disk (such as a floppy disk) or magnetic tape; optical storage media, such as an optical disk, an optical tape, or a machine readable bar code; solid state electronic storage devices, such as a random access memory (RAM) or a read only memory (ROM); or any other physical device or medium employed to store computer programs.

[0052] The invention has been described with reference to a preferred embodiment. However, it will be appreciated that variations and modifications can be effected by a person of ordinary skill in the art without departing from the scope of the invention.

PARTS LIST

[0053] **10** digital camera

[0054] **12** lens

[0055] **14** CCD image sensor

[0056] **16** A/D converter

[0057] **18** processor

[0058] **19** DRAM memory

[0059] **20** digital storage interface

[0060] **22** color LCD image display

[0061] **24** user buttons

[0062] **26** host interface

[0063] **28** flash EPROM

[0064] **30** memory card

[0065] **32** compact disc

[0066] **34** floppy disk

[0067] **36** interface

[0068] **40** host computer

[0069] **42** CD-ROM drive

[0070] **44** floppy disk drive

[0071] **46** camera interface

[0072] **48** memory card reader

[0073] **50** CPU

[0074] **52** display monitor

[0075] **54** keyboard

[0076] **55** mouse

[0077] **56** hard drive

[0078] **58** local printer

[0079] **60** modem

[0080] **64** channel

[0081] **70** network service provider

[0082] **72** modem

[0083] **74** computer

[0084] **76** customer image storage

[0085] **78** billing system

[0086] **80** application software database

[0087]   **82** printer

[0088]   **100** autolaunch operation

[0089]   **110** label query operation

[0090]   **120** user response

[0091]   **130** nickname operation

[0092]   **140** picture classification operation

[0093]   **150** label storage operation

[0094]   **160** image capture operation

[0095]   **170** image display operation

[0096]   **175** additional label query

[0097]   **180** image selection operation

[0098]   **185** menu query

[0099]   **190** label selection operation

[0100]   **195** metadata database input operation

[0101]   **200** label and metadata match operation

[0102]   **210** image-associated metadata storage operation

[0103]   **220** label selection operation

[0104]   **230** image viewing operation

[0105]   **3000** Main User Interface Screen

[0106]   **3010** Add label toolbar button

[0107]   **3020** Show labels toolbar button

[0108]   **3030** Find with labels toolbar button

[0109]   **3040** slide show toolbar button

[0110]   **3050** transfer pictures toolbar button

[0111]   **3060** scroll bar toolbar button

[0112]   **3070** thumbnail images

[0113]   **4000** Menu for selecting labels

[0114]   **4010** add label toolbar button

[0115]   **4020** people selection

[0116]   **4030** places selection

[0117]   **4040** subject selection

[0118]   **4050** types selection

[0119]   **4060** user input associated people selection

[0120]   **4070** user input associated places selection

[0121]   **4080** user input associated subjects selection

[0122]   **4090** user input associated types selection

[0123]   **5000** screen for how "Main User Interface labels are selected"

[0124]   **5010** metadata label icon

[0125]   **6000** screen for "Show Picture Labels"

[0126]   **6010** current picture labels displayed

[0127]   **6020** associated thumbnail image

[0128]   **7000** screen for "Find with Labels"

[0129]   **7020** user selected labels

[0130]   **7040** label search images

What is claimed is:

1. A method for rating images to facilitate image retrieval, comprising:

(a) storing a plurality of digital image files in a digital memory;

(b) displaying the plurality of stored digital image files;

(c) permitting a user to select one of the plurality of displayed images and to select a rating, wherein the rating indicates how much the user likes the image;

(d) storing metadata, indicating the user's selected rating, in both a stored digital image file corresponding to the displayed image and in a database separate from the stored digital image file.

2. The method claimed in claim 1, wherein the rating is provided using a multi-point scale.

3. The method claimed in claim 1, further comprising:

(e) displaying a group of thumbnail images corresponding to at least some of the plurality of stored digital image files;

(f) retrieving the metadata from the stored digital image files corresponding to the group of thumbnail images; and

(g) displaying an icon adjacent to at least one of the thumbnail images correlating to or associated with the retrieved metadata.

4. The method claimed in claim 1, wherein the stored digital image files comprise JPEG image files.

5. The method claimed in claim 4, wherein the stored digital image files comprise Exif image files.

6. The method claimed in claim 5, further comprising the step of transferring the plurality of digital image files from a digital camera, prior to storing the plurality of digital image files in the digital memory.

7. The method claimed in claim 6, wherein the metadata also includes a label for identifying the person or event depicted in the selected displayed image.

8. The method claimed in claim 7, further comprising:

(i) displaying a group of thumbnail images corresponding to at least some of the plurality of stored digital image files;

(ii) retrieving the label metadata from either the stored digital image files corresponding to the group of thumbnail images or from the database; and

(iii) displaying the retrieved label as text adjacent to the thumbnail image.

9. A computer software product comprising a computer readable storage medium having a computer program, which when loaded into a computer causes the computer to perform the steps according to claim 1.

10. A method for rating images to facilitate image retrieval, comprising the steps of:

(a) storing a plurality of digital image files in a digital memory;

(b) displaying the plurality of stored digital image files;

(c) permitting a user to select ratings for each of the plurality of displayed images, wherein the rating indicates how much the user likes each displayed image;

(d) storing metadata, indicating the user's selected rating, in each of the plurality of stored digital image files corresponding to the plurality of displayed images, and in a database separate from the plurality of shared digital image files.

11. The method claimed in claim 10, wherein the rating is provided using a multi-point scale.

12. The method claimed in claim 10, further comprising:

(e) displaying a group of thumbnail images corresponding to at least some of the plurality of stored digital image files;

(f) retrieving the value metadata from either the stored digital image files corresponding to the group of thumbnail images or from the database; and

(g) responsive to the retrieved metadata, displaying an icon adjacent to at least one of the thumbnail images.

13. The method claimed in claim 10, wherein the stored digital image files comprise JPEG image files.

14. The method claimed in claim 13, wherein the stored digital image files comprise Exif image files.

15. The method claimed in claim 14, further comprising transferring the plurality of digital image files from a digital camera, prior to storing the plurality of digital image files in the digital memory.

16. The method claimed in claim 15, wherein the metadata also includes a label for identifying the person or event depicted in the selected displayed image.

17. A computer software product comprising a computer readable storage medium having a computer program, which when loaded into a computer causes the computer to perform the steps according to claim 10.

*   *   *   *   *