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Shuster

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(54) **METHOD AND APPARATUS FOR PHOTOGRAPH FINDING**

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Related U.S. Application Data

(63) Continuation of application No. 12/325,589, filed on Dec. 1, 2008, which is a continuation of application No. 11/056,699, filed on Feb. 10, 2005, now Pat. No. 7,460,737.

(60) Provisional application No. 60/544,570, filed on Feb. 12, 2004.

(51) **Int. Cl.**
G06K 9/54 (2006.01)
(52) **U.S. Cl.** **382/305**; 382/209; 382/219; 382/282
(58) **Field of Classification Search** 382/291, 382/219, 282
See application file for complete search history.

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(57) **ABSTRACT**

Digital image data including discrete photographic images of a variety of different subjects, times, and so forth, are collected and analyzed to identify specific features in the photographs. In an embodiment of the invention, distinctive markers are distributed to aid in the identification of particular subject matter. Facial recognition may also be employed. The digital image data is maintained in a database and quarried in response to search requests. The search requests include criteria specifying any feature category or other identifying information, such as date, time, and location that each photograph was taken, associated with each photograph. Candidate images are provided for review by requesters, who may select desired images for purchase or downloading.

20 Claims, 2 Drawing Sheets

100

102
Distribute
Distinctive
Markers

104
Collect Digital
Image Data

106
Collect Source
Information

108
Time, Date
Location
Photographer
Subject Matter

112
Facial
Recognition

110
Analyze Image
Data

114
Marker
Recognition

118
Provide Data
to Database

122
Database
Query

116
Other
Feature
Recognition

120
Receive Requests
with Search
Criteria

124
Present
Images
Matching
Criteria

FIG. 1

200

202
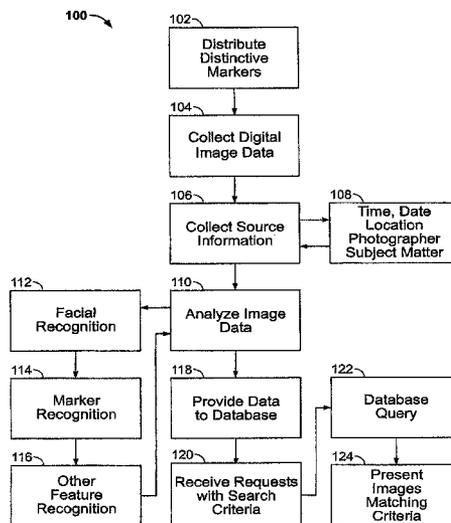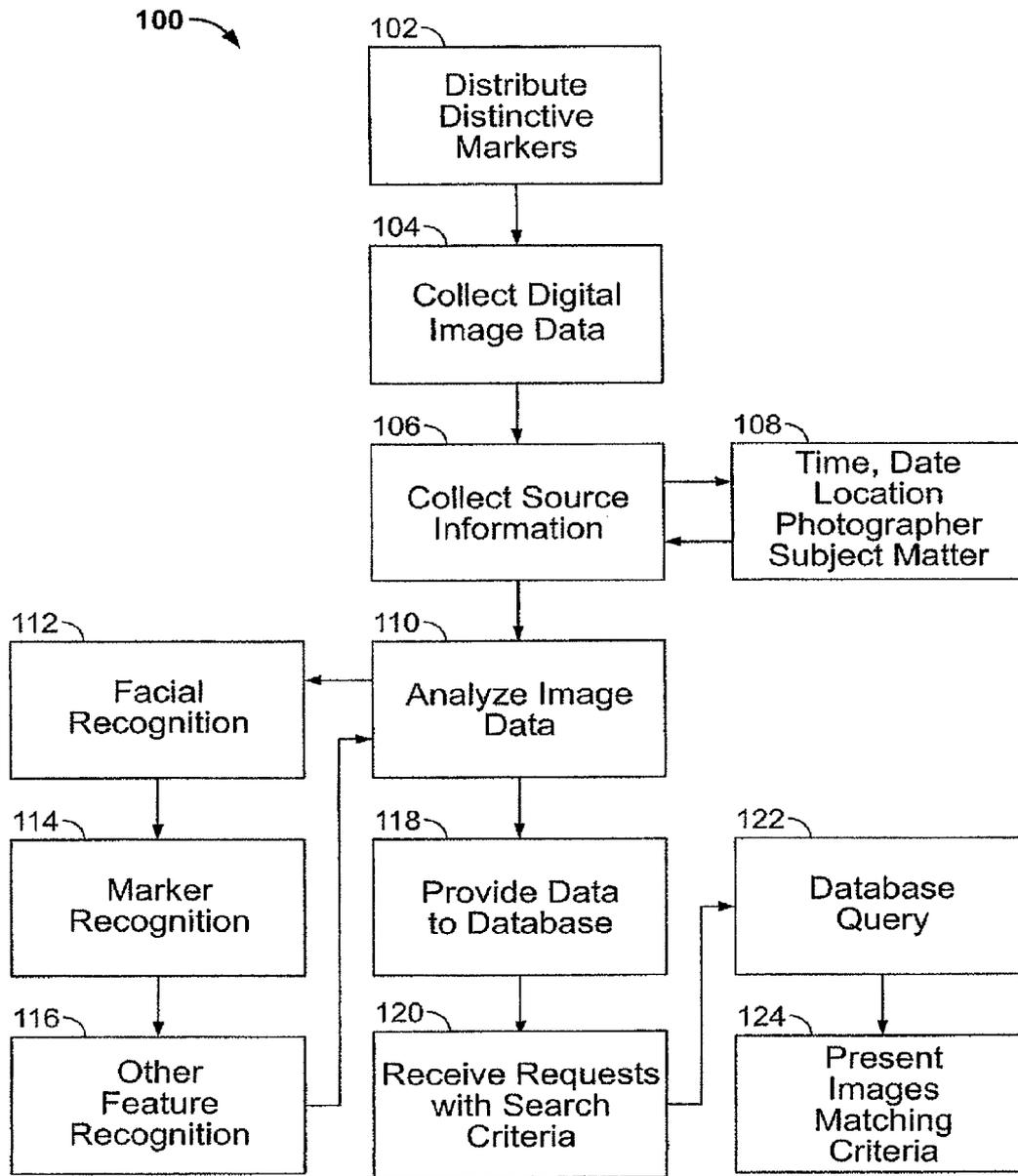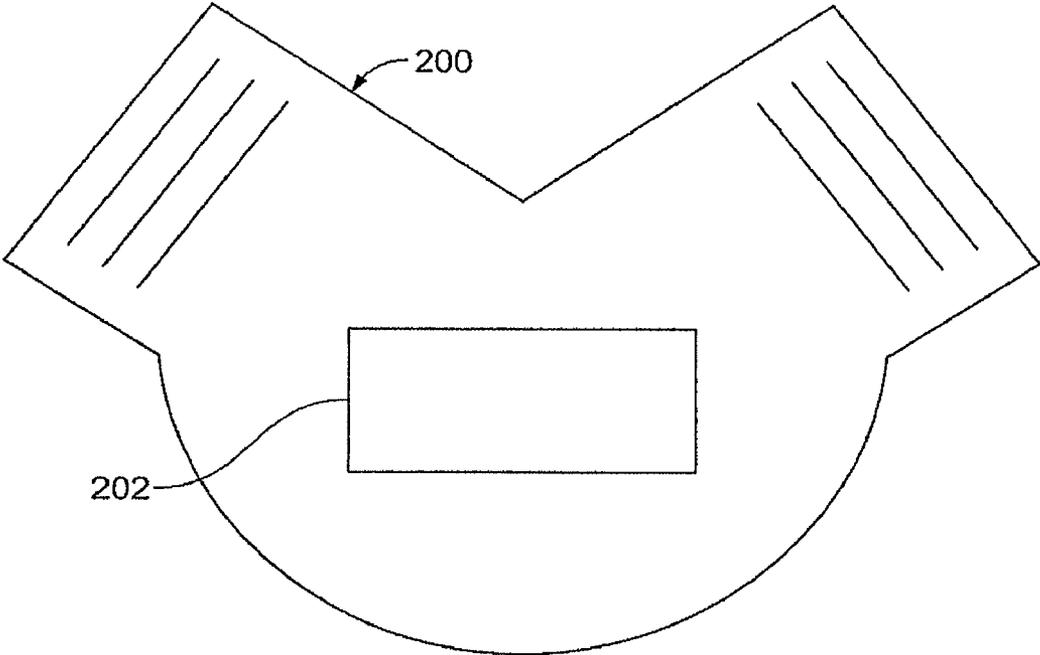
FIG. 2

METHOD AND APPARATUS FOR PHOTOGRAPH FINDING

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. application Ser. No. 12/325,589 filed Dec. 1, 2008 which is a continuation of U.S. application Ser. No. 11/056,699 filed Feb. 10, 2005, now U.S. Pat. No. 7,460,737, which claims priority pursuant to 35 U.S.C. §119(e) to U.S. Provisional Application No. 60/544, 570, filed Feb. 12, 2004, which applications are specifically incorporated herein, in their entirety, by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

Photography has transformed how people conceive of the world. Photographs allow people to see all sorts of things that are actually many miles away and/or years preceding. Photography lets people capture moments in time and preserve them for years to come.

Often people at a public place notice that a stranger has taken a photograph of which they would love to have a copy, Alternatively, after going somewhere, a person may bemoan the fact that he did not have a photograph of the event (in the present context, photograph also includes video, audio, or other representation).

A need exists, therefore, to provide a method and apparatus for identifying and connecting people with photographs they want. In addition, there is a need to provide a method and apparatus for characterizing errant photographs stored on computer databases that makes use of a variety of attributes to reliably characterize photographs in such a way as to reduce the amount of manual review necessary to identify and connect people with the photographs they want.

SUMMARY OF THE INVENTION

The present invention provides a method and apparatus that matches people with photographs in which they accidentally (or purposely) appear or with photographs of events they have attended.

Specifically, in one embodiment, a web site is created with a database backend. The database is seeded with information provided by (1) the photographer; (2) recovering metadata from the photograph; (3) reading devices such as a Global Positioning System (GPS) device; (4) referencing the account data of the photographer (i.e., account number, photographer's zip code or area code, etc.); (5) analyzing the photograph (i.e., computer recognizes eye color, optical character recognizes any text found in the photograph, recognizes the number of persons, the gender of persons, the hair color, the time of day by optical character recognizing any clocks in the photograph or analyzing the lighting conditions, the weather, etc.); (6) photograph quality information; and/or (7) any other information.

A user looking for a photograph would visit the web site and search for certain criteria. The user is then provided with a gallery of thumbnails that match the criteria. When the user identifies a photograph he wants to own, he can then download the full quality version, or order print(s). In a preferred implementation, the user is charged some amount of money that is split between the site owner and the photographer. Alternatively, the user may be charged in some other way,

such as by viewing advertisements or by exchanging credits for downloads or by some other payment or a combination thereof.

A more complete understanding of the present invention will be afforded to those skilled in the art, as well as a realization of additional advantages and objects thereof, by a consideration of the following detailed description of the preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a flow diagram showing exemplary steps of a method according to the invention.

FIG. 2 is a diagram showing an exemplary distinctive marker for photographic data.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention provides a method and apparatus that matches people with photographs in which they accidentally (or purposely) appear or with photographs of events they have attended.

FIG. 1 illustrates exemplary steps of a method 100 according to the invention. At optional step 102, distinctive markers may be distributed to persons desiring to contribute photographic images to a database. The markers may comprise, for example, distinctive bins, badges, or stickers for placing on objects to be photographed. The markers should be designed so as to be easily recognized using automatic recognition algorithms, but should not be too conspicuous.

At step 104, image data is collected from a variety of sources. It may be desirable to accept material from as many sources as possible, to increase the number of images available for browsing. Optionally, images may be accepted from qualified sources only.

At step 104, source information regarding each photograph is collected. For example, at step 108, the image provider may be asked for information, such as the time and date of the photograph, the subject matter, location, photographer, etc. Image metadata may also be read to obtain such information. Other ways of associating images to identifying information may include, for example, reading devices such as a Global Positioning System (GPS) device attached to a camera or other image capture device, or by referencing account data of the image contributor (e.g., account number, photographer's zip code or area code, etc.).

At step 110, image data is analyzed to identify any characteristics that may be of interest to users. Such characteristics may include, for example, eye color, words and sentences, a number or gender of persons, the hair color, time of day, lighting conditions, and so forth. For further example, at step 112, a facial recognition program as known in the art may be used to analyze any faces appearing in the photos at a sufficiently high resolution. At step 114, the images may be analyzed for the presence of any known markers. And at step 116, other features and qualities of the image may be classified, for example, whether it is taken indoors or outdoors, whether it contains people, dogs, cats, or other animals, whether it contains automobiles, airplanes, or other objects, and so forth. At step 118, selected feature information and other source information is associated with each image and provided to any suitable relational database.

At step 120, requests specifying search criteria for photographic images are received. For example, a user looking for a photograph may visit a web site hosted by the system and fill out a search form specifying search criteria of interest. The

criteria may include specific subject matter, times, dates, and locations. For example, "Disneyland AND Matterhorn AND blue eye AND child AND Jan. 1, 2004 AND morning" would search for a photograph or photographs taken at Disneyland's Matterhorn with a child who has blue eyes on the morning of Jan. 1, 2004.

At step **122**, the image database is queried as known in the art, to identify images that at least partially match the search criteria. Such images may be presented, at step **124**, to the user. For example, the user may be provided with a gallery of "thumbnail" (reduced-size) images generated from images that match the criteria. When the user identifies a photograph he wants to own, he can then download the full quality version, or order print(s). In a preferred implementation, the user is charged some amount of money that is split between the site owner and the photographer. Alternatively, the user may be charged in some other ways such as by viewing advertisements or by exchanging credits for downloads or by some other payment or a combination thereof. The price can be on a sliding scale depending on the quality of the photograph that the user downloads or the size or quality of the print. For example, a photograph may cost $1.00 for 1024×768 resolution or $2.00 for 1600×1200 resolution. Similarly, a print may cost $1.00 for 3×5 or $5 for 8×10. For downloads, an "upgrade" may be possible by charging the difference between the resolutions. An automated process may be used to reduce the number of pixels for purposes of having a lower quality version to sell.

In addition, a surcharge may be applied (even if no surcharge is required) for various enhancements to the photograph, such as "upconverting" to a higher resolution, eliminating red-eye, enhancing shadow, color, or brightness, etc.

Moreover, when a photographer takes photographs, he can be provided with printed cards bearing a Uniform Resource Locator (URL) and a unique code in order that the user would be able to enter into the web site to find the photograph or the series of photographs then being taken. The photographer can also distribute cards (the printed cards bearing the URL and the unique code or any other cards known to those skilled in the art) to people whom he photographs, whether intentionally or inadvertently. The photographer can further advertise the same (e.g., the URL and the unique code) via a mark on his camera, a T-shirt, or other means.

Fixed-place cameras can also serve this function (e.g., the of photographer). For example, a camera set up at an intersection in Hollywood might take and upload one photograph every 10 seconds.

Photographers can also be given accounts and be allowed to upload photographs to the site. The database is populated during this process, although additional database information can be added later by web site users. In addition, the number of times the photograph has been purchased and/or viewed can be a part of the database.

In one embodiment, the method and apparatus of the present invention should be capable of face recognition. It should assign values to various factors (i.e., ratio of distance between pupils to distance to tip of nose, etc.). It would add this information to the database for uploaded photographs. A user can then upload a photograph of the target person and the system would then generate the same data from that photograph and use it to limit the possible search targets.

A provider of the present method and apparatus or a photographer can also hand out pins, clothing, or other materials that are marked in a way that allows a computer to later recognize them in a photograph. FIG. **2** shows an exemplary distinctive marker **200** having an optical code **202**, such as a bar code. The marker may have a color combination, distinc-

tive shape, lettering, bar code, or other optical pattern, or some combination of the foregoing, that is unique to the marker. The marker may be computer generated, for example, and produced using an end-user's laser or ink-jet printer. The marker may be associated with specific information, for example, a particular user account, photographer, subject matter type, person, event, or location. Users can later search for photographs containing an image of the marker.

Numerous distribution mechanisms exist whereby photographs may be distributed from a source over a wide area network, such as the Internet. In some cases, the photographs are distributed using a centralized server system (such as Napster 2.0, eBay, or from a web site). In other cases, the photographs are distributed using a decentralized system (such as Gnutella). In a preferred implementation, the photographs are distributed to a person using the centralized server system or using a central hub.

Embodiments of the present invention operate in accordance with at least one web-hosting mechanism and a plurality of user mechanisms communicating over a wide area network, such as the Internet. Specifically, a web-hosting mechanism includes a database, an interface application and a server, wherein the server is adapted to communicate with a plurality of user mechanisms over a wide area network. It should be appreciated that the mechanisms described can include, but are not limited to, personal computers, mainframe computers, personal digital assistances, wireless communication devices and all other physical and wireless connected network devices generally known to those skilled in the art. It should further be understood that the database depicted can include, but is not limited, to RAM, cache memory, flash memory, magnetic disks, optical disks, removable disks, SCSI disks, IDE hard drives, tape drives, and all other types of data storage devices (and combinations thereof, such as RAID devices) generally known to those skilled in the art. In addition, the mechanisms described above are for purposes of example only and the invention is not limited thereby.

Having thus described several embodiments for photograph finding, it should be apparent to those skilled in the art that certain advantages of the system have been achieved. It should also be appreciated that various modifications, adaptations, and alternative embodiments thereof may be made within the scope and spirit of the present invention. For example, in the context of the present invention a photograph can include video, audio, and/or other representation of how people conceive of the world. The invention is defined by the following claims.

What is claimed is:

1. A computer-implemented method comprising:

by a computer system comprising computer hardware:

receiving from a remote computing device a search request including a first digital photograph depicting at least a face of a first person;

performing facial recognition on the portion of the first digital photograph depicting the face of the first person in order to determine a plurality of attributes of the face of the first person;

comparing the determined attributes to facial recognition attributes associated with ones of a plurality of other digital photographs in order to identify any of the other digital photographs having attributes that at least partially match the determined attributes associated with the face of the first person, wherein an at least partial match of attributes of respective other digital photographs and the determined attributes associated with the face of the first person is indicative

of an increased likelihood that the same first person is depicted in the first digital photograph and the respective other digital photographs; and

transmitting to the remote computing device information regarding any identified other digital photographs.

2. A computing system comprising:

a processor; and

a computer readable medium storing machine-executable instructions including one or more modules configured for execution by the processor in order to cause the computing system to:

receive a digital image;

analyze the received digital image to identify feature information present in the received digital image;

compare the feature information of the received digital image to feature information of respective other digital images; and

provide identifiers for any other digital images that have feature information that at least partially match the identified feature information of the received digital image.

3. The system of claim 2, wherein the feature information comprises facial characteristics of one or more persons imaged in the received digital image.

4. The system of claim 2, wherein the feature information comprises visual characteristics of one or more objects imaged in the received digital image data.

5. The system of claim 2, wherein the one or more modules are further configured for execution by the processor to cause the computing system to analyze the received digital image data and to assign descriptions of objects depicted in the received digital image.

6. The system of claim 3, wherein the one or more modules are further configured for execution by the processor to cause the computing system to assign values to respective facial characteristics.

7. A tangible computer-readable medium encoded with instructions encoded thereon, wherein the instructions are readable by a computing device in order to cause the computing device to perform operations comprising:

receiving a search request including digital data;

analyzing the received digital data to identify feature information present in the received digital data; and

compare the feature information of the received digital data to feature information of respective discrete objects;

providing a response to the request comprising identifiers for any discrete objects that have feature information that at least partially match the identified feature information of the received digital data.

8. The tangible computer-readable medium of claim 7, wherein the feature information comprises facial characteristics of one or more persons imaged in the received digital data.

9. The tangible computer-readable medium of claim 7, wherein the feature information comprises visual characteristics of one or more objects imaged in the received digital data.

10. The tangible computer-readable medium of claim 7, wherein the received digital data is analyzed to assign descriptions of objects depicted in the received digital data.

11. The tangible computer-readable medium of claim 7, wherein the received digital data is analyzed to assign descriptions of objects appearing in the received digital data.

12. The tangible computer-readable medium of claim 7, wherein the received digital data comprises digital image data.

13. The tangible computer-readable medium of claim 7, wherein the discrete objects comprise discrete photographic images.

14. The tangible computer-readable medium of claim 8, wherein values are assigned to respective facial characteristics.

15. A computer-implemented method comprising:

by a computer system comprising computer hardware:

receiving a search request including digital image data;

analyzing the received digital image data to identify feature information present in the received digital image data; and

providing a response to the search request comprising identifiers for discrete photographic images that at least partially match the identified feature information.

16. The method of claim 15, wherein the feature information comprises facial characteristics of one or more persons imaged in the received digital image data.

17. The method of claim 15, wherein the feature information comprises visual characteristics of one or more objects imaged in the received digital image data.

18. The method of claim 15, wherein the received digital image data is analyzed to assign descriptions of objects depicted in the received digital image data.

19. The method of claim 16, wherein values are assigned to respective facial characteristics.

20. The method of claim 15, wherein analyzing the received digital image data comprises performing face recognition.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO.   : 7,929,810 B2
APPLICATION NO.   : 12/874929
DATED   : April 19, 2011
INVENTOR(S)   : Shuster

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 5, line 44, in Claim 7, delete "data; and" and insert -- data; --.

Column 5, line 45, in Claim 7, delete "compare" and insert -- comparing --.

Column 5, line 46, in Claim 7, delete "objects;" and insert -- objects; and --.

Signed and Sealed this
Fifteenth Day of November, 2011
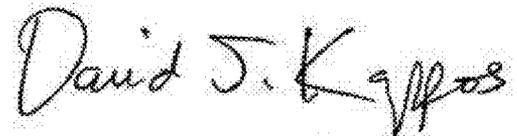
David J. Kappos
Director of the United States Patent and Trademark Office