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Event-based photo rediscovery and resurfacing

ABSTRACT

Social networks, online photo-sharing services, messaging services, etc. include feature that provide a user with reminders of photos that may be of interest. For example, such services may resurface photos taken on the same day in the past, e.g., a year ago. Resurfacing past photos allows the user to relive memories. Viewing resurfaced photos has become a popular online activity. However, some periodic events do not occur on exactly the same day each year. For example, an annual football game may occur on different days across years (e.g., the first Monday of October, which may be a different day in the month of October), birthday celebrations which may be moved to the nearest weekend, religious holidays based on the lunar calendar, etc. This disclosure describes techniques to detect and resurface photos that depict similar periodic, e.g., annual, events that have taken place on possibly differing days. The similar annual events need not take place on the same day of the year, so long as they take place within a certain time period near the date of a particular day of interest.

KEYWORDS

- Photo resurfacing
- Photo rediscovery
- Photo sharing
- Event detection in photos

BACKGROUND

Viewing photos from the past is a widespread activity amongst photographers and their audiences. Online photo-hosting sites and social media enable this popular activity by resurfacing photos from the past, e.g., photos taken on the same day one year or two years ago. Typically, viewers show interest in recurring events, e.g., birthdays, festivals etc., that have taken place in the past. However, recurring or annual events may not take place on exactly the same day every year. For example, an annual spring break vacation may take place on slightly different days. Similarly, annual festivals or community gatherings may occur on slightly different days across the years. Other examples of annual events occurring on differing days in different years include seasonal events, e.g., the first snowfall of winter, or the change of foliage at the onset of autumn. Resurfacing photos taken on exactly a given day a year ago may result in a narrow selection. Rather, it may be more satisfying to a user if past photos that are resurfaced on a present day relate to an event of that day, precise dates of creation of resurfaced photos notwithstanding.

DESCRIPTION

This disclosure describes techniques to discover photos of past events that have taken place within a time period near the date of a particular day. Photos taken on a particular day are analyzed and their features are extracted, when the user consents to such analysis and feature extraction. Based on an analysis of the features, the event depicted in the photos is discerned. A search is conducted amongst photos from past periods, e.g., years, months, etc., taken on or near the same date as the particular day under consideration. Photos from past periods that depict events that are similar to the event of the particular day are resurfaced and displayed. Resurfaced photos could depict, for example, an event from a year ago, a day from a previous

month, an event from six months ago, etc. Other examples of resurfaced photos include the last time certain events took place, e.g., the last snowfall, the last get-together with a friend, etc. The detection of events depicted in photos, and the search for similar past events, is performed specifically when users provide consent to such operations.

The resurfacing of photos taken in the past may be carried out in a three-stage process, per techniques of this disclosure. A first stage involves determining the event, if any, that took place on a particular day. A second stage involves determining events of the past that match the event from the particular day. A third stage involves resurfacing, e.g., displaying or offering to display, photos corresponding to matched events from the past.

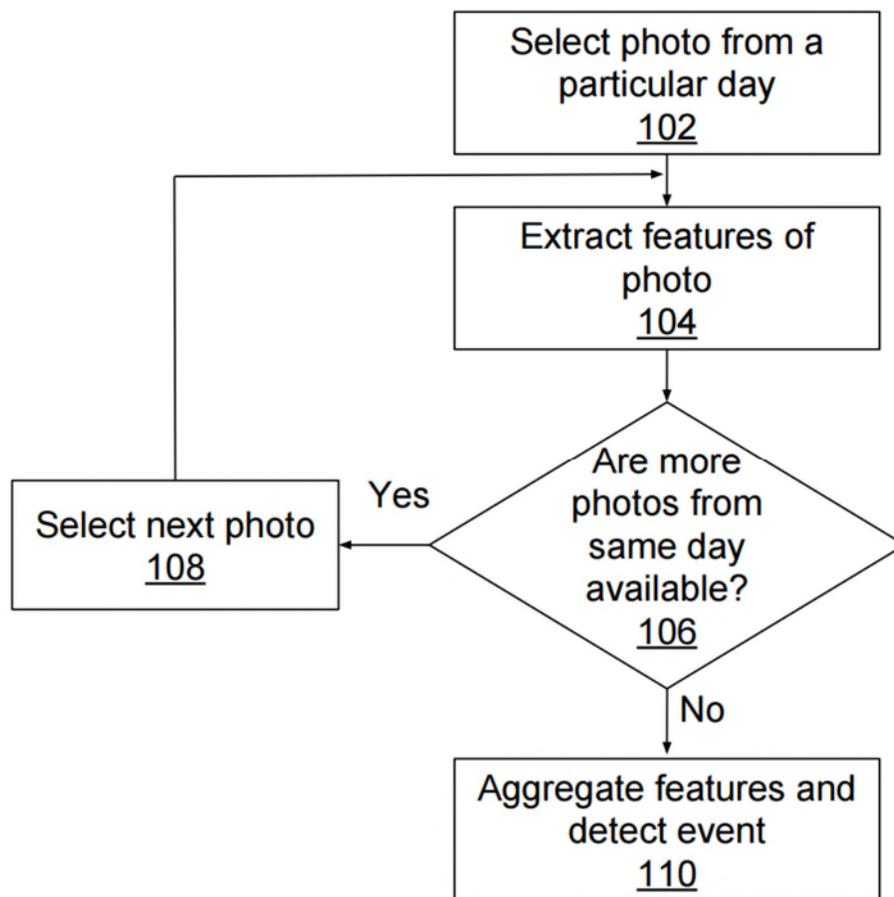


Fig. 1: Determining events of a particular day by analysis of photos from that day

Fig. 1 illustrates a process of determining the events that may have taken place on a particular day of interest. A photo taken on the day of interest is selected (102) and features of the photo are extracted (104). Features of a photo may include relevant objects, persons, semantic labels etc. as determined by the methods of computer vision, e.g., object recognition techniques, face recognition techniques, machine learning, support vector machines, image segmentation, feature-vector matching, etc. Feature extraction, and the extent and types of image data that may be used thereto is performed when users consent to such operations. For example, user consent is obtained prior to operations such as extraction of certain types of features, facial recognition, use of metadata, e.g., captions, annotations, time or place of image capture, etc. The user may permit some types of data to be used while disallowing use of some other types of data. For example, the user may specify that metadata, but not an image itself, be permitted for use towards feature extraction, or vice-versa. The process of feature extraction is repeated for all the photos taken on the day of interest, as shown in steps 106-108. When features of all photos of a given day are extracted, the event of the day, if any, is detected in step 110. The event of the day may be detected by aggregating the features of all the photos, wherein the aggregation may be performed by simple voting, by clustering of feature vectors, etc. User-defined album titles, time(s) of photo capture etc. are features that serve as inputs to event detection. Detected events may be represented as a vector of features that have been aggregated over all photos from the day of interest.

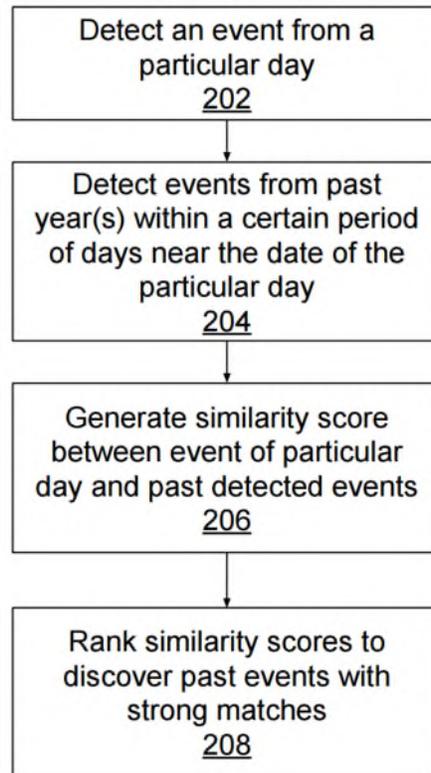


Fig. 2: Matching an event of a particular day with past events

Fig. 2 shows a process of matching an event detected on a particular day with events of past years. An event from a particular day is detected (202). Events are detected from past year(s) (204) that have occurred within a certain period of days, e.g., a few days or a few weeks, on or near the date of the particular day. Constraining the search of past events to a time period near the particular day of interest increases the probability of finding matching events, while not rejecting relevant events of the past that may have occurred near, but not quite exactly on, the date of the particular day. A similarity score is generated (206) that measures the match between the event of the particular day and each of the past detected events. Similarity scores are ranked (208) to discover past events that strongly match the event of the particular day. Once past events with high similarity scores are discovered, photos from said events are displayed to the user.

While this disclosure refers to resurfaced media as photos, techniques described herein apply to other types of media, e.g., videos, documents, tweets, posts, etc. Analysis of photos or other media is controlled by the user and is performed only upon the user's consent. In providing consent, the user can choose conditions for selection of media used for analysis, for example, media created between certain dates and/or certain times may be allowed for analysis, or disallowed for analysis, etc. Still further, the user can specify a frequency at which media is collected for analysis, limit the total amount of media collected within a given time period, etc. Analysis of media, and the drawing of inferences therefrom, is performed based on the user's permissions for such analysis. The user can choose the types of inferences that may be drawn from the data. Analysis of photos, and the extent and types of image data that may be used in such analysis is performed specifically upon user consent. For example, user consent is obtained prior to extraction of certain types of features, for facial recognition, for the use of metadata such as time or place of image capture, etc. The user may permit some types of data to be used while disallowing use of some other types of data. For example, the user may specify that metadata, but not the image itself, be permitted for use towards feature extraction, or vice-versa. Storage and analysis of media is performed in such a manner that no personally identifiable information is collected or used without a user's explicit approval. The user can restrict the use of the media or inferences therefrom, e.g., make it available only to certain third parties, disallow third party usage, etc. The user can specify the retention time for their media, or from inferences drawn therefrom, e.g., do not retain, retain for display within one hour, retain for display within n day(s), etc. A user can decline authorization for use of their media, in which case no media is selected for analysis or otherwise used. The user is permitted to modify her consent and parameters of media selection and analysis.

Examples of Use

Example 1: A user is taking photographs at annual music concert, currently taking place on the 21 June 2016. Per techniques of this disclosure, and subject to user permission settings, photos taken from the present-day music concert are analyzed and matched with events that have taken place between 10 June and 10 July for past years, e.g., 2015, 2014, 2013 and 2012. It is discovered that similar music concerts have taken place on 15 June 2015 and 1 July 2014. Photos from these previous music concerts are resurfaced and offered for display to the user.

While this example refers to the periodicity of events as annual, techniques of this disclosure apply to events of any other periodicity, e.g., monthly, quarterly, bi-annual, quadrennial, etc.

Example 2: A user is attending an Olympics event taking place on 6 August 2016. Per techniques of this disclosure, and subject to user permission settings, photos from the present-day Olympics event are analyzed and matched with photos taken within a month of 6 August 2012, 6 August 2008, and 6 August 2004. Photos from past Olympics events that have occurred during the months of July-August 2004, 2008 and 2012 are discovered, and offered to the user for display.

In situations in which certain implementations discussed herein may collect or use personal information about users (e.g., user data, information about a user's social network, user's location and time at the location, user's biometric information, user's activities and demographic information), users are provided with one or more opportunities to control whether information is collected, whether the personal information is stored, whether the personal information is used, and how the information is collected about the user, stored and

used. That is, the systems and methods discussed herein collect, store and/or use user personal information specifically upon receiving explicit authorization from the relevant users to do so. For example, a user is provided with control over whether programs or features collect user information about that particular user or other users relevant to the program or feature. Each user for which personal information is to be collected is presented with one or more options to allow control over the information collection relevant to that user, to provide permission or authorization as to whether the information is collected and as to which portions of the information are to be collected. For example, users can be provided with one or more such control options over a communication network. In addition, certain data may be treated in one or more ways before it is stored or used so that personally identifiable information is removed. As one example, a user's identity may be treated so that no personally identifiable information can be determined. As another example, a user's geographic location may be generalized to a larger region so that the user's particular location cannot be determined.

CONCLUSION

Techniques of this disclosure enable the discovery and resurfacing of photos of periodic events that have occurred in the past. The events of the past need not occur on the exact same day of the year. Per techniques of this disclosure, features of photos taken on a particular day of interest are used to detect event(s) that may have taken place on that day. A search of photos is conducted for similar events that may have taken place at periodic, e.g., annual, intervals in the past. The search for similar past events is conducted within a time period near the date of the day of interest. Techniques of this disclosure increase the probability of finding relevant past events, including events that may not have taken place on exactly the date of the day of interest.