Categorization of a collection of pictures into structured events

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ABSTRACT

This demo showcases our system which classifies a collection of pictures into events and its individual images into subevents. We reach this goal by analysizing visual features with an efficient implementation of a Bag-of-Words method and by leveraging time information both for events and subevents. The system allows the user to analyze a collection of images - named as *event-album* - from disk or from internet sharing services such as Picasa and Flickr. The results are displayed in a web-browser window allowing the user to view the pictures of the entire recognized event, as well as their recognised sub-events.

Categories and Subject Descriptors

H.3 [**Information Storage and Retrieval**]; I.4 [**Image Processing and Computer Vision**]; I.5 [**Pattern Recognition**]

General Terms

Algorithms, Performance, Experimentation.

Keywords

Events, Sub-Events, BoW, Clustering

1. INTRODUCTION AND MOTIVATION

Imagine a user back home from the graduation ceremony of his nephew or a family back from a winter holiday on snowy mountains. Nowadays, these users would download their pictures from the camera to the pc, store them in a specific folder and view them in a photo management software. Part of this collection, or even the entire album, could be shared in social networks. On average, these users will title their photo-album with a vague title as 'Graduation of my nephew' or 'Family holidays 2011'. What happens if, after several years, the owner of the pictures wants to search for that specific event in his collection of thousand of images and hundreds of folders? In the first case, the title of the album has a keyword -graduation- that is beneficial for retrieving and browsing of these memories. In the second case, instead, the retrieval of the ski holiday event would not be so easy, since nothing in the system has any label or information for recognizing a ski holiday.

Organizing images through events is beneficial from the user point of view [4] and would enable the developing of powerful facilities to support users and communities in managing their media.

Therefore our demo, which extends our previous work [2], organises images into a hierarchical event structure by using both visual features and time information.

Main event	Events description
Social events	*Concert, Graduation, Meeting, Mount.Trip, Pic-nic, Sea-holiday, Ski-holiday, Wedding.*
Sport events	*Baseball, Basket, Bike, Cycling, F1, Golf, Hockey, Rowing, Skating, Swimming.*

(a) Different event-classes for social and sports events.

Social Events	Sub-events classes
Graduat.	*Group-pictures, Celebration, Party-eating.*
Wedding	*Group-pictures, Ceremony, Party-eating.*
Ski Holiday	*Skiing, Walking in the city, Eating at the hotel-restaurant, Eating-relax during the ski session, Partying.*

(b) Sub-event labels for 3 classes of Social Events.

Table 1: Event and Sub-event used for training our demo

2. OUR DEMO

We designed a completely automatic recognition system for events and sub-events analysis in a collection of pictures. We reach the categorization goal at two levels: **event level** and **sub-event level** as throutfully explained in [2].

In the following, we define '*event-album*' a collection of pictures spanning one event and belonging to one user.

The demo application is built as a web-interface for interaction with users (front-end layer) and a server side for the computational load (back-end layer).

2.1 Applications

The categorisation of a user collection of pictures into an event-based structure would be beneficial for three reasons: (a) browse memories in a natural manner and related to the

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way people tend to remember their real life activities; (b) provide different granularity levels for browsing the collection of pictures, from event to its sub-events; (c) provide a different way of image indexing based on structured events.

2.2 Front-end

Browsing an event-album. The web interface gives the user two possibilities to analyze an event-album: by uploading pictures from the computer or by browsing from a webservice such as Flickr or Picasa. Once an event-album has been chosen, its pictures are shown in a slideshow. The user can easily browse the images in the web browser. Figure 1a shows the slideshow representation and the pictures ordered in time.

Viewing the recognition results. The recognition results are shown to the user as a pop-up window. The pictures are not only shown in a temporal order, as in the event-album browsing, but also structured with one of the event labels of Table 1a or with further sub-events of Table 1b. Figure 1b shows an example of a Graduation event-album and different recognized sub-events.

2.3 Back-end

The event and sub-event recognition is based on the analysis of visual features and time information. We make use of a multi-step image classification system coupled with visual features extracted and analysed following the classification pipeline of Uijlings et al. [3] and grouped with the clustering algorithm of Cooper et al. [1]. We leverage the time information in event and sub-event recognition to achieve higher accuracy as shown in Table 2. For further explanation of the methods used in our approach, please refer to [2].

During the test phase, 2.8s are required (on average using a single core on an Intel i7 CPU 2.8 GhZ) to analyze one image and about 95% of this time is spent for the Dense RGB feature extraction. However, this computation phase is highly parallelizable and can be computed while uploading the photos in a photo software management or in a web photo sharing service.

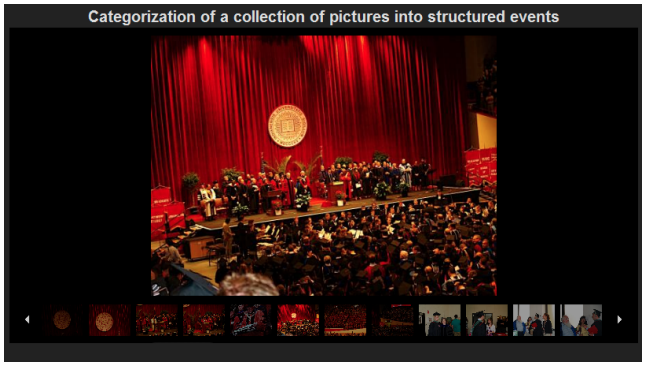
The work can be extended to include any class, both objects and events, at an extra computational cost of 28ms.

	baseline	post-proc.
Social ev.	0.62	0.89
Sport ev.	0.81	0.98
sub-events	complete results in [2]	

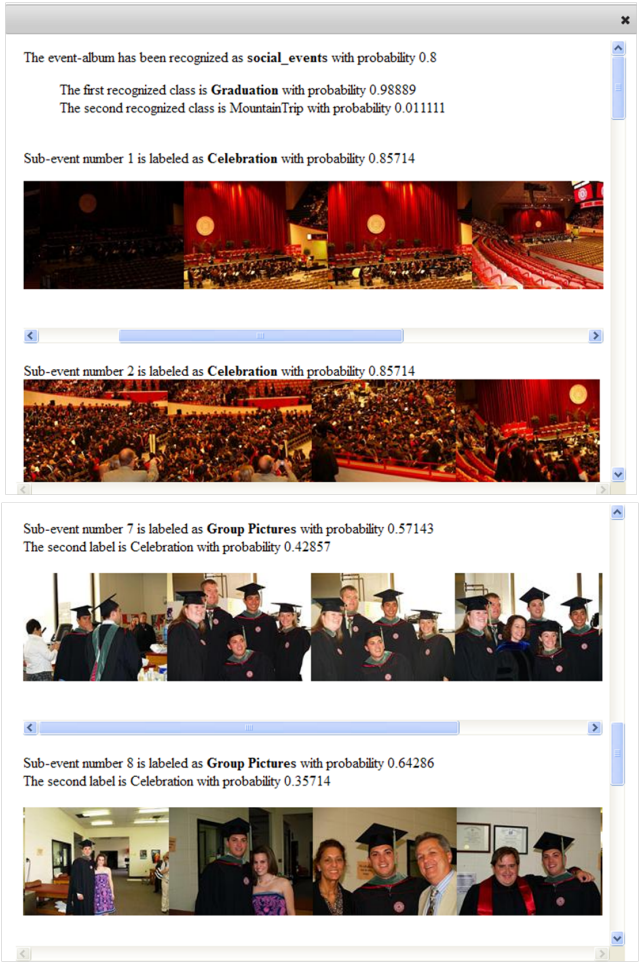
Table 2: Improvement of our methodology

3. CONCLUSIONS

We designed an automatic system able to recognize event-albums belonging to several social or sports event classes and to further analyze the users' activities and classify them in different sub-event classes. We reached this goal by the analysis of visual features in form of Bag of Words and by the leverage of time information for both events and sub-events. A web-interface for the evaluation of our system has been designed and can be used for the analysis of event-albums from disk or from webservices as Picasa or Flickr.



(a) Slideshow of event-album images



(b) Recognition results: different sub-events recognized.

Figure 1: Web user interface

4. REFERENCES

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