# Audience Dependent Photo Collection Summarization

Pere Obrador, Rodrigo de Oliveira, Nuria Oliver
Telefonica Research
Via Augusta 177, 08021, Barcelona – Spain
{pere, oliveira, nuriao}@tid.es

## ABSTRACT

In this short paper we present an automatic image selection system in the framework of the CeWe Grand Challenge. We take users' selection traits learnt from their on line social network photo sharing behavior in order to improve automatic image selection; these traits can in turn be used in order to recommend a subset of photo book styles to the end user.

## Categories and Subject Descriptors

H.1.2 [**User/Machine Systems**]: Human factors; H.3.1 [**Information Storage and Retrieval**]: Content Analysis and Indexing—*Indexing methods*

## General Terms

Algorithms, Human factors

## Keywords

Photo collection summarization, social networks, user study.

**System Description**. Social photo storytelling plays an important role in people's lives as it serves to structure and share personal and interpersonal experiences and to express personal and group identities. Hence, it does not come as a surprise that automatic approaches to personal photo collection summarization and event detection have recently been of interest in the research community, and more specifically in [1] where the target audience is taken into account, i.e., the on-line social network (OSN) with whom the story will be shared. In other words, the same user may share the same story with two different on line communities in a very different way, which in turn could drive the recommendation of a very different photo book style subset.

The proposed photo summarization system is inspired by principles of dramaturgy and cinematography. It generates the narrative structure by dividing the collection to summarize, $C$, into *Acts* (*i.e.*, time clusters), which are divided into *Scenes* (*i.e.*, images similar in global color and captured close in time), which in turn are divided into *Shots* (*i.e.*, near duplicate images captured close in time). For the *Characters* in the story our system not only analyzes $C$, but it also analyzes the user's OSN photo albums ($C_{SN}$) by extracting two *Character* related features: (1) *Face ratio*: the proportion of images with people, that should appear in the story, which we found to be a very personal trait [1]; and, (2) *Character histogram*: adapt to the target audience by identifying who should be the people in the pictures, and in what percentage – *i.e.*, friends that appear prominently in the user's albums are probably socially closer, and should therefore be favored.

Given a particular user, the goal of the photo selection system is to generate a photo summary $S$, from $C$, that contains a pre-defined number of photos, and conveys the essence of the story to be shared by the user on his/her OSN. This is accomplished by selecting first a set of people images corresponding to the *face ratio*, and approximating the *Character histogram* and the *Act histogram*, while selecting aesthetic face images. The rest of the images are selected by alternating semantically important images with highly aesthetic images within each *Act*, while approximating the *Act histogram*. Please refer to [1] for further details on the selection algorithms that conform the system.

**User Study**. Twelve subjects evaluated three 20-photo stories generated from a set of 200 photos from their personal repository: (1) Random –photos chosen randomly and presented in chronological order, (2) System –photos chosen and ordered by the proposed system, and (3) Professional–photos chosen and ordered by an A/V human professional with storytelling skills. A majority of nine participants preferred to share on their main OSN the stories generated by the proposed system instead of the stories by the random approach ($Z = -2.183; p = .029$). Furthermore, seven participants liked the System stories more than the Professional stories while the remaining five participants preferred the Professional stories. The difference between these preferences is not significant ($Z = -.165; p = .869$) and therefore suggests that participants liked the Professional stories *as often as* they liked the System stories. Finally, 75% of the participants reported preferring to reuse the System story and make changes to it. These results suggest that our system can effectively support users in the photo storytelling task.

**Conclusion**. We have shown that our audience dependent collection summarization system can be of help to users in creating a first draft of a photo album to be shared online.


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## 1. REFERENCES

[1] P. Obrador, R. Oliveira and N. Oliver. Supporting Personal Photo Storytelling for Social Albums. In *Proc. ACM Int. Conf. on Multimedia*, 2010.