

# Audience Dependent Photo Collection Summarization

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## ABSTRACT

We briefly present an automatic image selection system in the framework of the CeWe Grand Challenge. Our system learns the users' selection traits from their online social network photo sharing behavior in order to improve automatic image selection. These traits can in turn be used 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. In our work [1], not only the quality and characteristics of the photos but also the target audience – *i.e.*, the on-line social network (OSN) with whom the story will be shared – are taken into account. 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). In order to determine who are 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*, or 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*, which enables us to adapt to the target audience by identifying *who* should be 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. Our findings reveal that the difference between the subjects' rankings to the stories generated by the **System** and **Random** approaches was significant ( $p = .03$ ), thus confirming the better performance of our system (9 participants preferred the **System** stories). Furthermore, 7 participants liked the **System** stories more than the **Professional** stories while the remaining 5 participants preferred the **Professional** stories. The difference between these preferences is not significant ( $p = .87$ ) 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.** Our audience dependent collection summarization system can be of help to users in automatically creating a first draft of a photo album to be shared online.

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## REFERENCES

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

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