Photo Browsing with Collage Trees sketches_0174

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1 Introduction

Technological advances in digital photography have made it possible to acquire and store more pictures than ever before. Unfortunately this has led to massively sized photo collections that becomes difficult to browse. We propose a novel interface to facilitate browsing these large collections. Our approach hierarchically groups the photos, summarizes the groups as a tree of collages, and allows the user to navigate the collection by traversing the tree. Our system automatically groups the photos and dynamically constructs the collage summaries generating a *Collage Tree* (Figure 1). At any time, the system presents a collage that summarizes some part of the collection, by clicking on a member of the collage the user selects a smaller subset of the photos that is again summarized as a collage or single photo if it is a leaf of the tree.

The ideas in this paper draw on those of photo browsing, and collage generation. Research in photo browsing looks at different ways of allowing a user to efficiently go through collections of photographs; programs such as Picasa and ACDSee are examples of photo browsing software. When browsing, users are presented with every photo, which is undesirable when dealing with large collection. Recently researchers have been looking at using collages in order summarize a large collection of images [2]. In this way the user can get an overall impression of the photo collection by viewing a single image. However, by removing photos, this approach may detract from the overall browsing experience. By using a tree of collages, we are able to combine the benefits of both traditional photo browsing and collage summarization.

Our system generates a tree structure containing collages and photos from a large collection of digital photographs. Each collage is a node in the tree summarizing the information, or photographs, beneath it. Each photo in the collage is an edge leading to a new node, or new collage summarizing the sub-tree that the photo represents. The original photos are the leaf nodes of the tree. By traversing some path of the tree, each photo can be accessed.

2 Collage Tree Generation

Given a large collection of photographs we want to automatically partition the photographs into a hierarchy of groups (and subgroups), select the "best" photograph from each group, and dynamically create a collage to summarize each group. For the first step, partitioning, we use K-Means clustering based on the time the photo was taken, as research has shown time is a strong cue when trying to partition a collection of digital photographs [1]. The user defines the number of clusters which is equal to the branching factor of the tree and the maximum number of image shown in each collage.

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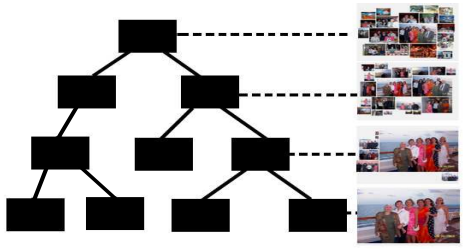

Figure 1: Example of a collage tree.

Figure 2: Example of a collage representing approximately 400 photos.

An "interest score" is computed off-line for each photograph. The image with the highest score in each partition is used as the representative photograph in the collage. Our current method scores photographs based on salience and face detection. Our system allows other interest detectors be included in order to personalize the scoring based on user preferences.

The computed interest score determines the position and size of each photograph in the rendered collage. The more interesting a photo is relative to the other photos, the more space it is given, and the closer to the center it is placed on the collage canvas. In other words, the most interesting image is given the most space and placed on the center. As a photograph is being placed, it attempts to border other photographs as much as possible, to in order to reduce whitespace. Figure 2 shows a collage generated by our method.

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References

[1] Adrian Graham, Hector Garcia-Molina, Andreas Paepcke, and Terry Winograd. Time as essence for photo browsing through personal digital libraries. In *JCDL 2002*, pages 326–335. ACM Press, 2002.

[2] Jingdong Wang, Jian Sun, Long Quan, Xiaoou Tang, and Heung-Yeung Shum. Picture collage. In *CVPR 2006*, 2006.