

Agrafo: A Visual Interface for Grouping and Browsing Digital Photos

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ABSTRACT

With the growing popularity of digital cameras, the organization, browsing, management and grouping of photos become a problem of every photograph (professional or amateur), because their collections easily achieve the order of thousands. Here, we present a system to automate these processes, which relies on photo information, such as, semantic features (extracted from content), meta-information and low level.

Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User Interfaces - Graphical user interfaces (GUI)

General Terms

Design, Human Factors

Keywords

Image grouping, Image analysis, User interface

1. INTRODUCTION

Nowadays, due to the wide dissemination of digital cameras, any ordinary photograph reaches easily a large collection of photos. Since taking photos is almost priceless, people tend to take several similar photos, for later selection of the best one. Additionally, the sharing of photos has become an easier and more global experience, helping the growing of personal collections. This increase in the number of photos demands the need for tools to help users organize and manage their collections in an automatic way. Although, there are some approaches [3, 1] to organize photos, they use time as the main organizing principle tending to disregard other important information about photos that can only be gleaned by their contents. In this paper, we describe the Agrafó system, a visual tool to help users organize collections of photos based on its content and associated information. We use meta-information provided by

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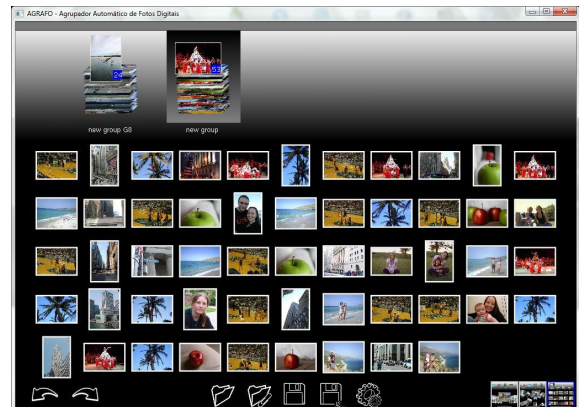


Figure 1: Agrafó user interface.

the digital cameras (i.e. time), semantic information extracted from photos (presence of faces, urban/nature scene, indoor/outdoor picture) and low-level information extracted from the content of images, such as, color and texture. Users can combine several of these criteria to organize their photos, in an interactive and iterative way.

2. THE AGRAFO SYSTEM

Contrarily to other existing solutions, the Agrafó system allows the grouping and browsing of collections of photos based on their contents, using semantic information and low-level features. The semi-automatic grouping is done interactively and iteratively, through the selection of grouping criteria.

2.1 The Visual Interface

The Agrafó user interface has two main areas (see Figure 1). At the top we can see the resulting groups represented as stacks of photos, with a representative one facing the user. A small number shows the number of photos in the group. The rest of the photos are organized in perspective to give users an overview of the group content. Users can open various groups at the same time, rename groups and perform drag & drop operations to join groups or to order them. Below the group area, the system shows the photos from a group (or groups) arranged according to the selected view. Currently, we have three views available: The grid view, illustrated in Figure 1, the disorganized view (Figure 2-left) and the carousel view (Figure 2-right). Users can drag, rotate, zoom and select photos as they do in any direct



Figure 2: Agrafó visual interface and the set of photos to be grouped.

manipulation application. It is also possible to drag photos to the group area to create a new group or to add them to an existing group. Finally, users can see photos properties provided by the EXIF data and from the filesystem.

Initially, when the user opens a set of photos (e.g. from a folder) they are all placed in the same new group. New groups can be created by selecting a group or group of photos and submitting them to the automatic grouping mechanism. As a result, new groups will be created according. To choose how photos are grouped users use the Grouping Pane illustrated in Figure 3. We can select various criteria and their relative importance, allowing the fine tune of grouping. For instance, it is possible to select the Time, and Indoor/Outdoor criteria, to separate photos from a wedding into groups for the church ceremony, the photos of the spouses in the garden outside the church (taken shortly after, so using time alone would not suffice to tell them apart), and the wedding reception (later that day).

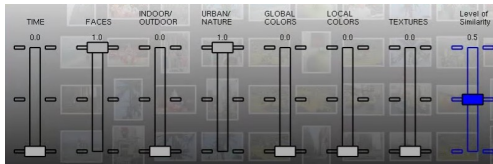


Figure 3: Grouping criteria.

The rightmost bar allows users to select the similarity between elements in a group. The bigger the similarity level, the smaller the number of photos in a group and more groups will be created. What we are saying is that we only want groups with very similar photos.

Figure 4 illustrates two of the four groups created by Agrafó after grouping the collection of photos from Figure 1, using two criteria, Faces and Urban/Nature. The system created four groups: photos with Nature scenes without Faces, Nature photos with Faces, Urban images without Faces and Urban photos with Faces. When users select criteria that can lead to "strange" combinations, such as, Ur-

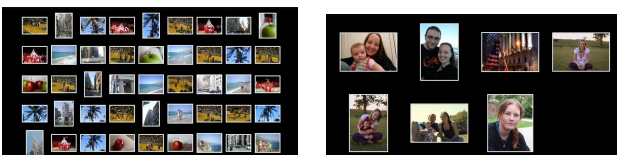


Figure 4: Photos from Nature without Faces (left) and with Faces (right), after grouping by Urban/Nature and Faces.

ban/Nature and Indoor/Outdoor, the system only creates those groups that make sense (Indoor, Outdoor+Nature and Outdoor+Urban).

2.2 Grouping Mechanism

The automated grouping mechanism was implemented using the QTClust clustering algorithm [2]. While this is more computational intensive than the more widely known k-means algorithm, it has the advantage of not require the number of clusters beforehand. In Agrafó, we can not provide that number, because it will depend of the set of photos and of the criteria selected by the user.

The QTClust algorithm requires a distance function to tell how close photos are from each other. The more similar the photos are, the closer they will be. To measure that similarity, our algorithm uses the different criteria specified by the user. It is important to notice that only the specified criteria are used during the clustering operation. Each criterion corresponds to a different dimension, thus by using only the selected criteria we are creating smaller dimension spaces, which optimizes the clustering process.

To optimize performance, our system computes features for each criteria in background and stores those features for next executions of the application.

Currently, Agrafó can group photos using the following criteria: Time, extracted from EXIF metadata; semantic information, such as, presence of Faces, Indoor/Outdoor and Urban/Nature scenes, detected from image content; and low-level features, namely Global color, Local color and Textures, extracted from photos. However, and since our architecture is modular, the inclusion of new criteria is very easy.

3. CONCLUSIONS

In this paper we shortly describe a system to support users in their task of grouping and browsing collections of photos, through the selection of features extracted from images content. It has a simple and easy to use visual interface, which allows automatic and quick grouping of photos.

Currently we are preparing an experimental evaluation of the Agrafó system, to check if the resulting groups are similar to what users will do by hand. To that end we are collecting photos from users, already organized in groups, to serve as test bed.

4. ACKNOWLEDGMENTS

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