

Managing Digital Memories with the FXPAL Photo Application

John Doherty
FX Palo Alto Laboratory
3400 Hillview Ave
Palo Alto, CA, 94304 USA
doherty@fxpal.com

John Adcock
FX Palo Alto Laboratory
3400 Hillview Ave
Palo Alto, CA, 94304 USA
adcock@fxpal.com

Andreas Girgensohn
FX Palo Alto Laboratory
3400 Hillview Ave
Palo Alto, CA, 94304 USA
andreasg@fxpal.com

ABSTRACT

The FXPAL Photo Application is designed to facilitate the organization of digital images from digital cameras and other sources through automated organization and intuitive user interfaces.

Categories and Subject Descriptors

J.m [Computer Applications]: Miscellaneous

General Terms

User interfaces, Algorithms.

Keywords

Digital photo collections, automatic event detection, user-centered design.

1. INTRODUCTION

The rapidly increasing use of digital cameras is causing a corresponding increase in the number and size of personal digital photo collections which routinely contain thousands of photos and require effective interfaces that facilitate browsing, manipulation, and sharing. Studies have found that users exploit aspects of digital photography in usage scenarios such as sharing photos with friends and retrieving photos of important events[1, 2, 3, 4]. Before sharing, people typically classify photos into those they wish to share versus those they intend to leave “in the shoebox.” Thus, there is a demand for powerful tools to help users organize, classify, and browse their collections.

There are already many commercial (Adobe Photoshop Album, Canon Zoombrowser, Apple iPhoto) and research applications [5, 6, 1] supporting the organization of digital photos. While our application shares features with some of them, our goal has been to make organizing and browsing photos simple and quick, while retaining scalability to large

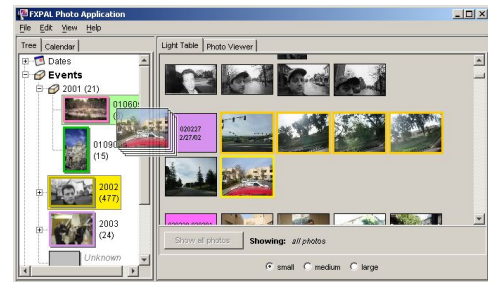


Figure 1: The FXPAL Photo Application.

collections[9]. To that end, we have concentrated on areas that improve the overall experience without neglecting the mundane components of a digital photo organization application.

2. AUTOMATIC EVENT DETECTION

Researchers have found that organizing photos by time improves users’ performance in retrieval tasks[2, 7]. We often describe photos by the events they document or the times they were taken. While “events” are difficult to define quantitatively or consistently, photographs from the same event are typically taken in close proximity in time, while visually dissimilar photos often belong to the same event. Thus, content-based image similarity is often less useful for photo clustering or event detection than metadata. Images from digital cameras typically include metadata, including the time and date, in a standard Exif header.

We adapt a similarity-based media segmentation algorithm[8] to hierarchically cluster photographs with similar (*i.e.*: proximal) timestamps. Our approach makes no assumptions about the distribution of the timestamps.

The photos to be analyzed are sorted by their date and time and a matrix of inter-photo time differences computed. A checkerboard matched-filter is applied along the diagonal of this matrix to compute a novelty score[8]. Peaks in the novelty score correspond to event boundaries. The novelty score is computed at several scales and the best scale chosen automatically based upon the “goodness” of the boundaries at that scale.

When photos are imported into the application, events are automatically detected and assigned. Extant events are reused and new events are added for photos that do not belong with any of the existing events.

3. LIGHT TABLE AND PHOTO VIEWER

The light table shows the entire collection of photos in a vertically scrollable window (see Figure 1).

We offer three different fixed thumbnail sizes for the light table. We precompute high-quality, anti-aliased thumbnails in the different sizes and pre-cache thumbnails in the neighborhood of the current position so that the application may scroll smoothly through collections of thousands of images.

Depending on the current sorting criterion, colored title-boxes delimit the start of each category (such as days or events) in the light table. In cases where a photo belongs to multiple categories (*e.g.*, a photo of several people) it will appear several times in the light table, once in the section for each relevant marker.

Users can select any number of photos in the light table and rotate them, export them to a Web page or a file folder, attach captions, or assign them to categories through a context menu and associated dialogs.

The photo viewer can be displayed in place of the light table to view the current picture at medium (640x480) resolution. While in the photo viewer, operations can be performed on the current photo as if it were selected in the light table. We also offer a full-screen view with photo transitions and automatic slideshow mode.

4. TREE VIEW

The tree view has a sub-tree for each of several different categories: Dates, Events, People, Places, and Labels. With the tree, the user can navigate the light table by any desired category. The currently selected sub-tree determines how the photos are sorted in the light table. The color of the thumbnail border matches the color of the corresponding title-box in the light table. Selecting a tree node scrolls to and selects the first photo with the selected value or tag. Nodes can be renamed and new nodes can be created through context menu items or by dropping a selection on the top level of the tree.

The nodes of the tree are drag-and-drop targets. A selection of photos dragged from the light table to a tree node will be added (or moved) to that category.

5. CALENDAR VIEW

The calendar interface provides a way to navigate the photo collection within the familiar context of a wall-calendar. The calendar represents the empty space between events in a way that is lacking from the tree-based date view. The use of space is optimized in sparse calendar views by expanding the days of the calendar where there are images and shrinking the days where there are none.

Just like a date node in the tree view, selecting a day in the calendar scrolls the light table to the first photo from that date. When the user wants to assign photos to an event by hand, the calendar provides a natural interface for selecting time-contiguous groups of photos. By selecting a group of days in the calendar, the photos on those days are selected, and can then be assigned to an event or other label.

The calendar view may also be used to apply dates to undated or incorrectly dated images. A user may wish to merge dated images from digital cameras with undated images from film cameras or digital images whose time and date information has been lost (*e.g.*, by manipulating it with an image editor). Photo dates may be set by dragging a se-

lected image or images onto a date in the calendar. If a camera is set to a different time zone or has an incorrect clock, we also offer a dialog to shift the time for the selected photos by a specified amount of time.

6. SUMMARY

In this paper, we described a photo management application aimed at facilitating the management of large photo collections by implementing automatic organization techniques, powerful but concise interface methods, and optimized data handling. Our user interface provides a variety of means for browsing, navigating, sorting, and filtering photos that scale up well to collections containing thousands of photos.

Initial user response has been very positive and indicates that our application addresses some of the perceived deficiencies of existing applications. Future work will continue to refine and augment the application in response to user feedback and also introduce novel and compelling methods for creating media objects for sharing and presenting photos such as slide shows set to music.

7. ADDITIONAL AUTHORS

Matthew Cooper cooper@fxpal.com and Jonathan Foote foote@fxpal.com and Lynn Wilcox wilcox@fxpal.com

8. REFERENCES

- [1] Kuchinsky, A., Pering, C., Creech, M.L., Freeze, D., Serra, B., and Gwizdka, J. (1999) FotoFile: A Consumer Multimedia Organization and Retrieval System. Proc. of the CHI 99 Conf. on Human Factors in Computing Systems, pp. 496-503.
- [2] Graham, A., Garcia-Molina, H., Paepcke, A., and Winograd, T. (2002) Time as the Essence for Photo Browsing Through Personal Digital Libraries. Proc. Joint Conf. on Digital Libraries, pp. 326-335.
- [3] Schiano, D.J., Chen, C.P., and Isaacs, E. (2002) How Teens Take, View, Share and Store Photos. CSCW Interactive Poster.
- [4] Shen, C., Lesh, N.B., Vernier, F., Forlines, C., and Frost, J. (2002) Sharing and Building Digital Group Histories. Proc. ACM Computer-Supported Cooperative Work (CSCW), pp. 324-333.
- [5] Bederson, B. (2001) PhotoMesa: A Zoomable Image Browser Using Quantum Treemaps and BubbleMaps. Proc. ACM User Interface Software and Technology (UIST), pp. 71-80.
- [6] Kang, H. and Shneiderman, B. (2000) Visualization Methods for Personal Photo Collections: Browsing and Searching in the PhotoFinder. Proc. IEEE Intl. Conf. on Multimedia and Expo, pp. 1539-1542.
- [7] Gargi, U., Deng, Y., and Tretter, D.R. (2003) Managing and Searching Personal Photo Collections. Proc. SPIE Storage and Retrieval for Media Databases, pp. 13-21.
- [8] Cooper, M. and Foote, J. (2001) Scene Boundary Detection Via Video Self-Similarity Analysis. Proc. IEEE Intl. Conf. on Image Processing, pp. 378-381.
- [9] Girgensohn, A. and Adcock, J. and Cooper, M. and Foote, J. and Wilcox, L. (2003) Simplifying the Management of Large Photo Collections. To appear in Proc. of Interact 2003.