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Chapter 9

Visualization, Estimation and User Modeling for Interactive Browsing of Personal Photo Libraries

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ABSTRACT

Recent advances in technology have made it possible to easily amass large collections of digital media. These media offer new opportunities and place great demands for new digital content user-interface and management systems which can help people construct, organize, navigate, and share digital collections in an interactive, face-to-face social setting. In this chapter, we have developed a user-centric algorithm for visualization and layout for content-based image retrieval (CBIR) in large photo libraries. Optimized layouts reflect mutual similarities as displayed on a two-dimensional (2D) screen, hence providing a perceptually intuitive visualization as compared to traditional sequential one-dimensional (1D) content-based image retrieval systems. A framework

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for user modeling also allows our system to learn and adapt to a user's preferences. The resulting retrieval, browsing and visualization can adapt to the user's (time-varying) notions of content, context and preferences in style and interactive navigation.

INTRODUCTION

Personal Digital Historian (PDH) Project

Recent advances in digital media technology offer opportunities for new story-sharing experiences beyond the conventional digital photo album (Balabanovic et al., 2000; Dietz & Leigh, 2001). The Personal Digital Historian (PDH) project is an ongoing effort to help people construct, organize, navigate and share digital collections in an interactive multiperson conversational setting (Shen et al., 2001; Shen et al., 2003). The research in PDH is guided by the following principles:

1. The display device should enable natural face-to-face conversation: not forcing everyone to face in the same direction (desktop) or at their own separate displays (hand-held devices).
2. The physical sharing device must be convenient and customary to use: helping to make the computer disappear.
3. Easy and fun to use across generations of users: minimizing time spent typing or formulating queries.
4. Enabling interactive and exploratory storytelling: blending authoring and presentation.

Current software and hardware do not meet our requirements. Most existing software in this area provides users with either powerful query methods or authoring tools. In the former case, the users can repeatedly query their collections of digital content to retrieve information to show someone (Kang & Shneiderman, 2000). In the latter case, a user experienced in the use of the authoring tool can carefully craft a story out of his or her digital content to show or send to someone at a later time. Furthermore, current hardware is also lacking. Desktop computers are not suitably designed for group, face-to-face conversation in a social setting, and handheld story-telling devices have limited screen sizes and can be used only by a small number of people at once. The objective of the PDH project is to take a step beyond.

The goal of PDH is to provide a new digital content user-interface and management system enabling face-to-face casual exploration and visualization of digital contents. Unlike conventional desktop user interface, PDH is intended for multiuser collaborative applications on single display groupware. PDH enables casual and exploratory retrieval, and interaction with and visualization of digital contents.

We design our system to work on a touch-sensitive, circular tabletop display (Vernier et al., 2002), as shown in Figure 1. The physical PDH table that we use is a standard tabletop with a top projection (either ceiling mounted or tripod mounted) that displays on a standard whiteboard as shown in the right image of Figure 1. We use two Mimio (www.mimio.com/meet/mimimouse) styluses as the input devices for the first set

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