Chapter 13

Principles for Supporting and Enhancing User Navigation of Digital Video in Video Browsers

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Video browsers provide an environment in which a user may navigate digital video content. They are therefore an important application for improving access to digital video resources. We apply a general framework for navigation, proposed by Spence (1999), and consider existing proposals for video browsers made within the research literature within the context of the framework. We then use this analysis to derive a number of principles that reflect the requirements for supporting and enhancing the user in the digital video navigation task.

INTRODUCTION

Digital video is no longer a novelty data type and its uses are becoming plentiful, diverse, and central to current and future computing environments. Although originally available primarily in restricted low-resolution formats on CD-ROMs, digital video now forms the basis for a host of applications including DVDs, video-on-demand, media streaming applications over the Web, digital television, and applications running on newly-emerging mobile devices, such as Pocket PCs. However, despite this abundance, effective user access to digital video resources is proving problematic.

Video browsing is one area of research that offers promise in improving access to digital video (Bolle, Yeo & Young, 1998; Ferman & Tekalp, 1998; Lienhart, Pfeiffer & Effelsberg, 1997; Smith, 1999; Smoliar & Zhang, 1994; Teodosio &

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Bender, 1993; Tonomura, 1991; Tonomura, Akutsu, Taniguchi & Suzuki, 1994; Uchihashi, Foote, Girgensohn & Boreczky, 1999; Zhang, 1999). Video browsers assist the user by enabling them to navigate through digital video, e.g., by limiting the amount of content that is presented and by providing overviews of entire digital videos. However, not only have few video browsing applications been proposed, but moreover there has been little research on how user navigation, rather than browsing, of digital video should be supported in such systems.

This paper proposes a number of principles for supporting and enhancing user navigation of digital video in video browsers. The principles are derived through the application of a navigation framework proposed in the research literature by Spence (1999). The structure of the remainder of this paper is as follows. The next section provides a concise review of video browsers. The third section presents Spence’s general framework for navigation. The fourth section applies this framework to digital video navigation and considers existing video browsers within the context of the framework. The fifth section then presents a number of principles for supporting and enhancing user navigation of digital video that stem from the application of the framework. The final section concludes the paper.

VIDEO BROWSERS
The objective of a video browser is to enable a user to navigate through a digital video efficiently and effectively. In other words, a video browser may be considered a media-specific type of browser. Video browsers may exist in two forms:

- **For explicit query support:** Given a user-formulated query (e.g., expressed in a database query language), a video search and retrieval system presents candidate digital video segments to the user, i.e., video segments that meet the user’s query criteria. The user should then be able to navigate through these candidate video segments to ascertain their suitability and/or to determine whether the query criteria need refinement (Bolle et al., 1998).

- **For implicit query support:** In this case, navigation occurs as a result of implicit querying. The user has an internal query that is never made explicit (e.g., it is not expressed via a database query language). Instead, the user seeks to satisfy their query by searching for a digital video segment of interest by navigating “at leisure.”

The conventional approach to digital video navigation is that provided by standard media players, such as Real Networks’ RealPlayer, Microsoft’s Windows Media Player, and Apple’s QuickTime Player. Such players provide conventional VCR-like controls (fast forward and rewind) and also step forward and step backward controls (to jump a uniform number of frames per “step” of the
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