Chapter 8
Extracting Sport Video Semantics:
Research and Applications

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ABSTRACT

Recent developments in video content analysis contribute to the emergence of multimedia database management. With the rapid growth of digital videos, efficient tools are essential to facilitate content indexing, searching, retrieving, browsing, skimming, and summarization. Sport video analysis has attracted lots of research attention because of its entertainment applications and potential commercial benefits. Sport video analysis aims to identify what excites audiences. Previous methods rely mainly on video decomposition, using domain specific knowledge. Research on suitable and efficient techniques for sport video analysis has been conducted extensively over the last decade. However, several longstanding challenges, such as semantic gap and commercial detection, are still waiting to be resolved. This chapter reviews research on sport video analysis and investigates the potential applications and future trends of sport video analysis.

INTRODUCTION

Rapid developments of digital video processing technologies and communication infrastructure, along with the increase of bandwidth, enable the easy access, editing, and distribution of video contents. More and more digital videos are now available for entertaining, commercial, educational, and other purposes. As videos become important sources of everyday knowledge, one of the major problems that we face nowadays is the ways to manage the explosive amounts of videos generated everyday effectively, promoting high-quality modes of life and consumer technology.

Multimedia and communication technologies have become maturer after their rapid development for almost half of a century. Digital technologies are now widely applied to speech, audio, video, and graphics in various commercial applications. Furthermore, the availability of broadband wired/wireless infrastructures and new technologies, such as peer-to-peer networking, has changed the distribution and exchange of digital media. In this new era, research has shifted its focus from technology development to novel applications.

Content-based video analysis aims at organizing videos into systematic structures so that their semantic contents can be effectively represented by still images, video clips, graphical representations, and textual descriptors (Manjunath, 2000, 2002; Chang, 2001). Significant audio and visual cues are used as the foundation for video presentation. Suitable and effective techniques for video content analysis have been studied and developed extensively over the last decade. Due to the content variations of each of the videos, the style and extent selected vary greatly and no standard can be found, which should be included and excluded for content-based video analysis. Furthermore, the ways to extract the semantic meaning of videos are generally known to be an open and challenging problem (Chang, 1997; Li, 2006; Rui, 1998; Yeh, 2005).

Sport video analysis has drawn many researchers' attention because of its commercial potentials in the entertainment industry. Audience rating is an indicator of aforementioned factors. Increasing audience rating and attracting advertisement are the top priorities of TV broadcasters. Therefore, American broadcasters such as ESPN, ABC, FOX and other local media try their best to attract audience attention by providing desirable broadcasting, charming anchors, high definition videos, and etc. Sport video analysis belongs to one of the content-based video analyses. Sport videos tend to be well-structured due to similar filming techniques used in a sport game; therefore, they could be analyzed. One goal of sport video analysis is to extract the underlying semantic content. However, different from textual information, the wide range of semantics appeared in multiple modes in a sport video. Extracting semantics accurately and concisely still poses an ongoing challenge for research community. The expectations of the users encourage the investigation of this growing area. This chapter provides an overview of major developments in sport video analysis. We discuss semantic approaches to sport videos understanding and the trend of this field. In particular, several important research issues are discussed, including commercial detection, playfield detection, highlight extraction, and etc. Potential applications are also suggested. This chapter aims to discuss sport video analysis. The rest of this chapter is organized as follows: we first examine sport video filming and discuss commercial detection in broadcast TV programs, an essential step for broadcast video processing. Then, several sport video filming techniques are introduced. Research issues of sport video analysis; including playfield detection, highlight exaction and object tracking/reorganization, are discussed. Finally, concluding remarks and future trend of sport video analysis are given.

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