Chapter 6

A Content-Driven System Architecture for Tackling Automatic Cataloging of Animated Movie Databases

Bogdan Ionescu
University Politehnica of Bucharest, Romania

Alexandru Marin
University Politehnica of Bucharest, Romania

Patrick Lambert
University of Savoie, France

Didier Coquin
University of Savoie, France

Constantin Vertan
University Politehnica of Bucharest, Romania

ABSTRACT

This article discusses content-based access to video information in large video databases and particularly, to retrieve animated movies. The authors examine temporal segmentation, and propose cut, fade and dissolve detection methods adapted to the constraints of this domain. Further, the authors discuss a fuzzy linguistic approach for deriving automatic symbolic/semantic content annotation in terms of color techniques and action content. The proposed content descriptions are then used with several data mining techniques (SVM, k-means) to automatically retrieve the animation genre and to classify animated movies according to some color techniques. The authors integrate all the previous techniques to constitute a prototype client-server architecture for a 3D virtual environment for interactive video retrieval.

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1. INTRODUCTION

Managing large collections of video materials is a tedious task as it requires processing huge amounts of data. A lot of efforts are done today to develop new intelligent indexing systems able to provide user-friendly search capabilities. The target is to attend a semantic level of description close to human perception, and thus, to render the task of finding video contents as simple as devising a textual query, e.g., “find me the sad movies, or find the outdoor scenes”.

Video indexing primarily involves content annotation, which basically means adding some extra content-related information to the actual data (e.g., indexes/attributes). This information provides key-cues about the data content, allowing thus the automatic cataloging. Content annotation is mandatory, as non-indexed data is practically inexistent for the system (and eventually for the user) since there is no trace of it. Most of the research in the field addresses mainly the data annotation task, which is also the most difficult to perform (Naphade & Huang, 2002; Snoek & Worrning, 2005). The challenge is to find methods to extract meaningful attributes, which tend to maximize the relevance and the information coverage, while minimizing the amount of data to deal with, and thus the dimensionality of the data feature space. Nevertheless, in order to be useful and efficient, the annotation must be performed automatically, without human intervention.

Unfortunately, because of the diversity of the existing video materials, which involves a large variety of specific processing constraints, the issue of automatic understanding of video contents is still an open issue. Despite some few attempts (Chan, Qing, Yi, & Yueting, 2001; Kim, Frigui, & Fadeev, 2008), there is still no generic solution available for indexing all kind of video materials. The chosen compromise consists in reducing the high complexity of this task by adopting some simplifying assumptions, e.g. particular setups, “a priori” information, hypothesis, etc., which are facilitated by the specificity of each application domain. This makes the existing systems highly application dependent. Many domains have been addressed, while new ones are still emerging, e.g., basketball sequences (Saur, Tan, Kulkarni, & Ramadge, 1997), soccer sequences (Leonardi, Migliorati, & Prandini, 2004), medical sequences (Fan, Luo, & Elmagarmid, 2004), news footage (Lu, King, & Lyu, 2003), TV programs (Kawai, Sumiyoshi, & Yagi, 2007), animal hunt in wildlife documentaries (Haering, Qian, & Sezan, 2000), etc.

In this article we tackle the indexing issue for a new application domain, which becomes more and more popular: the animated movie entertainment industry. While the very few existing approaches are limited to dealing either with the analysis of classic cartoons or with cartoon genre detection (Roach, Mason, & Pawlewski, 2001; Snoek & Worrning, 2005; Ianeva, Vries, & Rohrig, 2003; Geetha & Palanivel, 2007), our approach is different as it uses fuzzy color-based and action-based content descriptions to retrieve animated movies according to their artistic content.

One reference in the field is IAFF - The International Animated Film Festival (CITIA, 2009), which stood as validation platform for our approaches. CITIA, the company managing the festival, has composed one of the world’s first digital animated movie libraries. Today, this library accounts for more than 31.000 movie titles, 22.924 companies and 60.879 professionals, which are to be available online for a general and professional use. For the moment, the existing indexing capabilities for animated movies (the CITIA Animaquid Indexing System) are limited to use only textual information (e.g., synopsis, descriptions, etc.), provided mainly by movie authors, which in many cases do not totally apply to the rich artistic content of the animated movies.

Animated movies are different from conventional movies and from cartoons in many respects which should be particularly addressed, (Ionescu, Coquin, Lambert, & Buzuloiu, 2008, see Figure 1):
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