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Video Summarization Using a Self-Growing and Self-Organized Neural Gas Network

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Abstract. In this paper, a novel method to generate video summaries is proposed, which is allocated mainly for being applied to on-line videos. The novelty of this approach lies in the fact that the video summarization problem is considered as a single query image retrieval problem. According to the proposed method, each frame is considered as a separate image and is described by the recently proposed Compact Composite Descriptors(CCDs) and a visual word histogram. In order to classify the frames into clusters, the method utilizes a powerful Self-Growing and Self-Organized Neural Gas (SGONG) network. Its main advantage is that it adjusts the number of created neurons and their topology in an automatic way. Thus, after training, the SGONG give us the appropriate number of output classes and their centers. The extraction of a representative key frame from every cluster leads to the generation of the video abstract. A significant characteristic of the proposed method is its ability to calculate dynamically the appropriate number of clusters. Experimental results are presented to indicate the effectiveness of the proposed approach.

1 Introduction

In the last decades, observing the increasingly use of multimedia data, it is realized that they have penetrated in our everyday life. A characteristic example of multimedia data is the digital video, whose on-line use, especially the last years, has been increased dramatically.

This fact automatically entails that video web sites have become overcrowded and the amount of data has reached to an uncontrollable point. It is no coincidence that in August 2008 YouTube was considered to be the world's second search engine[1] while in 2010, more than 2 billion videos watched per day on-line[2]. Consequently, the situation necessitates the generation of a representative video abstraction with a view to facilitating the user to decide rapidly and easily whether or not he/she is interested in a video without the need to watch the entire video but only the essential content of it.

Over the last years a noteworthy amount of work in the field of video summarization has been observed (e.g. [22,29,21,18,4]). In the literature a lot of significant approaches

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[1] http://tinyurl.com/yz5wb8x
[2] http://www.focus.com/images/view/48564/