

A survey based on Video Shot Boundary Detection techniques

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Abstract- Processing of video and image provides an understanding of the scene that it describe. It is an essential component of a number of technologies including video surveillance, robotics and multimedia. It represents an area of research with huge growth in the recent past. Video shot boundary detection is one of the research works in the field of video processing. Many researchers are trying to put forward different algorithm in this respect. Here we present a brief literature survey that depicts the work done till date.

Keywords: Transition, shots, thresholding, SBD (Shot boundary detection).

I. INTRODUCTION

The foremost requirement of any multimedia industry is video. Over the years industries has developed comprehensive and complete measures and techniques to index, store, edit, retrieve, sequence and present video material. Shot boundary detection is usually the opening step toward automatic video indexing and browsing. It is based on the recognition of visual discontinuities caused by the transitions, to segment a video stream into elementary uninterrupted content units for subsequent high-level semantic analysis. The discontinuities usually found during scene change or shot change. These discontinuities occur in form of transitions of different kinds which are categorised into two groups: abrupt (as hard cut) and gradual (dissolve, fade in, fade out, wipe). Conventionally, if there exist frames that are merged by the adjacent shots but belong to neither of them, the transition is called a gradual one; otherwise, it is called a cut.



Figure-3 Wipe effect



Figure-4 Dissolve effect



Figure-1 hard cut effect



Figure-2 fade effect

SHOT DIFFERENCE COMPUTATION TECHNIQUES IN VIDEO SHOT BOUNDARY DETECTION:

1. Pixel-based difference: it compares pixel difference between two successive video frames. It is sensitive to camera motion.



Figure-5 illustration of pixel difference

2. Statistical based difference: it divides the frames into small regions and then compares few properties of every

pixels in those regions between successive frames using statistical computation parameters.



Figure-6 illustration of statistical difference

3. Transform-based difference: It represents compression difference computation using different transformation methods. For example Discrete Cosine Transformation (DCT) coefficients.

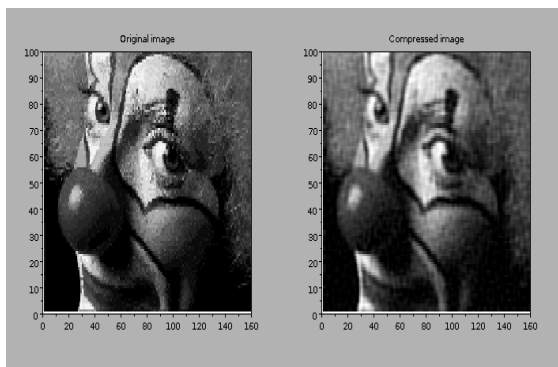


Figure-7 illustration of pixel difference

4. Histogram-based difference: it computes the colour histogram of each frame and compares it to detect shot boundaries.

5. Edge based difference: In this method the edges of successive aligned frames are detected first and then the edge pixels are paired with nearby edge pixels in the other image to find out if any new edges have entered the image or if some old edges have disappeared

II. SURVEY ANALYSIS

This chapter concentrate on the work till done in respect of shot boundary detection. **John S. Boreczky et al [1996]** proposed Comparison of video shot boundary detection techniques and present a comparative analysis of various shot boundary detection techniques and their variations including histograms, discrete cosine transform, motion vector, and block matching methods. **Patrick Bouthemy et al [1999]** proposed Unified Approach to Shot Change Detection and Camera Motion Characterization which describes an approach to partition a video document into shots by using image motion information, which is generally more intrinsic to the video structure itself. **A. Miene et al [2001]** presented Advanced and Adaptive Shot Boundary Detection techniques which is based on–

feature extraction and shot boundary detection. First, three different features for the measurement of shot boundaries within the video are extracted. Second, detection of the shot boundaries based on the previously extracted features.

H. Y: Mark Liaoff et al [2002] proposed a novel dissolve detection algorithm which could avoid the mis-detection of motions by using binomial distribution model to systematically determine the threshold needed for discriminating a real dissolve from global or local motions. **Jesús Bescós [2004]**, proposed a Real-Time Shot Change Detection over Online MPEG-2 Video where it describes a software module for video temporal segmentation which is able to detect both abrupt transitions and all types of gradual transitions in real time. **Guillermo Cisneros et al [2005]** proposed a paper on A Unified Model for Techniques on Video-Shot Transition Detection. The approach presented here is centred on mapping the space of inter-frame distances onto a new space of decision better suited to achieving a sequence-independent thresholding. **Liuhong Liang et al[2005]**, presented an Enhanced Shot Boundary Detection Using Video Text Information, in which a number of edge-based techniques have been proposed for detecting abrupt shot boundaries to avoid the influence of flashlights common in many video types, such as sports, news, entertainment and interviews videos. **Daniel DeMenthon et al [2006]** proposed a paper on Shot boundary detection based on Image correlation features in video. This paper is based on image correlation features in the videos. The cut detection is based on the so-called 2max ratio criterion in a sequential image buffer. The dissolve detection is based on the skipping image difference and linearity error in a sequential image buffer. **Kota Iwamoto et al [2007]** proposed Detection of wipes and digital video effects based on a pattern-independent model of image boundary line characteristics which is based on a new pattern independent model. These models rely on the characteristics of image boundary lines dividing the two image regions in the transitional frames.

Jinhui Yuan et al[2008] proposed a paper on a Shot boundary detection method for news video based on object segmentation and tracking. It combines three main techniques: the partitioned histogram comparison method, the video object segmentation and tracking based on wavelet analysis. The partitioned histogram comparison is used as the first filter to effectively reduce the number of video frames which need object segmentation and tracking. **Yufeng Li et al [2008]** proposed paper on Novel Shot Detection Algorithm Based on Information Theory. Firstly the features of color and texture are extracted by wavelet transform, then the dissimilarity between two successive frames are defined which colligates the mutual information of color feature and the co-occurrence mutual information of texture feature. The threshold is adjusted adaptive based on the entropy of the Continuous frames and it is not depend on the type of video and the kind of shot. **Vasileios T. Chasanis et al[2009]** presented Scene detection in videos using shot clustering and sequence alignment Foremost the key-frames are extracted using a

spectral clustering method employing the fast global k-means algorithm in the clustering phase and also providing an estimate for the number of the key-frames. Then shots are clustered into groups using only visual similarity as a feature and they are labelled according to the group they are assigned. **Jinchang Ren et al [2009]** proposed a paper on Shot Boundary Detection in MPEG Videos using Local and Global Indicators operating directly in the compressed domain. Several local indicators are extracted from MPEG macro blocks, and Ada Boost is employed for feature selection and fusion. The selected features are then used in classifying candidate cuts into five sub-spaces via pre-filtering and rule based decision making, then the global indicators of frame similarity between boundary frames of cut candidates are examined using phase correlation of dc images.

Priyadarshinee Adhikari et al [2009] proposed a paper on Video Shot Boundary Detection. This paper presents video retrieval using shot boundary detection. **Lihong Xu et al [2010]** proposed a paper on A Novel Shot Detection Algorithm Based on Clustering. This paper present a novel shot boundary detection algorithm based on K-means clustering. Colour feature extraction is done first and then the dissimilarity of video frames is defined. The video frames are divided into several different sub-clusters through performing K-means clustering. **Wenzhu Xu et al [2010]** proposed a paper on A Novel Shot Detection Algorithm Based on Graph Theory. This paper present a shot boundary detection algorithm based on graph theory. The video frames are divided into several different groups through performing graph-theoretical algorithm. **Arturo Donate et al [2010]** presented Shot Boundary Detection in Videos Using Robust Three-Dimensional Tracking. The proposal is to extract salient features from a video sequence and track them over time in order to estimate shot boundaries within the video.

Min-Ho Park et al [2010] proposed a paper on Efficient Shot Boundary Detection Using Block wise Motion-Based Features. It is a measure of discontinuity in camera and object/background motion is proposed for SBD based on the combination of two motion features: the modified displaced frame difference (DFD) and the block wise motion similarity. **Goran J. Zajić et al [2011]** proposed a paper on Video shot boundary detection based on multifractal analysis. Low-level features (color and texture features) are extracted from each frame in video sequence then are concatenated in feature vectors (FVs) and stored in feature matrix. Matrix rows correspond to FVs of frames from video sequence, while columns are time series of particular FV component. **Partha Pratim Mohanta et al [2012]**, proposed a paper on A Model-Based Shot Boundary Detection Technique Using Frame Transition Parameters which is based on formulated frame estimation scheme using the previous and the next frames. **Pablo Toharia et al [2012]** proposed a paper on Shot boundary detection using Zernike moments in multi-GPU multi-CPU architectures along with the different possible hybrid combinations based on Zernike moments. **Sandip T et al [2012]** proposed a paper on Key frame Based Video

Summarization Using Automatic Threshold & Edge Matching Rate. Firstly, the Histogram difference of every frame is calculated, and then the edges of the candidate key frames are extracted by Prewitt operator. Ravi Mishra et al [2013] proposed a paper on Video shot boundary detection using dual-tree complex wavelet transform, an approach to process encoded video sequences prior to complete decoding. The proposed algorithm first extracts structure features from each video frame by using dual-tree complex wavelet transform and then spatial domain structure similarity is computed between adjacent frames. **Zhe Ming Lu et al [2013]** present a Fast Video Shot Boundary Detection Based on SVD and Pattern Matching. It is based on segment selection and singular value decomposition (SVD). Initially, the positions of the shot boundaries and lengths of gradual transitions are predicted using adaptive thresholds and most non-boundary frames are discarded at the same time. **Sowmya R et al [2013]** proposed a paper on Analysis and Verification of Video Summarization using Shot Boundary Detection. The analysis is based on Block based Histogram difference and Block based Euclidean distance difference for varying block sizes. **Ravi Mishra et al [2014]** proposed a paper on a “Comparative study of block matching algorithm and dual tree complex wavelet transform for shot detection in videos”. This paper presents a comparison between the two detection methods in terms of various parameters like false rate, hit rate, miss rate tested on a set of different video sequence.

III.CONCLUSION

Even the simple techniques work efficiently for structured videos. These techniques can be further refined and implemented for shot detection. Beside the already existing detection algorithm some new algorithm like graph theory, gist method, information theory, robust tracking method etc has also been proposed which mainly concentrate on gradual transition. In this paper we presented a brief overview of detection techniques. The newly developed method seems to produce good result and also give an idea about its capacity to detect many other transitions.

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