

# Video Shot Boundary Detection Using Various Techniques

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**Abstract**— Shot and classification is first and foremost step for further analysis of video content . A Shot is defined as a set of frames from a single camera. Processing of video and image facilitates better understanding of the scene that it describe. It is a fundamental component of a number of technologies like video surveillance, robotics etc .A scene is a collection of one or more shots focusing on one or more object of interest. various shot boundary methods have been developed which can detect cut and gradual shot simultaneously.

**IndexTerms**—Shot,Scene,Shot Boundary Detection

## I. INTRODUCTION

The primary requirement of any multimedia industry is video. Now a days use of video bases information is increasing drastically. Due to this many comprehensive techniques were developed for indexing, storing, retrieving, sequencing and present video material. Video shot boundary detection has become one of the most challenging research area in the field of video processing. Shot boundary detection is usually the basic step for video indexing and browsing. In this process, video sequence is first segmented into shots. A shot is a series of frames that run for uninterrupted period of time..It shows a continuous action in an image sequence. A scene is a collection of one or more adjoining shots that focuses on an object.. When a scene changes or shot changes the disruptions (discontinuity) usually occur. These disruptions occur in the form of transitions. There are two types of transitions. Gradual transition and abrupt transition. Abrupt transition is a sudden transition from one shot to another shot, that is, one frame belongs to first shot and next frame belongs to second shot These transition are also called hard cut



Fig1 hard cut effect

In gradual transition, two shots are combined using chromatic ,spatial effects which generally replace one shot by other shot .These transition are also called as soft cut.. Various types of gradual transition are dissolve, fade, wipe.

Dissolve convey a sense of passing time or changing location. These are more difficult to detect.



Fig 2 dissolve effect

Fade usually signal the beginning and end of scenes .Two type of fade are fade in and fade out.



Fig 3 fade effect

Fade out appears when the image is fades to black screen and fade in appears when the image is displayed from a black image



Fig.4fade in



Fig 5 fade out

Wipe, it has a coloured border which helps in distinguishing the shots during the transition .It is a good way to show changing locations.



Fig 6 wipe effect

Earlier various matrices were used for shot boundary detection .These matrices are classified as histogram based matrices, statistical based matrices pixel based difference and edge based difference..

Histogram based matrices is the most common method used to detect shot boundary. It provides a compact summarization of data in video frames and is sensitive to camera rotation .

Statistical based matrices divide the image into small regions and comparing the properties of each pixel in that region by using statistical computation measures.In pixel based difference, pixel difference is compared between two video frames .. but it has a drawback that it is sensitive to camera motion.

In edge based difference ,to find out the new edges have entered in the image or some old edges have disappeared ,this method first detect the edges of the successive aligned frames with the nearest edge pixels in another image...this approach is computationally expensive. Instead of using traditional matrices, we use complex wavelet transform to extract the features for shot boundary detection. Complex wavelet transform is a complex valued extension to the standard discrete wavelet transform (DWT).It is a two dimensional wavelet transform which provides multi resolution sparse representation and useful characterization of the structure of image and it has a high degree of shift variance.

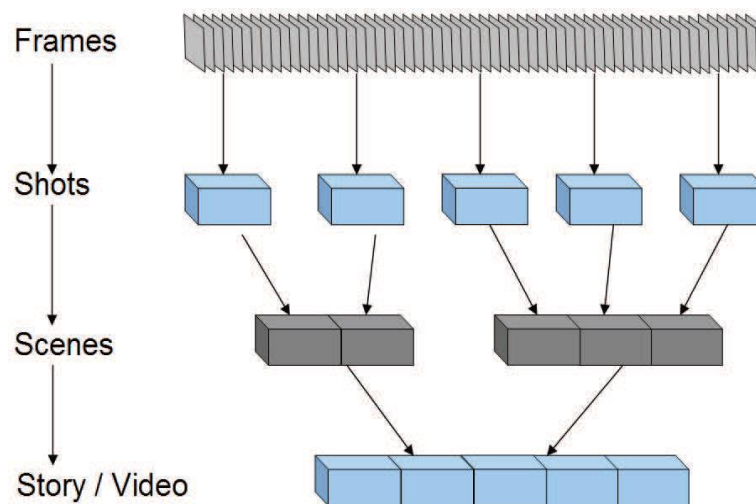


Figure 7: Hierarchical Structure of Video

## II. LITERATURE SURVEY

There are many research papers with respect to video content based analysis where shot boundary detection is the fundamental step. Hence shot boundary detection is the popular area in the field of video content analysis and has been studied for a long time.

Research has resulted in variety of algorithms. JOHN S.BORECZKY et al. proposed a comparison of various shot boundary detection techniques and classification and their variations including histogram, discrete cosine transform, motion vector and block matching method

SOWMYA R et al. proposed a paper on "analysis and verification of video summarization using shot boundary detection."

The analysis is based on two different methods block based histogram difference and block based Euclidean distance difference for varying block sizes. The results show that as block size increases, the histogram method performs better. But block size does not impact performance in Euclidean distance method. overall results are better in Euclidean distance method than histogram method.

Prajesh v.k.kathiriya proposed a paper on chi square based shot boundary detection and frame extraction of video.

In this paper shot boundary is detected by using histogram method and the key frame is extracted from the video. But histogram is very time consuming method but accuracy is higher in gradual transition.

Ravi mishra proposed a paper on comparative study of block matching algorithm and dual tree wavelet complex transform for shot detection in videos. This paper presents a comparison between two detection methods in terms of various parameters like false ratio hit rate, miss rate tested on a set of different video sequences.

Jinhui yuan proposed a paper on shot boundary detection method for news video based on object segmentation and tracking.

In this paper three main techniques are combined: the partitioned histogram method, the video object segmentation and tracking based on wavelet analysis.

Wenzhu Xu and Lihong Xu proposed shot boundary detection based on clustering based on k-means clustering. In this, feature of colour is extracted first and dissimilarity of video frames is defined. Then the video frames are divided into several different sub clusters through performing k-means clustering. It can detect cut and gradual shots by adaptive double threshold of different sub clusters.

Abdelati Malek Amel proposed a paper on shot boundary detection using motion activity descriptor. The motion activity is one of the motion features including the visual part of the MPEG-7 standard. The motion activity information is extracted in uncompressed domain based on adaptive road pattern search (ARPS) algorithm. In this context, the motion activity descriptor was applied for different video sequence. This can promise a better computing performance and can be useful for real time implementation.

NIKITA SAO & RAVI MISHRA proposed a paper on video shot boundary detection using nodal analysis of graph theoretic approach. The conceptual knowledge of nodal analysis is combined with the existing technique: histogram difference method and statistical deviation of pixel intensities using contrast change parameters to detect the edit effect occurring in different videos. These effects including abrupt transition and gradual transition. Proposed method is tested on different videos and the result shows its accuracy and efficiency in detecting shot boundaries.

Jian Zhou video shot boundary detection using independent component analysis. By projecting video frames from illumination-invariant raw feature space into low dimensional ICA subspace, each video frame is represented by a two-dimensional compact feature vector. ICA is a linear non-orthogonal transform which blindly separates the independent source signals from their linear mixtures without knowing the mixture matrix.

Goran J.Zaic et al. proposed a paper on video shot boundary detection based on multiracial analysis. They extracted low level features like color and texture features from each frame in video sequence and then features are combined with feature vectors and stored in feature matrix.

Real shot boundaries are detected in a video sequence but they also contained incorrectly detected shot boundaries. This problem can be sort out by further improvement of detection algorithms.



Chunmei Ma et al. proposed a rapid and robust method for shot boundary detection and classification in uncompressed MPEG video sequence. To generate DC images we first only decode first frame partly in video sequence and then histogram of these DC images were calculated to detect not only the abrupt changes but also gradual transition in video sequences.

Arturo Donate and Xiuwen Liu proposed a paper on shot boundary videos using robust three dimensional tracking. By using simultaneous localization and mapping (SLAM), we are able to track objects in a scene by modeling the relative 3D positions of the features as well as camera.

Shouqun Liu proposed a paper on video shot boundary detection with local feature post refinement. It is based on mean shift procedure and feature definition. The difference metric between frame images are need to be defined to apply mean shift kernel density estimations.

### III. VARIOUS SHOT BOUNDARY TECHNIQUES

#### *Histogram Method*

Histograms are the most popular method used to detect video shot boundaries.

Nikita sao and Ravi Mishra computed the colour histogram of each frame and compare it to detect shot boundaries. The most popular histogram method is Bin -to -Bin(B2B) as shown in equation(1)

$$D(b2b)(h1,h2)=1/2N \sum |h1-h2|$$

Where h1 and h2 are histograms of consecutive frames and N is the number of pixels In single frame.

[20]Histogram method computes 64 bin gray level histograms of the two images and Euclidean distance or chi square distance is used to find histogram difference.

#### *Statistical Differences*

Statistical method expand on the idea of pixel differences by splitting the images into regions and statistical measures of pixels in those regions were compared.

Kasturi Jain found this method is slow due to complex statistical computations. In this method mean and standard deviation are two statistical measurements are used. It is noise tolerant and generate many false positives



#### *Pixel Differences*



Shahraray break the images into 12 regions and found the best match for each region in a neighborhood around the region in the other image. This matching process duplicates the process used to extract motion vectors from an image pair. But this technique is very sensitive to camera motion and object motion. Sum of absolute differences (SAD) is the fundamental pixel difference method. In this method the difference between two frames is obtained by calculating the value that represents overall change in pixel intensity of image [18].

#### **Compression Technique**

T Arman, Hsu and Chu compared a small number of connected regions to find shot boundaries.

They used differences in the discrete cosine transform of jpeg compressed frames as their measure of frame similarity, thus avoiding the need to decompress frames.

[19] this method uses differences in the DCT coefficients of frames. The same 15 DCT coefficients from each block of frame is taken and combined to produce a vector difference and is calculated by subtraction of vectors of consecutive frames.

#### **Edge Tracking**

Zabih, Miller and Mai compared color histogram, chromatic scaling and their own algorithms based on edge detection.

To reduce the effects of camera motion consecutive frames are aligned and then number of positions and edges in the edge detected image was compared to find out if new edges have entered the image or if some old edges have disappeared.

They are less sensitive to motion than chromatic scaling. According to them this method was more accurate for detecting cuts than histograms.

#### **Motion Vectors**

Ueda, Miyatake and Yoshizawa used block matching from which motion vector was determined to check whether a shot was zoom or not.

Shahraray determined motion vector information can also be obtained from MPEG compressed video sequences.

#### **IV. CONCLUSION**

In this paper, various shot detection algorithms are discussed that are very effective which can detect gradual and shot simultaneously. These algorithms can combine with other information also, to detect shot accurately in future.

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