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An Emerging Trends in Shot Boundary Detection

Ashishgoud purushotham [1], G. Usha Rani [2], Yeshvant Birla [3], Margi S. Kanani[4]

[1]M.Tech., H.O.D., E.C.E., J.D.C.T., Indore, India, ashishgoudp@gmail.com, +91 9754207233
[2]M.Tech., Asst. Prof., E.C.E., J.D.C.T., Indore, India, usharanigodugu@gmail.com
[3]M.Tech., Asst. Prof. E.C.E., J.D.C.T., Indore, India, yeshvantbirla@gmail.com
[4]M.Tech. student, E.C.E., J.D.C.T., Indore, India, margik.90@gmail.com

Abstract:

Videos are the sources of education, entertainment, and information. The rapid developments of multimedia technologies have led to explosive growth of video resources but the video data are amorphous and transmit complex information the existing indexing and retrieval methods for textual data have confines in dealing with video data. As a result, demanding research efforts have been spent in looking for effective video managementechniques.Video fragmentation is the prerequisite for video management. Detection of abrupt & gradual transition and differentiation between gradual transition and camera and object motion are necessary for video fragmentation. In this paper, we have studied different shot boundary detection techniques. We have shown implemented results on one of the shot boundary detection method with evaluation performance.

Keywords: *Shot boundary detection, dissolve, wipes, fade in, fade out, gradual transition, abrupt transition.*

I.INTRODUCTION:

There is an amazing growth in the amount of digital video data in recent years but there is lack of tools for classification and retrieval of video content There exists a gap between low-level features and high-level semantic content To let machine understand video is important and challenging The increased availability demand and usage of on-line video has formed a need for computerized video content analysis techniques. A user may choose a representative picture from each scene to create a visual overview of the whole film and, by processing such indexes, a search engine can process search items so it becomes easier for the user to browse the desired video .To generate such indexes Shot boundary detection is an essential requirement[1]. Shot transition detection is used to split up a film into basic temporal units called shots; a shot is a series of interrelated consecutive pictures taken contiguously by a single camera and representing a continuous action in time and space. A digital video consist of consecutive frames in succession so as to create an impression of continuous movement in the eyes of the viewer**.** Each frame of these consecutive frames can be uniquely identified by its frame index, a serial number. A shot is a sequence of frames shot uninterruptedly by one camera. Abrupt transition (AT) is a sudden transition from one shot to another, i . e. one frame belongs to the first shot, the next frame belongs to the second shot. They are also known as hard cuts or simply cuts transition. Figure 1. Shows hard cuts.

Fig.1 Hard cut

Gradual transition (GT) is a transition in which the two shots are combined using chromatic, spatial or spatial-chromatic effects where one shot is gradually replace by another. These are also often known as soft transitions and these shot can be of various types, e.g., wipes, dissolves, fades [1]. Figure 2,3,4 shows fade in, fade out and dissolve effects respectively.

Fig.2. Fade in

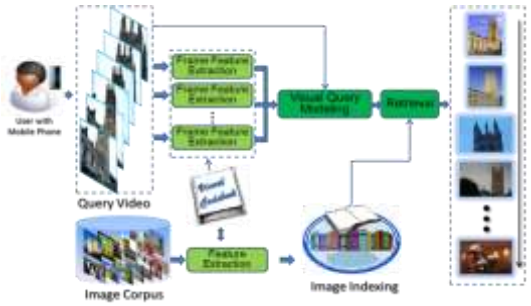
Fig.3.Fade out

Fig.4. Dissolve effects

The major challenge in video segmentation for video retrieval is a detection of gradual transition in the presence of motion. A gradual shot transition occurs when the change takes place over a sequence of frames. The most common gradual transitions are dissolves and fades (in-out). A dissolve in a video sequence is a shot transition with the first shot gradually disappearing while the second shot gradually appears.

II.VIDEO RETRIEVAL PROCESS:

The are four main processes involved in content-based video structuring and retrieval [9-11] are: video content analysis, video structure parsing, summarization or abstraction, and indexing. Figure. 5.shows the entire process of video retrieval.



.Fig. 5. The process of video retrieval.

2.1 **Video content analysis**

Video content analysis is the capability of automatically analyzing video to detect and determine temporal events not only based on a single image but also on the basis of text, audio, speed.. Much different functionality can be implemented in video content analysis. Video motion detection is one of the simpler forms where motion is detected with regard to a fixed background scene. More advanced functionalities include video tracking, object detection, motion detection, face recognition.

2.2. Video structure parsing

Digital video needs to be properly processed before it c inserted into a video server. These tasks include compressing, parsing and indexing a video

sequence. Video parsing is the process of detecting scene changes or the boundaries between camera shots in a video stream.

2.3.Video summarization

Due to the rapid progress in technology of network and multimedia, large number of videos is available on the internet. Video summarization plays an important role in this context. It helps in efficient storage, quick browsing, and retrieval of large collection of video data without losing important aspects. This process is similar to extraction of keywords or summaries in text document processing. That is, we need to extract a subset of video data from the original video such as key frames or highlights as entries for shots, scenes, or stories. Combining the structure information extracted from video parsing and the key frames extracted in video abstraction, we can build a visual table of contents for a video.

2.4.Video indexing

The structural and contents found in content analysis, video parsing and video summarization are referred as metadata. So the, Efficient and effective handling of video documents depends on the availability of indexes. Based on the metadata, we can build video indices and the table of content.

III.LITERATURE SURVEY

Boundary detection for video retrieval is an active research topic since two decades approximately.

Ali Amiri have proposed the video shot boundary detection using Eigen value, decomposition and gaussian transition detection [1]. In this method, using generalised Eigen value decomposition novel shot boundary algorithm is designed.This approach significantly increases the effectiveness of shot boundary task while at the same time reduces the computation cost. Also gives the good result in recall with a range of 92.4%-97.2%.

Na Lv, Zhiquan Feng, and Jingliang Peng proposed mutual information based video shot boundary detection method the method employ hierarchical analysis both spatially and temporarily on the video data, leading to reduced computation and improved gradual transition detection accuracy[2].

Y.-N. Li et al. have proposed a fast shot detection framework employing pre-processing techniques including thresholding and bisection-based comparisons to eliminate non-boundary regions [3]. .On Simulations and comparisons, significant speed up is achieved in the proposed framework, while the precision and recall rates can get in a satisfactory level.

Vasileios Chasanis, Aristidis Likas, Nikolaos Galatsanos proposed Simultaneous detection of abrupt cuts and dissolves in videos using vector machines [4].In proposed methodology commonly colour histogram and $\varkappa^2$ value features are used.Using variations of $\varkappa^2$ can increases the difference between two histogram and dissimilarity is obtained by using interframe distance. For detecting transition, distance should be less than minimum length.The advantage of proposed method is that there is no use of threshold for detecting[4].

Yang Xu, Xu De et al. have proposed 3- DWT based motion suppression for video shot boundary detection [5]. In this method, adaptive threshold is selected so that gradual transition and motion are adequately discriminated In the proposed method, motion intensity is extracted and motion suppression value (MSV) is defined, which is

integrated into histogram based edge based methods for video shot boundary detection.

K. I. Koumousis, V. Fotopoulos, A. N. Skodras proposed a new approach to gradual transition detection [6]. In this method the problem of shot boundary detection for gradual transitions within video sequences is uses statistical tests in conjunction with the Iterative Self Organizing Data Analysis (ISODATA) classification algorithm for consecutive video frames. The confusion matrix from the classification results is formed in order to calculate the kappa coefficient and from this they identify the transition.

T. Lu, P. N. Suganathan has proposed an accumulation algorithm for video shot boundary detection[7]. The proposed algorithm takes the difference between consecutive frames and accumulates them. When accumulation difference exceeds a threshold, transition is detected. The algorithm have introduced C frame. The content of frame C represented the changes from beginning of the shot. The frame C takes the difference and similarity between first frames and second frames.

Jun Li et al. have proposed DWT-based shot boundary detection using support vector machine [8]. In this technique, shot boundary detection algorithms extract the color and the edge in different direction from wavelet transition coefficients. Then a multi-class support vector machine (SVM) classifier is used to classify the video shot into three categories: cut transition (AT), gradual transition (GT) and normal sequences (NF). To enhance the robustness of the algorithm, the feature vector from all frames within a temporal window is formed. This technique is capable for numerical experiments using a variety of detecting and discriminating shot transitions in videos with different characteristics.[8].

IV. IMPLEMENTATION:

We have implemented and tested the method proposed by Y N Li et al.[2] our test video sequence. The detailed flow chart of steps is as shown in fig.4. In the pre-processing stage, adaptive local thresholding is adopted to classify non-boundary segments and candidate segments that may contain shot boundaries. The candidate segments are refined using bisection-based comparisons to eliminate non boundary frames. Only refined candidate segments are preserved for further detections; hence, the speed of shot detection is improved by reducing detection scope. Moreover, prior knowledge about each possible shot boundary such as its type and duration can be obtained in the pre-processing stage, which can accelerate the consequent hard cut and gradual transition detections.

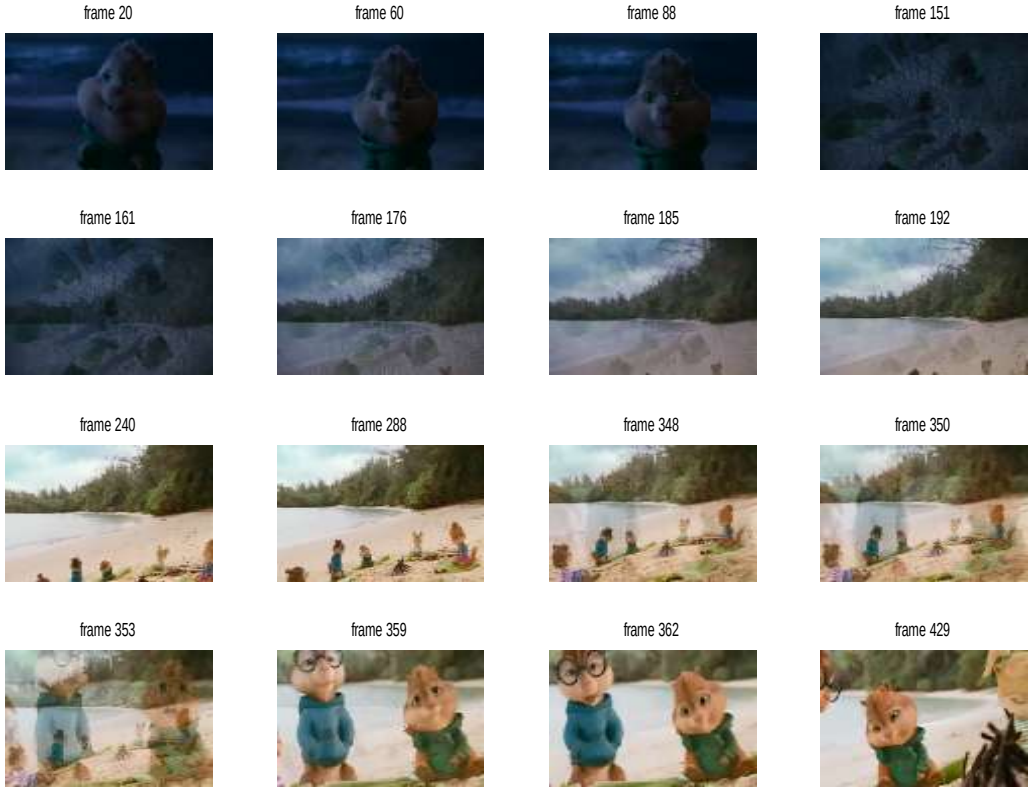


Fig.6. Consecutive frames from movie clip of chipmunks and Alvin showing dissolve transition

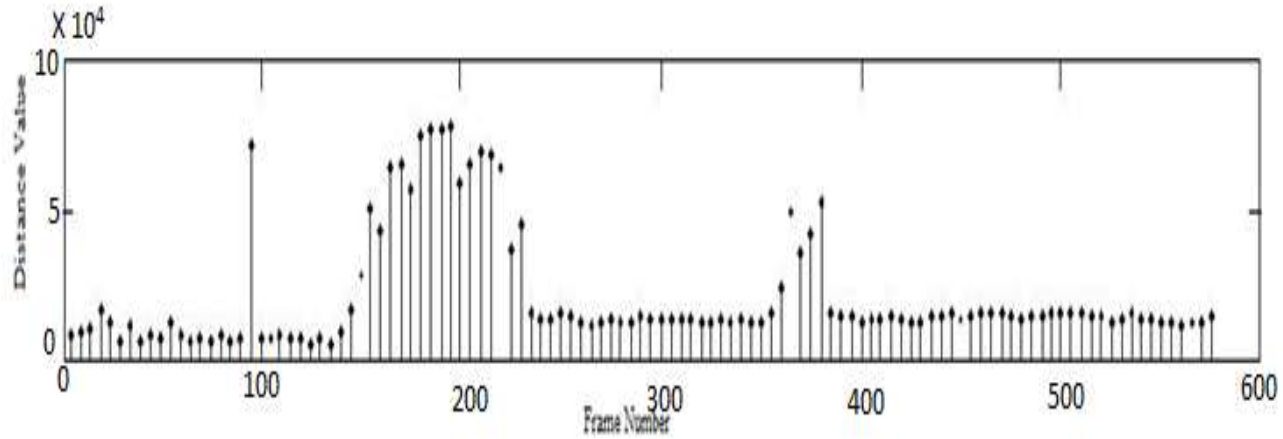


Fig.7. Histogram difference between consecutive frames

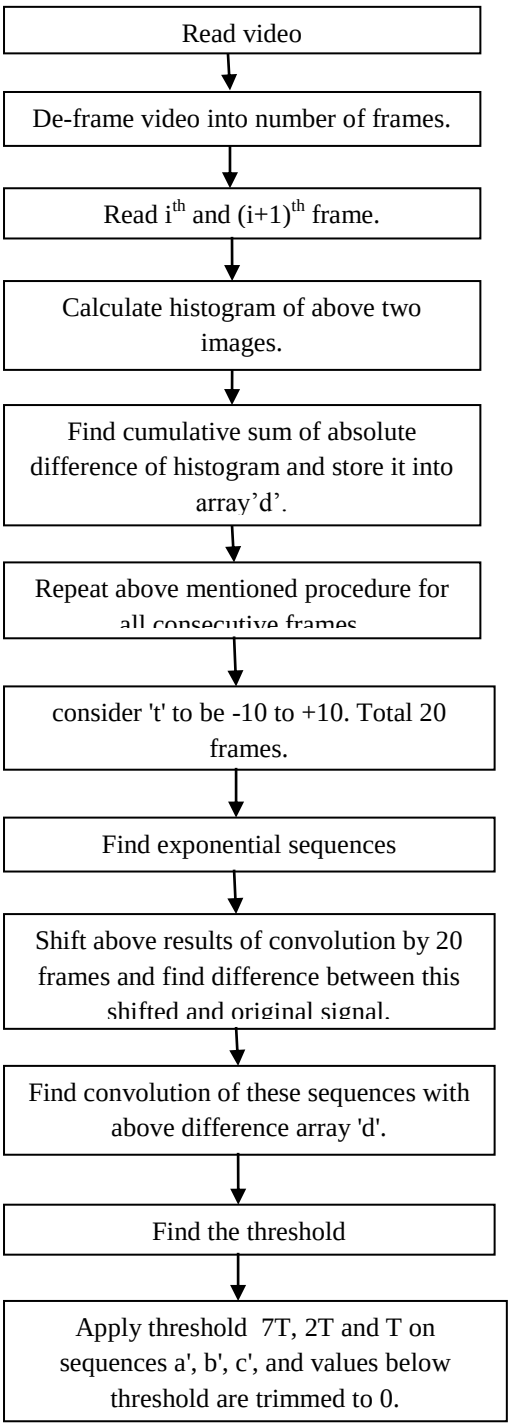


Fig.8. Flow chart of method implemented [2]

V.EXPERIMENTAL RESULT

We have selected the test video sequence which contains significant camera motion with dissolve transition. Fig.6 shows consecutive frames from the Alvin's and chipmunks movie video clip. The portion of the video considered for analysis consist of 500 frames with 131 frames camera motion (frames 20-151) and(363-429) and 199 frames with dissolve transition (frames 161-360).We have applied fast video shot boundary pre-processing technique as mentioned in [2] to the above test video sequence Fig.7 shows histogram difference of 500 consecutive frames. Here actual dissolve transition is from frame 20-151 and 363-429, whereas camera motion is from frame 161-360. It can be clearly observed from Fig. 5 that because of fast camera motion the difference between frames shows higher value than dissolve transition.

CONCLUSION:

The demand for multimedia data services necessitates the development of techniques to store, navigate and retrieve visual data. The use of existing text indexing techniques for image and video indexing is inefficient and complex. Consequently, shot boundary detection techniques should be employed to search for desired images and video in a database. We have implemented one shot boundary detection technique.

. It can be clearly shown from the results that because of fast camera motion the difference between frames shows higher value than dissolve transition. If the shot boundary algorithm falsely identifies camera motion as a shot boundary then correspondingly key frames and video retrieval will provide false results.

Hence we required develop robust and effective algorithm which can either suppress motion with respect to dissolve transition or can differentiate between motion and actual shot transition.

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