Video Shot Boundary Detection

Priyadarshinee Adhikari, Neeta Gargote, Jyothi Digge and Krishna Warhade

Abstract-- **This paper presents video retrieval using shot boundary detection. The algorithm used is for length 2 hours video and for the resolution of 320 X 480 pixels using Histogram approach in the uncompressed media. An attempt is made here for the retrieval of transformed gray level picture. The simulation is for abrupt change in video using mat lab using chi square distribution test histogram difference h_i is calculated for cut and non cut frames.**

***Index Terms*—Abrupt Change, Chi square test histogram(CHI), Cut and non cut frames, Gray level, Histogram, Normalized, Precision, Shot boundary, video segmentation.**

I. Introduction

VIDEO is the most effective media for capturing the world around us. Video has been the primary concern of the movie and television industry. Over the years that industry has developed detailed and complete procedures and techniques to index, store, edit, retrieve, sequence and present video material.[1]

Conceptually the video retrieval system should act like a library system for the users. Video materials should document be modeled and stored in a similar way for effective retrieval.

Shot change detection is the procedure for identifying changes in the scene content of a video sequence so that alternate representation may be derived for the purposes of browsing and retrieval. e.g. key frames may be extracted from a distinct shot to represent it.

The definition of a shot change is difficult to make. Pronounced object or camera motions may change the content of the view frame drastically.

Shot change may occur in a variety of ways:

Cuts, where a frame from one shot is followed by a frame from a different shot, or gradual transitions such as cross dissolves, fade-ins, fade-outs and various graphical effects (wipes, pins) which may also be accorded varying semantic significance (e.g. a fade out to black, followed by a fade-in, is often used by film directors or editors to indicate the passage of time or change of location)

II. Video Segmentation

The success of the segmentation approach depends largely on how well the video materials are divided into segments or shots.

A shot is defined as a part of the video that results from one continuous recording by a single camera. A scene is composed of a number of shots, while a television broadcast consists of a collection of scenes. The gap between two shots is called a shot boundary.

There are mainly four different types of common shot boundaries within shots:

• *A cut*: It is a hard boundary or clear cut which appears by a complete shot over a span of two serial frames. It is mainly used in live transmissions.

• *A fade*: Two different kinds of fades are used: The fade-in and the fade-out. The fade-out emerges when the image fades to a black screen or a dot. The fade-in appears when the image is displayed from a black image. Both effects last a few frames.

• *A dissolve*: It is a synchronous occurrence of a fade-in and a fade-out. The two effects are layered for a fixed period of time e.g. 0.5 seconds (12 frames). It is mainly used in live in-studio transmissions.[2]

• *A wipe*: This is a virtual line going across the screen clearing the old scene and displaying a new scene. It also occurs over more frames. It is commonly used in films such as *Star Wars* and TV shows.

As these effects exist, shot boundary detection is a non-trivial task.

There have been a number of various approaches to handle different shot boundaries.

Shot Boundary Detection Based on Color Diagrams:

The first approach tested at Dublin was a shot detection based on color histograms. They computed frame-to-frame similarities based on colors which appeared within them, albeit of the relative positions of those colors in the frame. After computing the inter-frame similarities, a threshold can be used to indicate shot boundaries. It needs dynamic threshold to work on other effects than simple shot boundaries.[3]

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Edge Detection:

The next approach is Edge Detection which is based on detecting edges in two neighboring images and comparing these images. It should be possible to detect all kinds of shot boundaries by detecting the appearance of edges in a frame which are far away from the ones in the previous frame. The tested approach in Dublin used over 2 hours and 40 minutes of video files of different TV broadcasts.

They spotted various reasons why their program missed a real cut between scenes:

• blurred images where the edges could not be defined clearly
• Images with similar backgrounds or intensity edges to the next-following image
• dark or bright images where the edges are not defined in an accurate manner
• Straight cuts from a blank screen to a dark screen
• A cut between different camera perspectives showing the same scene.

They also detected reasons for wrong identification of cuts:

• Fast action scenes with fast moving and changing edges
• Camera flashes
• Close-up moving scenes
• objects moving in front of the camera lens without being present on the image before
• a zoom out or in, camera pan or any camera motion
•computer generated scenes
•interferences in the video from broadcasting or recording
•an object cut from an image

Main problems for missing cuts in all kinds of videos are cuts between dark scenes and the detection of so-called pseudo-cuts during the credits at the end of a film or programmer. They also found out that the detection of false shots increases with the quality and size of the example videos. Since many false detection had occurred because of camera panning and/or zooming they implemented a technique to compensate these movements. This solution can counter problems caused by dissolves and fades and other changes using soft color changes. The advantage – compared to color based shot detection – is that this technique will not be fooled by color changing effects like a flash. But on the other side, each frame has to be decoded, so it runs very slowly.

Shot Boundary Detection Using Macro-blocks:

Besides, they investigated the *shot boundary detection using macro-blocks*. Depending on the types of the macro-block the MPEG pictures have different attributes corresponding to the macro-block. Macro-block types can be divided into forward prediction, backward prediction or no prediction at all. The classification of different blocks happens while encoding the video file based on the motion estimation and efficiency of the encoding. If a frame contains backward predicted blocks
and suddenly does not have any, it could mean that the following frame has changed drastically which would point to a cut. This approach, however, becomes difficult to implement.

III. Detection Principle

The flow chart shown in fig 1 . depicts the measures for the procedure adopted for the color to gray transformation and shot boundary detection.

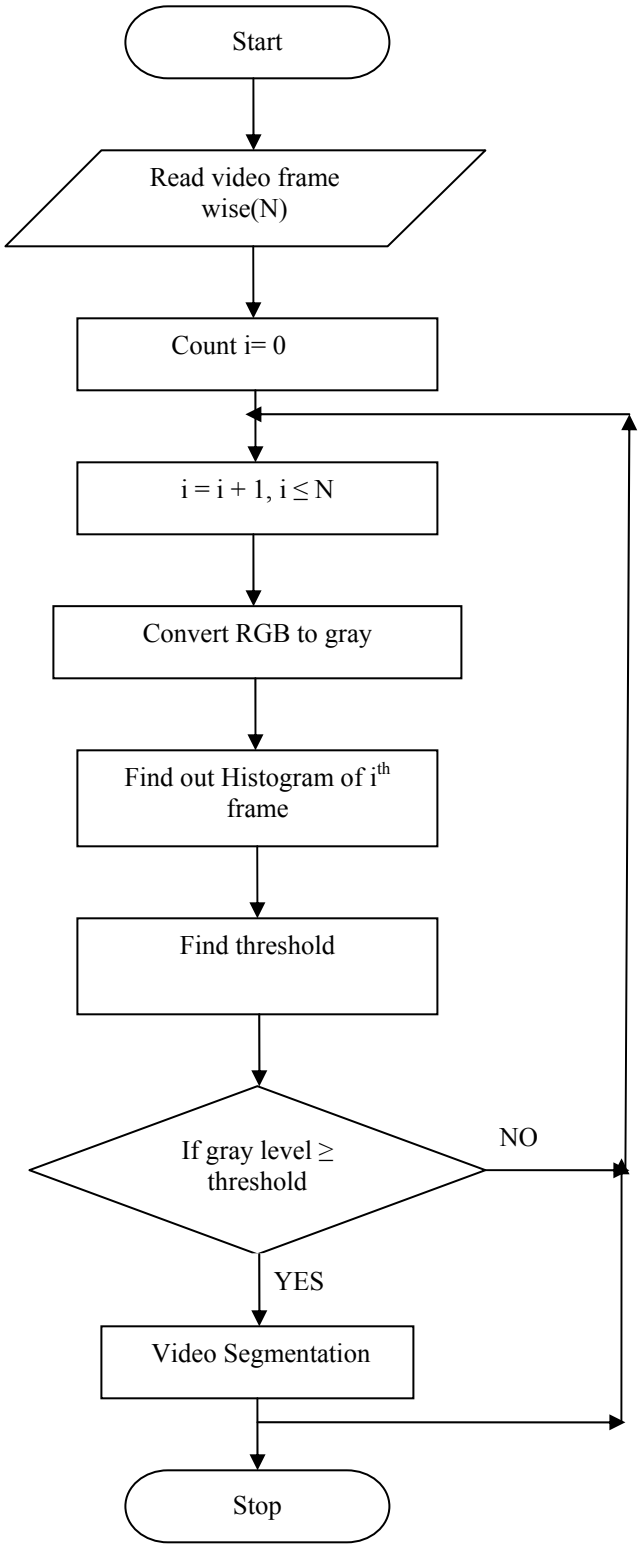

Fig 1 .flow chart for shot boundary detection.

IV ALGORITHM EVALUATION

Chi-square test histogram difference (CHI).The histogram bin difference values are normalized to sharpen the frame differences being computed.[4]

$$fd_{chi} = \frac{1}{N^2} \sum_i \frac{(h_1[i] - h_2[i])^2}{h_2[i]}, \qquad h_2[i] \neq 0$$
$$= \frac{1}{N^2} \sum_i \frac{(h_1[i] - h_2[i])^2}{h_1[i]}, \quad h_2[i] = 0.$$

The equation used above gives the normalized Chi-square distribution .

V. SIMULATION RESULTS

The formulae mentioned below calculates Recall and Precision which are evaluation parameters for the data set chosen for this simulation. The graph shown in figure 2 is based on these evaluation parameters and gives the clear cut idea of distribution for cuts and non cuts frame difference for the data sets shown in table one.

Recall = Correct

Correct + False

Precision = Correct

Correct + Missed

TABLE I
DESCRIPTION OF THE SEQUENCES IN THE DATASET

Sequence	Length	No. of cuts
TV serial	928	172
News	1200	180
Sports news	1200	291

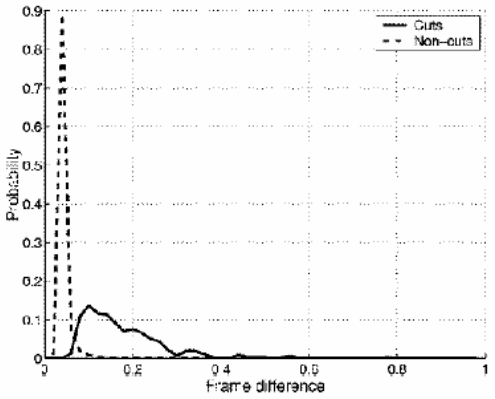

Fig.2 cuts and non cut frame difference distribution for sports news

VI. CONCLUSION

We have evaluated and characterized the performance of a shot boundary detection using gray scale histogram. It performs sufficiently well and can be used in video database applications at moderate computational cost .when there is a shot change, and the frame in the next shot contains similar blocks as the frame before.

Above are different techniques for segmentation and we have focused on the method where in the color image is transformed into grey image and its characteristics and performance is weighted in terms of histogram.

VII ACKNOWLEDGMENT

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VIII REFERENCES

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IX BIOGRAPHY

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