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KEY-FRAME EXTRACTION USING THRESHOLD TECHNIQUE

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***Abstract*- Triggered by technological innovation, there has been an enormous increase in the utilization of video for many significant applications. Video will be one of the key issues in the upcoming information technology and education. To increase the effectiveness of their content on the web and create new revenue stream, future content owners, publishers and educators will need to deliver video to users in ways that exploit proven economic models for the web and confirm to the demand both qualitative and quantitative of forthcoming internet usage patterns. To extract valid information from video, process video data efficiently, and reduce the transfer stress of network, more and more attention is being paid to the video processing technology. The amount of data in video processing is significantly reduced by using video segmentation and key-frame extraction. So, these two technologies have gradually become focus of research. This paper presents the method of selecting effective key-frames for video browsing where the new strategy is to extract most characteristic frame. The methodology applied here extracts the key frames using a Threshold Technique where the calculated threshold is brought out in comparison with the Difference Histogram of the Images. Experimental results show that the extracted key-frames can summarize the salient features and characteristics of the video maintaining the integrity of the information contained in that video. The method is highly feasible with high efficiency and robustness.**

Index Terms— Video segmentation [3], Image histogram, Image histogram difference, Key frame [11].

I. INTRODUCTION

With the increasing production of digital video contents, efficient technologies for analysis, indexing and retrieval of videos according to their content have more important. Data Compression coupled with the availability of high storage capacities have created the overwhelming production of multimedia content. Instead of this, the introduction of digital video will completely change the landscape of the entire video value chain. There will be increased availability and increased challenges to manage the data for content producers, advertisers and consumers. Users in the consumer and corporate domains will be given an overwhelming and confusing number of traditional and internet media viewing choice and will look for ways to help them manage these choices. The sheer size of the stored video data will pose serious issues for video owners to find and reuse the stored video. Another problem is the high bit rate that results from various types of video which makes their transmission through their intended channels very difficult. Video browsing and retrieval are inconvenient due to inherent spatio-temporal redundancies, in which extended periods of time contain little to no activities or events of interest. In most videos, a specific activity of interest may only occur in a relatively small region along the entire spatio-temporal extent of the video. Most of the video are full of redundant unnecessary data which takes most of the storage space. Here we will focus on removing the frames of a video by carrying out comparison with the calculated threshold value for extracting the key frames from a video sequence that can produce a summarized output video. Key frames extracted are used to summarize the characteristics of the video, and the image characteristics of a video can be scaned by all the key frames in time sequence. This technique described the build methods which address summarization multimedia level.

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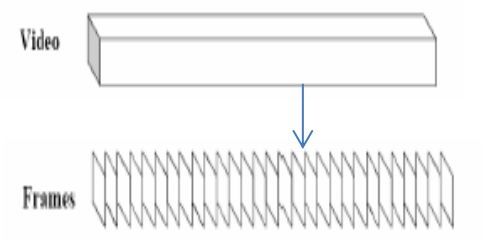

II. RELATED WORK

Researches on various algorithms have been done in the field of key-frame extraction. There are some algorithms summarized below.

A. [4] Novel Video Key-Frame-Extraction Algorithm- In this paper, they proposed a model of triangle to perceived motion energy (PME), a model of motion patterns in video and a scheme to extract key frames. In this case, the frames at the turning point of the motion acceleration and motion deceleration are selected as key frames. The key-frame selection process is threshold free and fast and the extracted key frames are representative.

B. [2] Key-Frames Extraction Scheme Based on SVD and Correlation Minimization- in this paper, for each frame the Singular Value Decomposition method is applied and a diagonal matrix is produced, taking the singular values of the frame. After this, a feature vector is created for each frame, by gathering the respective singular values. Next step is collection of all feature vectors of the shot to form the feature vectors basin of this shot. At last a genetic algorithm approach is proposed and applied to the vectors basin, for locating frames of minimally correlated feature vectors, which are selected as key frames.

C. [5] Shot reconstruction degree- In this case key frames are selected based on the degree of retaining motion dynamics of a video shot. Compared with the widely used fidelity criterion, the key frame set produced by SRD can better capture the detailed dynamics of the shot. A novel inflexion based key frame selection algorithm is developed using the new SRD criterion. Simulation results show that the new algorithm results in good performance in terms of both fidelity and shot reconstruction degree.

D. [1] Adaptive Key Frame Extraction using Unsupervised Clustering- After segmenting the video stream into shots a natural and easy way of key frame extraction is to use the first frame of each shot as the shots key frame. Otherwise simple the number of key frames for each shot is limited to one regardless of the shots visual complexity. Furthermore in this case, the first frame normally is not stable and does not capture the major visual content.

III. PROPOSED METHODOLOGY

Video summarization technique follows the following steps: First step is the extraction of key frames. The key frames of videos must contain the important frames so that it describes the contents of the video in the later processing stages. After the extraction of key frames, instead of analyzing the contents of all video frames, only the key frame images are analyzed to give the annotation. All the frames in the video are not rich with important information. Each frame is as light different from the previous frame. It is not necessary to analyze all the frames; so we need to identify those frames which are full of important information. The number of frames should be reduced in this way so that important information is covered by the key frames. Another important point is that as the key frames are analyzed after the key frame extraction process, so the algorithm for extraction should not be very complex or time consuming.

IV. PROPOSED SOLUTION STRATEGY

For implementing the "key frame extraction using threshold algorithm", our strategy is to extract frames from a video. Firstly, image frames are extracted from the target video and is stored in a particular directory. A function is created where each frame is then converted to its corresponding gray scale image. For every iteration, two consecutive gray scale images are taken and their Histogram difference is calculated. The sum of the elements of that histogram is then calculated and returned. The mean and standard deviation is calculated and threshold is computed using the values of this mean and standard deviation obtained.

Now, for each iteration, this threshold value thus computed is brought into comparison with the sum value taken out for the histogram difference calculated previously. If the sum value of the difference histogram for two images is greater than the threshold value then the next image is selected and taken as the key frame in that pair of images. Finally, after executing each iteration there will be a set of key frames obtained which will re-define the video in a compact and summarized manner without compromising the integrity of the information stored at that video.

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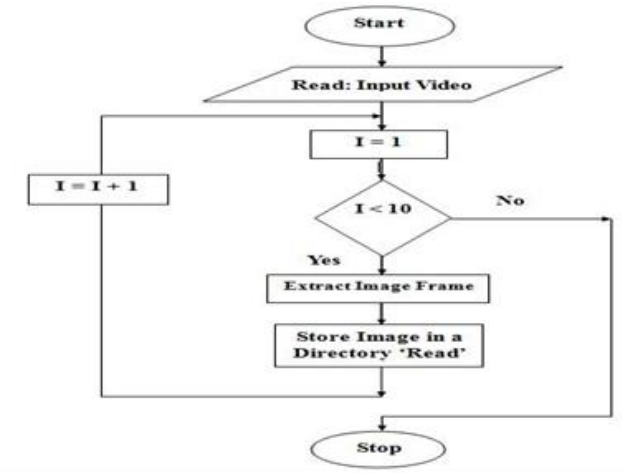
4. Algorithm for Key-frame Extraction

For the detection of key frame we have used difference between two consecutive images to calculate the difference between two consecutive frames. Only when the difference exceeds a threshold, one of the consecutive frames is considered as the key frame. In this algorithm three modules are constructed. The detailed description of all three modules for key frame extraction from the video is as follows:

4.1. Algorithm Realization

4.1.1 Module 1(Frame Extraction [Flowchart]



[Algorithm Module-1]

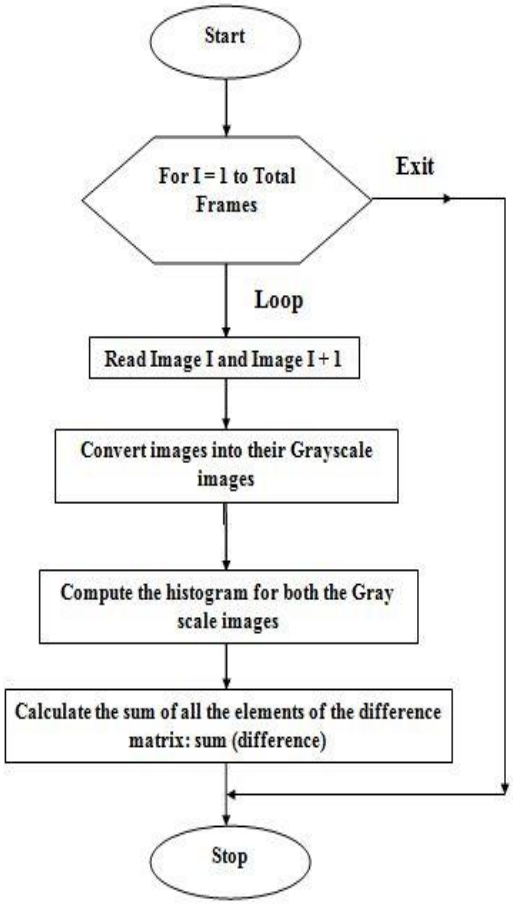
Input: a new video in .avi format
Output: set of frames extracted from video

Step1:- Read the video

Step2:- Extract the image frame from the Video.
Step3:- Create a directory 'frame' to store extracted images.
Step4:- Store the image frame in the directory 'frame'.

For frame extraction a new video in .avi format is taken. Then read this video to extract the image frame from the video. After this all the image frame is store in the directory 'frame'.

4.1.2 Module 2 (Frames Difference)[Flow Chart]



[Algorithm Module-2]

Input: Extracted Frames.
Output: A subtracted matrix of two images.

Step 1:- Define absolute difference between first image and second image.
Step2: Convert both image to gray scale image
Step3: Plot histogram of both gray scale images
Step4: Find difference between two matrix
Step5: Find out sum of element of diff. matrix

After extraction of frame from video, input of the algorithm is considered as extracted frame .Then identifies the absolute difference between the frames. For calculating the difference between two frames, Euclidean distance formula is used and converts all

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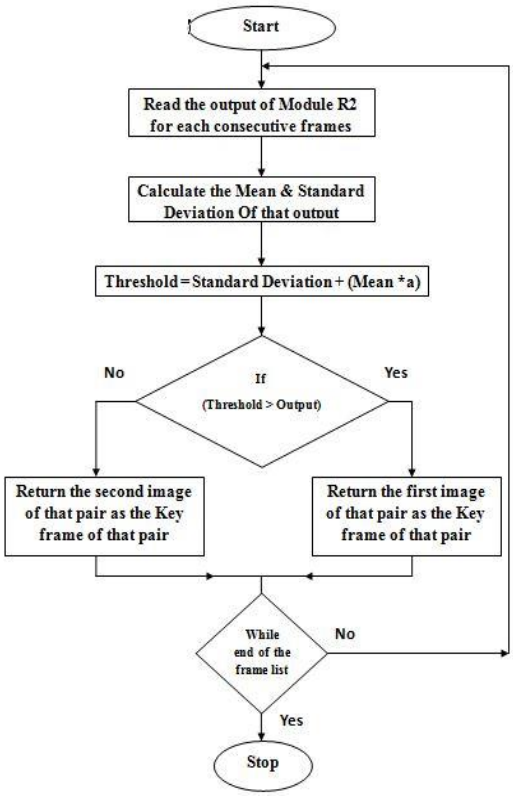
the images into gray scale image. Plot the histogram of both gray scale images. Frame difference calculation, it is required to find out the difference between two matrix and find out the sum of element of diff. matrix.

4.1.3 Module 3(Key Frames Extraction)
[Flowchart]



[Algorithm Module-3]

Input: Reads the matrix (Output of Mod. 2).
Output: Key-frames

Step1:-Read the frames of the video from the directory.
Step2:- Count number of frames
Step3:- Total frames ← read obj. Number of Frame
Step4:- For k = 1 to Total frames
Step5:- I← k
Step6:-J← k+1
Step7:- S←absdif (I, J)
//end for
//Find mean
Step8:- Mean← mean2(S)
// Find Standard Deviation
Step9:- Standard Deviation← std2 (S)
Step10:-Find threshold
Step11:- threshold← Standard Deviation + (Mean * a)
// a is constant
Step12:-if(S >threshold)
Step13:-Write image J as the key frame
//end if

For key frame identification purpose input is considered as all the elements of the difference matrix for each consecutive frame. After this Mean and Standard deviation of the entire matrix for fixing the threshold value. Threshold value is required for identify the key frames. If the threshold value is greater than output pair then first image of that pair is considered as key frame otherwise second image of that pair is considered as a key frame. Process is stop when the frame list is empty.

V. RESULTS& DISCUSSION

The system we have designed is capable of extracting key frames from the target video efficiently without compromising on the grounds of data integrity. The essence of our algorithm is that it brings into the use of histogram of each converted gray scale image through which threshold is computed and based on this threshold key frames are selected. The system developed by us has been divided into three modules performing various tasks at each level and are interrelated to each other.

5.1 Module 1

The input video containing car had around 189 frames. It extracts each frame from .avi format video; some of the frames are shown in Fig. 1.

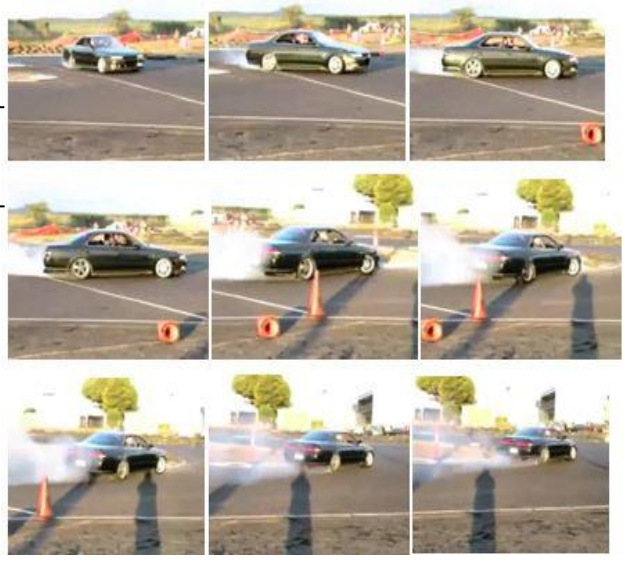


Figure 1

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5.2 Module 2

This module takes Histograms of two images to calculate the absolute difference between them. The Histograms and gray scale of two images is show in Figure 2.

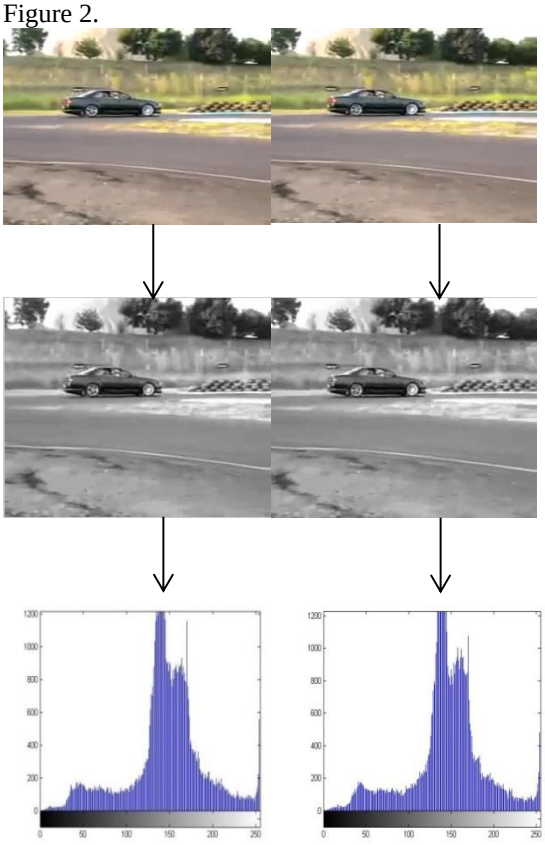

Image1 Image2

Figure 2

5.3 Module 3

In this third module, the key frames are extracted using the comparison between calculated threshold value and the output of Module 2.

Figure 3

VI. CONCLUSION

In this paper the key frames are to be processed for annotation purpose, the important information must not be missed. Proposed algorithm can be improved by further reducing the number of key frames extracted. It is possible by adding one more pass. After the phase 1 the key frames extracted can again be given as input to the algorithm. It will reduce the redundant frames or the frames that contain similar contents, but adding one more pass will increase the execution time. As the frames are analyzed after key frame extraction for the purpose of annotation, some amount of redundancy can be considered rather than increasing the execution time. In future, a video annotation system can be design which will utilize the key frames obtained from the above algorithm.

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