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262 - 265

Key Frame Extraction Using Deviation Based Algorithm for Enhancement of Video Quality

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***Abstract*— Developed technologies and its many applications have made today's life more relaxed. One of the areas within such technology has proved its demands and popularity i.e. video processing and its applications in various fields. Several researchers have shown their work for processing, extracting and enhancing the video quality. The approach of this paper is not only the key extraction but also removal of unnecessary frames with increase in processing speed and enhancing video quality. A Deviation based algorithm is used for extraction of the key frames and leading to a final enhancement of video quality. The algorithm uses basic steps of image processing with more enhanced and good quality video as an output.**

Keywords*-*Key frames, Deviation, Shot detection, frames clustering.

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I. INTRODUCTION

An interruption of noise causes an image or video quality to be disturbed for great extent. Every downloaded video of low quality contains the maximum amount of blur and noise. Sometimes the military applications also needs for extraction of important shot of videos with improved quality than the captured one. Similar aspects are going to observe in biomedical applications also. Pascal Kelm et. al. has provided feature-based video key frame extraction for low quality video Sequences.[1] Amanpreet Kaur et. al. has given feature extraction from video data for indexing and retrival [2]. Guozhu Liu et. al. also mentioned the key frames extraction from MPEG video stream [3]. Yueting Zhuang et. al. depicted the adaptive key frame extraction using unsupervised clustering [4]. An extensive survey of different key frame extraction techniques along with their merits and demerits has also given by Azra Nasreen et. al. [5].

In this paper, a deviation based approach is given for the analysis of frames and shot detection. A video with very poor quality captured by still camera is considering as input. The approach of this algorithm is to extract the key frames from the input video with image enhancement using histogram equalization. The final equalized key frames get converted in to video of more quality with very less processing time. In section 2, an overall system flow is given with detailed processes that have to be carried on an input video. The experimental result taken for multiple frames generated is explained in section3, whereas the algorithm analysis and all is depicted in further sections.

II. SYSTEM FLOW

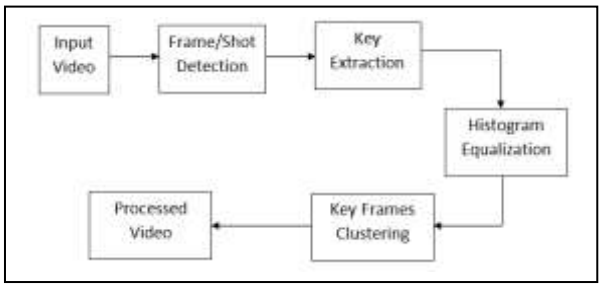

Fig.1 Overall System flow for deviation based key frames extraction.

a] Frame/Shot Detection:

An input video may be either real time or captured one. It consists of several image frames processed per seconds simultaneously on the same panel. Processing the video means extracting its frames and applying the required algorithm to each and every frame. Very prime processing step for any video is its frame/shot detection. The methods based on pixel comparison, histogram approach, template matching has

 ISSN: 2321-8169
262 - 265

already shown great application for frame/shot detection. When a scene capturing by the camera moves to change then it changes various parameters like pixel geometry, colour difference, contrast, brightness, etc. Every frame captured is applied for detection based upon some defined algorithm.

b] Key Extraction:

A video captured by still camera sometimes contain and irrelevant information which not only consumes more size but also increases the processing time. To avoid it, key frames extraction is very important phenomenon, which is going to use now a days. The algorithm designed for key frames extraction are based on shot activity, on macro block statistical characteristics of MPEG video stream, on motion analysis. In this paper, a deviation based algorithm is explained for the extraction of key frames.

Standard deviation,

$$6 = sqrt[\sum_{i=1}^{M}\sum_{j=1}^{N}(^2 / (M\times N)-1] \ldots\ldots \text{(i)}$$

Where, 6 is the mean of an input image.

Frames extracted is distributed and assigned number for 1 to n image. Now, first frame is correlated with the successive one and its standard deviation is calculated. If the means of the deviation produced is less than the required threshold, then it is discarded. Otherwise it is selected and saved for further processing. The process is repeated for all n-frames generated for given video and all key frames get saved for further step. An overall flow of algorithm based on standard deviation is as shown in fig.2.

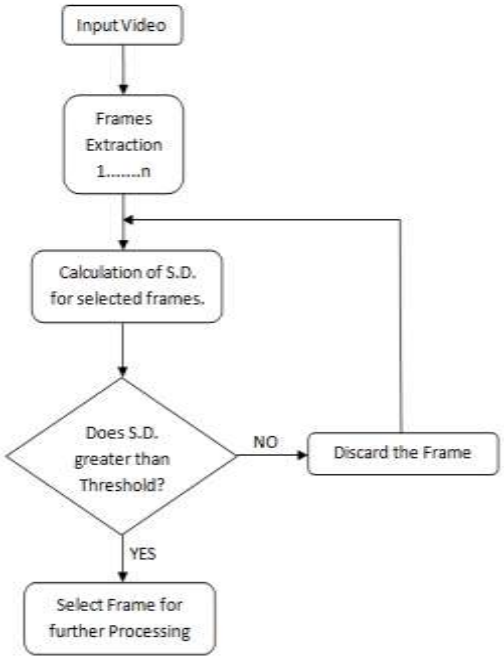

Fig.2 Flow of key frames extraction

c] Histogram Equalization:

Process of equalization is related to the removal of noise in signal processing. Discussing about Image noise minimization and quality improvement, the very prime image enhancement technique is nothing but Histogram Equalization.

The noise within an image frame causes due to the sudden change in the neighborhood pixel intensities. These generated edges when observed in the form of histogram, seems like an unequal distribution of intensities. The process of Histogram equalization converts such frames with a new result of evenly distributed pixel intensities. These equalized frames when observed, shows more enhanced and noise suppressed frame with good quality.

Key frames extracted, first undergoes the process of histogram equalization for getting the final reconstructed video with more enhanced features.

Fig.3(a)Image sample before historgram equalization

Fig.3(b)Image sample after historgram equalization

d] Key Frames Clustering:

Equalised key frames extracted from video finally want to cluster or bind for developing new processed video. Clustering of key frames can be achieved by simply processing the new key frames generated one after another on the same panel with more speed. This processing has built a new video to generate which contains more information than the previous. The processing speed now looked to increase more with a better equalized video to observe.

III. EXPERIMENTAL RESULTS

We have taken video sequence of Taj Hotel attack on 26/11 as an input for our algorithm. So first step was to detect and extract the frames. Total 90 extracted frames for the sequence are as shown in Fig.

 ISSN: 2321-8169
262 - 265

Fig.3 Frames extracted from input video

After extraction, next step cosidered is to identify key frames and remove the unnecessary ones to increase the processing speed for the algorithm. At the same time equalizing these key frames sequence to increase the video quality. Fig. shows equalized video

Fig.4 Key frames with histogram equalization

IV. ALGORITHM ANALYSIS

Number of result has been considered to observe the performance of the developed algorithm. Following table shows the analysis for several results.

Table1: Analysis of videos for key frames and processing time

Sr. No.	Input Video	Number of frames (processing time in minutes)	Number of Key Frames (processing time)
1	Taj.mp4	90(16)	48 (8.296)
2	Cam1.mp4	200(40)	74(12.58)
3	Cam2.mp4	200(40)	150(25.8)
4	Traffic.avi	120(8)	100(6.67)

V. CONCLUSION

The main motive of this paper is to extract the frames of an input video sequence, and then find out the key frames which perfectly depict the video and reject the frames with no changes in its motion. Matter of the fact is that more the number of frames for processing more would be the time algorithm takes to execute the results. So, discarding some un-useful frames and keeping only information rich frames makes the algorithm work speedily. Using the deviation based algorithm, frames having similar property with less deviation count is considered as irrelevant and hence discarded. So, only those frames are kept whose deviation is greater than the required threshold. Also lesser frame video would also require lesser time for transferring it from one location to other, so as to achieve better results.

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