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Frame Comparison Using Structural Similarity For Fixed Threshold

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Abstract - Now days there are different methods are present for evaluation of features of images, but there is no common effort developed for the comparison of the quality of image. Here we highlight the similarity based matching technique which will help in matching of the images. This method involves the comparison of points in one image to other, which reduces the complex algorithm implementation. The frames are extracted 1per/sec and frames are taken into a folder for reference match. Key image defines the image to be matched along frames extracted from videos. The image with the high similarity index is displayed as matched image. This would help in analyzing the image in greater depth.

Keywords - *Key Frame, Similarity index, Threshold*

1. Introduction

Any video that is telecasted or played on the TV, Computer, Phone, Tablet or Theaters are made up of continuous still images. These still images have the information in it, which need to be retrieved.

These images that slides one after the other, gives the feeling of video play. In the multimedia field, video has the high recognition to it. Video is also called as GOP (Group of Images) or we define video as collection of interrelated image sequences.

An image which had the information in it is known as Key frame. Key frame extraction is most important to understand video content. By understanding the content we can reduce the transfer stress on the network channel. Transfer stress can be reduced by allowing only key frame to be transmitted [1], neglecting the redundant images for transfer. It is obvious that key frames may not reside continuously in the set frames. Identification of the key frames would be challenging task. First we select the key frame from the set of frames extracted from the video. Videos are stored locally in the physical drives. Further similar frames are omitted for the transmission. This is successfully brought to reach by categorization idea in pattern recognition concept. We should also consider the fact that, adjacent frames are similar. These frames may have different information altogether. We are going to implement frame by frame video processing. The input video can be live camera video or video stored in your local machine. We are going to create frames from the video stored in our local machine & then store the frames in our local drive. Figure 1 depicts the extraction of the frames from the video and matching along a reference image with given fixed threshold. Even this can be extended to adaptive threshold.

Basic way of extraction of key frame is done by removing the similar frames retaining the distinct video information. This method considers the videos are already segmented into number of frames, which are ready to compare.

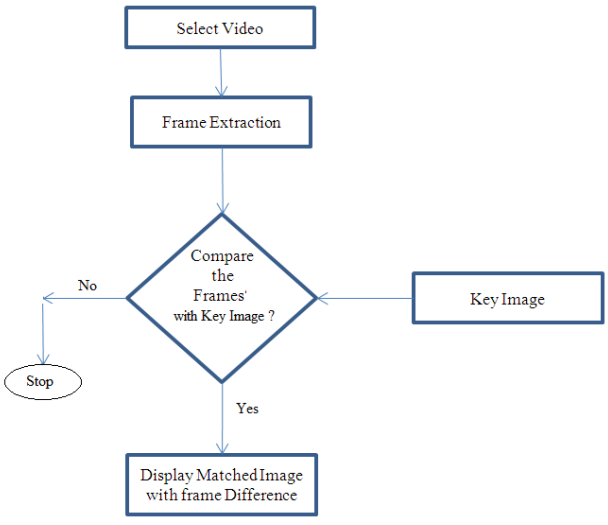

Figure 1: Flowchart of Frame Extraction from video

Key frame are extracted 1per second and are taken into a physical storage for image repository. This rate may be reduced to gather more number of frames. The large number of frames yields the better understanding of the video. Video summarization can be achieved by knowing the key frames in the video. This summarized information can be used to search the videos in the vault of videos, helping in easy retrieval of videos and thereby reducing the time of retrieval. Scene detection, Shot detection, edge detection and histogram detection are some of the ways in which extraction can be done [2].Learning information present in the key frame also yield in understanding non familiar languages, also helps to communicates between the deaf and dumb people.

2. Literature Survey

Ravikansagara et.al has proposed video processing techniques to serve the purpose of analyzing the largely available videos. Major analysis technique includes the video summarization. This is the process of creation a summary of the video for fast accessing of videos. Summaries will also help in describing the unnamed videos. In the era of digital world captioning the videos would lead to different way analysis.

Dolley Shukla has proposed digital world is rapidly increasing because of easy availability of the devices, computational capabilities, and low cast of the devices. These factor affect in growth of the digital world. Mostly important digital data to be considered is video. A bundle of images unfolding the information called summary.

Chandra Shekar et.al said video is visual information transmitted in the electronic media basically used for watching and sharing. The principal component of the video is image. Generally images are known as frames. Application like Indexing , summarization and online browsing of video database depend on the number of frames.

S.Ariffa Begum has proposed that with the large amounts of video data available, it has become increasingly important to have the ability to quickly search through and browse through these videos.

Priyanka U proposed that there is massive growth in the digital world clever way is to manage the digital data efficiently. Highly informative frames provide the summary of the video. This will the user to peak into the database quickly.
Azra Nasreen proposed that there is large amount of information is hidden in the video. Revealing this information would help the people to recognize video. Superfluous data can be removed by revealing the information. This results in the better transmission rate. Key frame drawing out is proposed.

Peter Sand et.al highlighted many application can be achieved from the images drawn from the same camera like segmentation, analysis, background/ fore ground, information retrieval. This process can be extended to footage the images and present a caption for the images.

3. Extraction of Frames from the video

Extraction of the frames from the videos is basically to understand the hidden information. To know more about the information in the video, extraction of the key frame is primary step. Further similar images need to avoid while analyzing the video. In the recent years, observation cameras are installed in the every corner of the premises like school, college, air ports, and railway stations and even in the private places. These are installed to keep track of the human interaction to the system. This leads to large collection of video data. Processing this large amount of data is a challenging problem. The large amount of data can be reduced to meaningful information by data processing techniques [4].

Data processing techniques includes primarily elimination of similar frames.

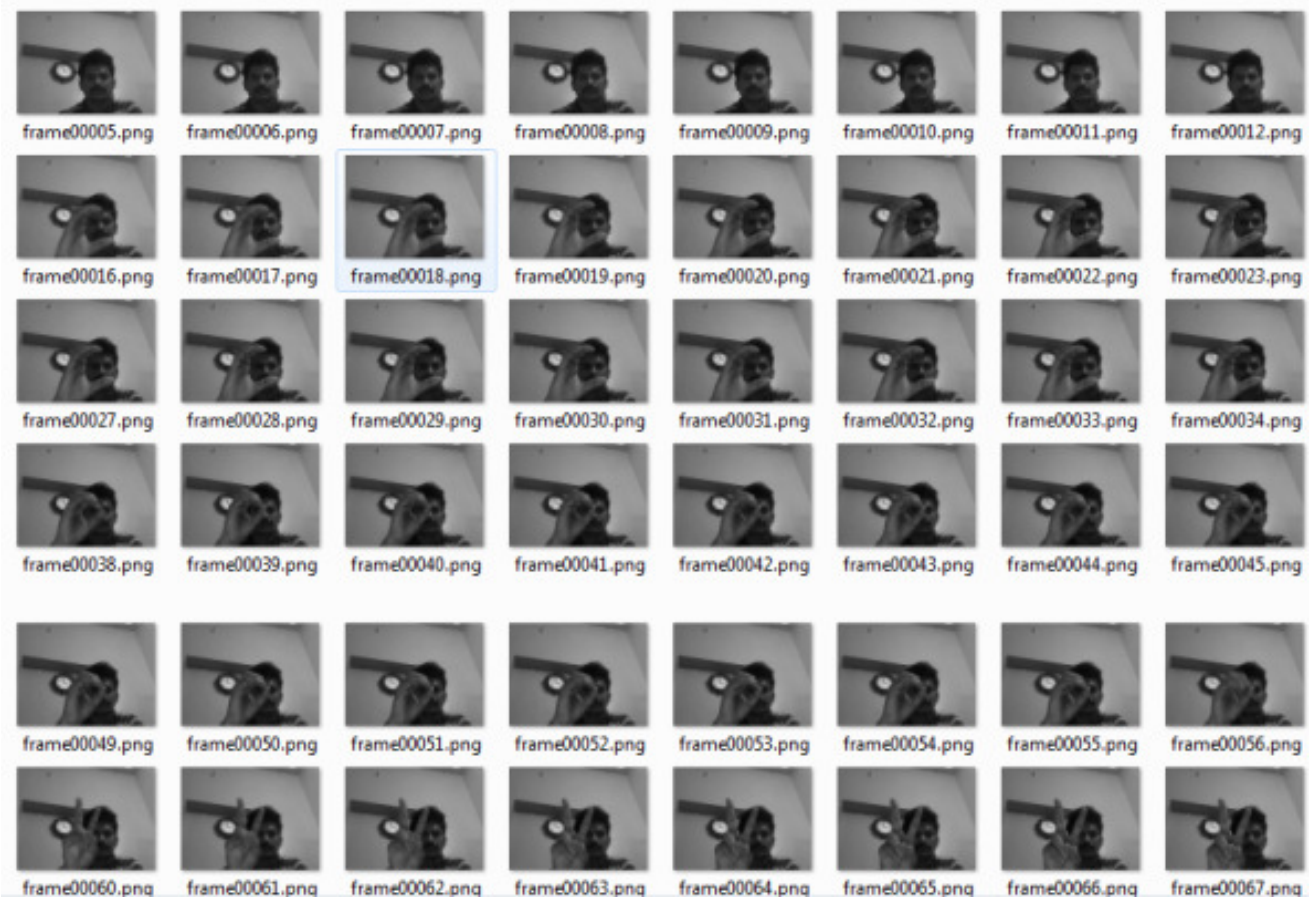

Figure 2: Frames from the video

In Figure 2, frames are extracted in a folder as repository for the future use. The video from which frames are extracted is also saved. The rate at which frames extracted from the video represents the number of fames in the repository. Information is directly proportional to the number of frames in the database.

There are different ways to select key frame. Triangle model of perceived energy is one of them. The frames are the edge cutting point of the motion speeding up and motion speeding down in selected frames. Features like colors, edges, actions and orientations can be extracted along with key frame [3]. In this method frames are extracted automatically and on content based. Similarity index method is used for this purpose. Here it is adopted of the fixed threshold, further can be extended to variable threshold.

Threshold represents the amount of similarity found in the two frames. Redundant frames can be eliminated from this process, thereby reducing the over head on the network. The frames with higher similarity value will be considered

for information gathering. Least information content in the frames is indicated by the lower similarity value. In Figure 3 shows the number of frames extracted from the video. Frame numbers are directly propositional to video length. The video is temporarily stored in the cache till the next extraction.

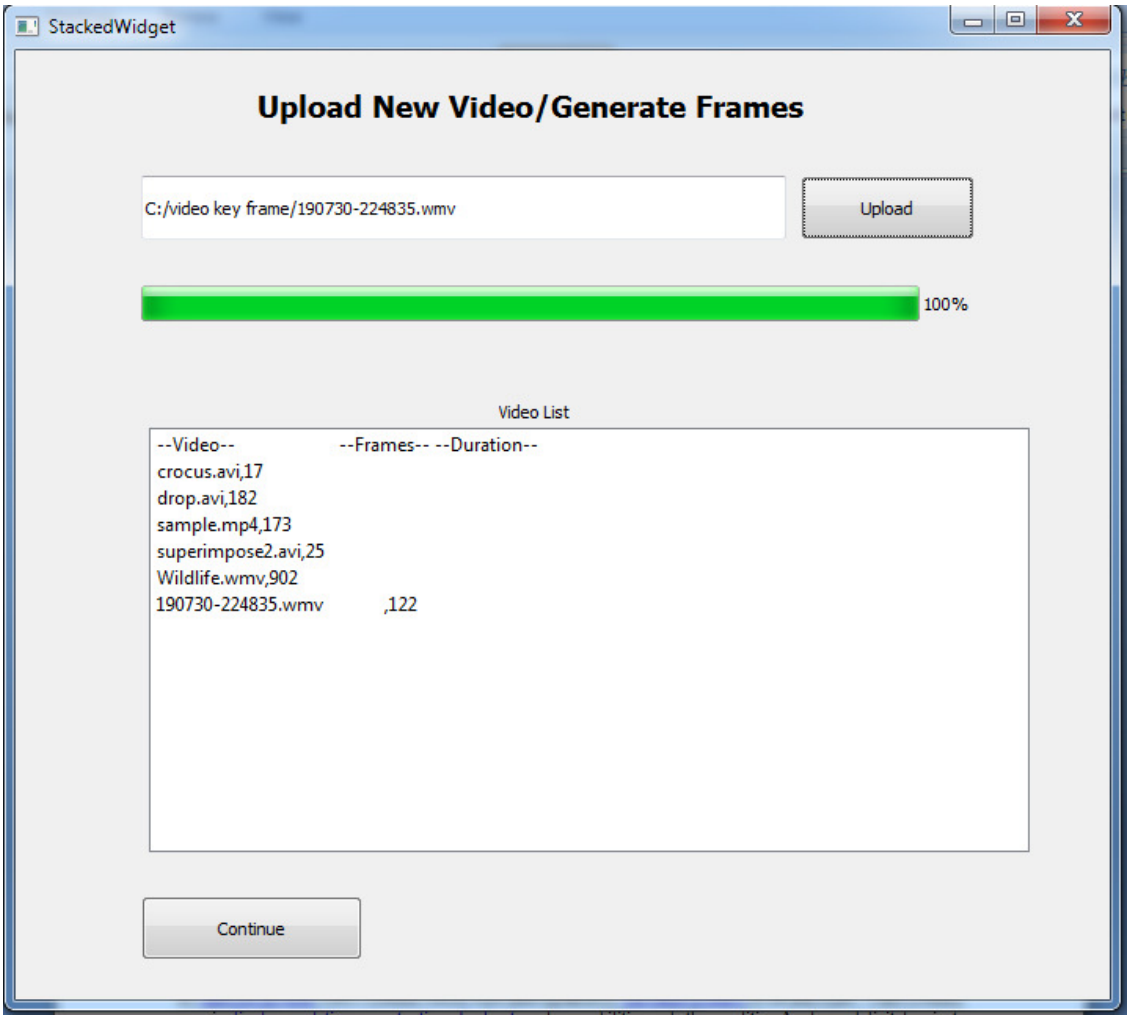

Figure 3: Display of frame numbers

Color histogram, wavelet statistics and edge detection histogram are basic features in selection of the frames [7].Resemblance actions are computed for each descriptor and combined to form a frame variation measure. Fidelity, Shot Reconstruction Degree, Compression Ratio qualities are used to estimate the video summarization.

Key frames are extracted utilizing the features of I-frame, P-frame and B-frame for each sub-lens. Key frames can also be extracted based on macro-block statistical uniqueness of MPEG video stream [5].

4. Image Matching

Structural Similarity value is used to find difference between the images, which means undeviating image difference. Better images can't be identified based on this similarity value.

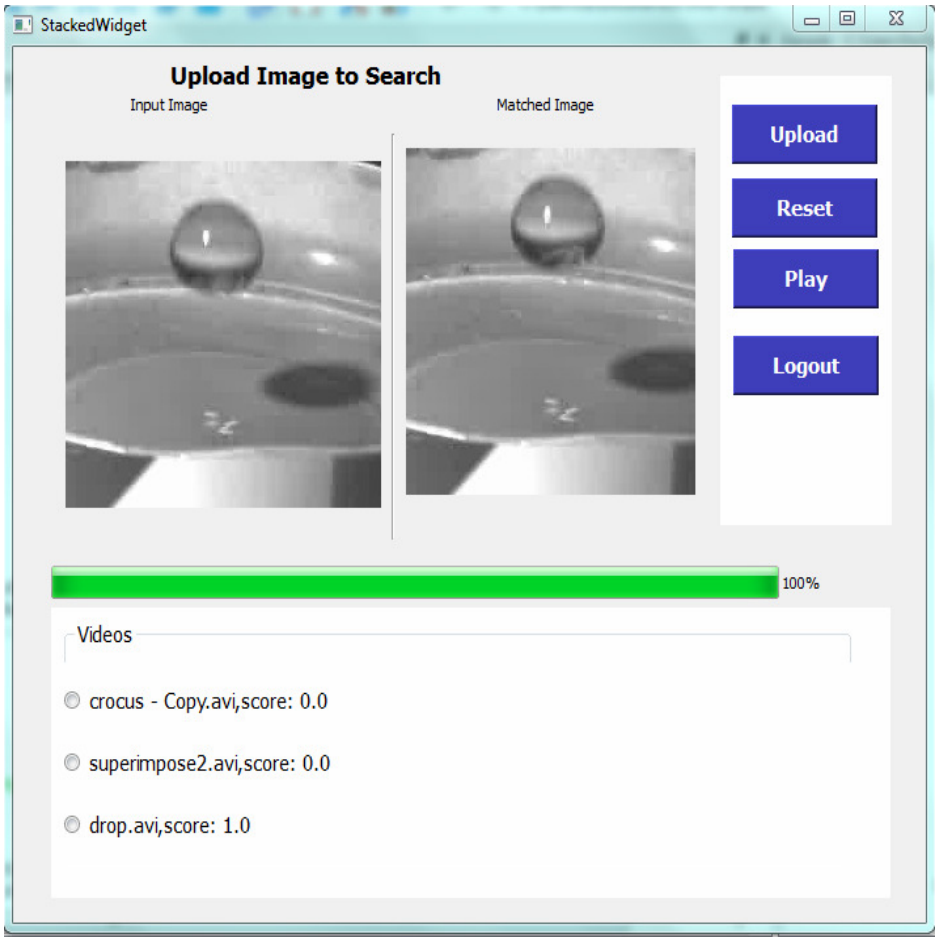

Figure 4: Frame Matching

The procedure of matching involves the comparison of the equivalent image points that are located on the intersection area of multiple images.

$$\mathrm{SSIM}(x,y) = \frac{(2\mu_x\mu_y + c_1)(2\sigma_{xy} + c_2)}{(\mu_x^2 + \mu_y^2 + c_1)(\sigma_x^2 + \sigma_y^2 + c_2)}$$

The locations of the image of (N*N) resolution and Average of the pixel strength in the *x* and *y* direction, the variance of strength in the *x* and *y* direction, along with the covariance are fed as the parameters for the equation 1.

Figure 4 highlights the frame which is matching the given frame with maximum threshold. Threshold 1 indicates the complete similarity between the two images. A fixed threshold can be taken to gather most related images, thereby reducing the redundant frames in the folder.

Figure 5, shows the similarity indices of the frames in the repository. An image with maximum similarity index is shown as the output as a matched image. Video playing using frame matching is image based search, no need of text. It is quick and easier to search videos using this technique.

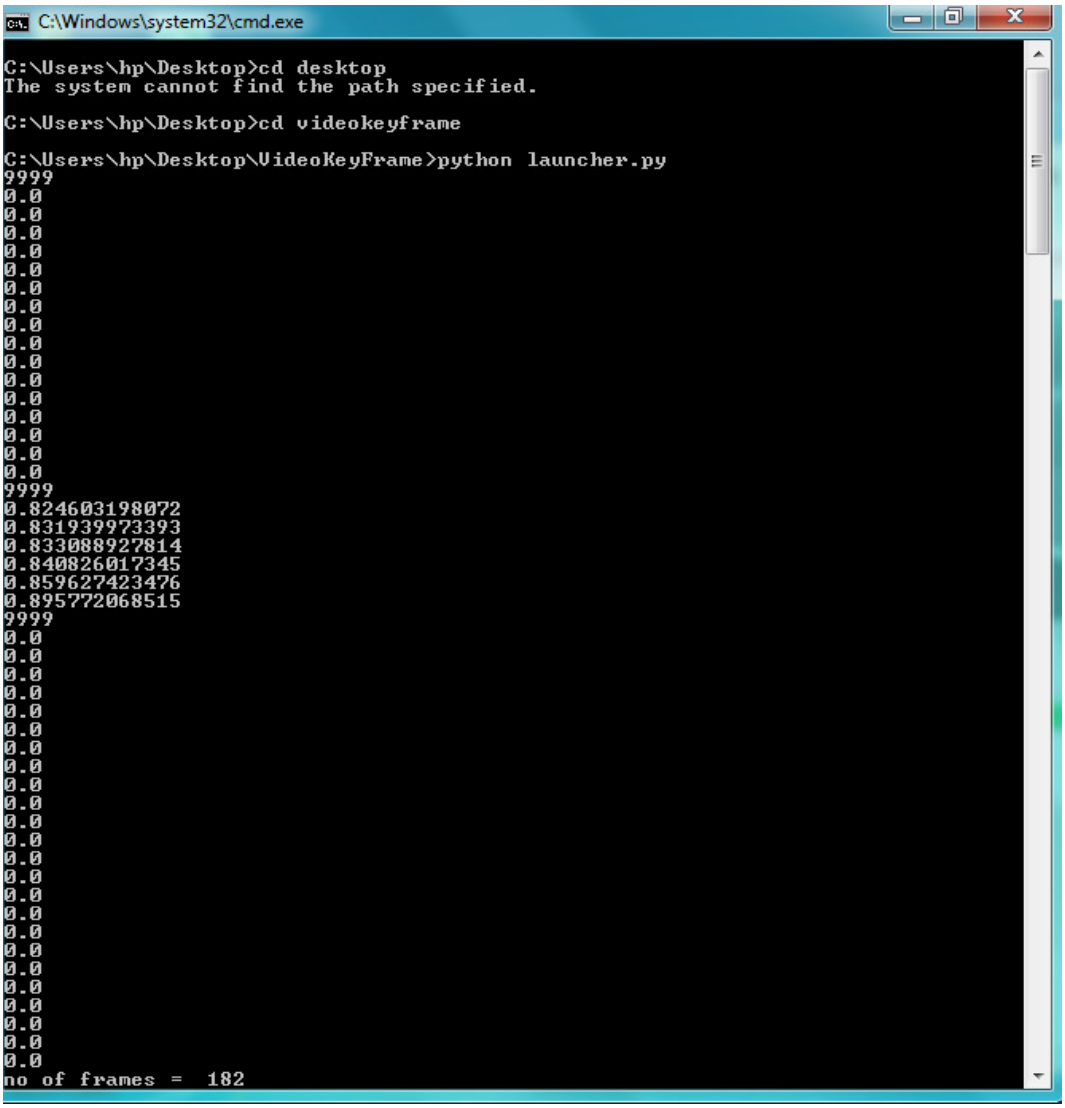

Figure 5: Frame difference display

Here fast frame matching can be done by estimating the quality of match between a pair of frames[6]. In case of large repository of images the search will take long time. Images of same format are used as input.

Some of the major fields frame matching can be used is playing the video in bulk videos. Distance learning: where in video is fetched from the database for the tutorial.

5. Future Enhancement

We can also do reorganization of object in future. Object detection can be done by attending the physical properties like shape, color and texture and relate semantic values to it (such as identifying the object as an apple). This system will not compare images of different formats and size. We can enhance the system to overcome this disadvantage.

6. Conclusion

In the field of computer vision image analysis is main objective. Analysis can be carried out on the frames extracted from the video. We have adopted a structural similarity value to indicate the difference between the images. Fames are extracted from the video 1per sec. Quality of the analysis can still be improved by reducing the rate at which frames are extracted from the video. The transfer rate and transmission time can be minimized by eliminating the similar frames. We focused on the image

retrieval and matching of the images based in the fixed threshold.

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