A FRAMEWORK FOR VIDEO DATA INDEXING USING DATA MINING

D. Saravanan[1], S. Srinivasan[2]

ABSTRACT

The amount of information produced every year is rapidly growing due to many factors. Among all media, video is a particular media embedding visual, motion, audio and textual information. Given this huge amount of information the researchers need general framework for video data mining to be applied to the raw videos (surveillance videos, news reading, Person reading books in library etc.). The first step of our framework for mining raw video data is grouping input frames to a set of basic units which are relevant to the structure of the video. The second step is charactering the unit to cluster of similar groups, to detect interesting patterns. To do this we extract some features (object, colors etc.)from the unit. A histogram based color descriptors also introduced to reliably capture and represent the color properties of multiple images. The preliminary experimental studies indicate that the proposed framework is promising.

Keywords: *Data Mining; Video Segmentations; Video Data Mining; Clustering; Histogram; Video Data Clustering; Hierarchical Clustering .*

I. INTRODUCTION

Data mining which is defined as the process of extracting knowledge from massive set of data has been a very active reseach.As a result, several commercial product and research prototypes are available nowadays. Multimedia data mining has been performed for different types of Multimedia data: image, audio and video. From this huge data set, content-based access, search, and indexing techniques are needed.[2].Content based image retrieval define the image content of the input image. Content here specifies the image color, shape, histogram value. [5]. Other technique of video content retrieval are based on using video annotation using text, image or video added to the input image which will improve the browsing and searching speed of video image retrieval[6][7][9].

Metadata such as image, text, and user tags [8] are used for multimedia mining effectively. Digital multimedia differs from previous forms of combined media in that bits representing, text, images, audios, and videos can be treated as data by computer programs. In video data mining, data bases are widespread and multimedia data sets are extremely large. There are tools for managing and searching within such collections, but the need for extracting hidden and useful knowledge embedded within data is becoming critical for much decision–making applications. Image Retrieval and Indexing is a multistep

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model which is based on multimedia indexing based on content based image [12].

II. Video Data Mining

A. Classification of Videos

Video classification mining classifies video objects into some categories. The initial set of data obtained partitions the video into number of frames. The features of every frame can be used to mine the patterns. A method for classification of different kinds of videos uses. Video segmentation or shot change detection, which involves identifying the frame(s) where a change takes place from one frame to another. [4].Some of the video classification are based on ranking technique, generate ranking for video files [3]

B. Remove Noise

Here cleaning is the process to eliminate the duplication among the given data set, extract the features and define the relationships between the frames Finding the repeated activity or frame from the video clip is found and removed from the video clips, so that we can achieve better performance. Comparison is done by using the grey value of the image and threshold value.

C. Knowledge Representation

The third preparatory step is dataset transformation and simplification. The different types of video shots need to be treat differently.

D. Clustering

The use of Clustering is the process of grouping the data of any stream into classes or clusters. As a r· ılt of clustering all the objects of similar properties are grouped into one class. In other words cluster is unsupervised machine learning process that creates clusters such that data points inside the cluster are close to each other, and also far apart from data points in other clusters. The similarity is obtained from the attribute values of the objects. The basic attributes are distance, pixel value, and other common factor if any. Clustering involves in many areas like data mining, statistics, biology and machine learning. Clustering can able to done in all multimedia files like database, text, audio, video, image etc., this is the base of the concept of data mining.

The main issue in the hierarchical clustering algorithm is that the clustering quality depends on the parameters which included on the clustering Han and Kamber , as a result of the BIRCH clustering the threshold is setting by the user obtained natural clusters, CURE also exposes the lack of problem in clustering quality. CHAMELEON used for dynamic modeling .So it is applied to limited data set only. Optimal parameter setting is also a major problem in clustering. User is going to give the value for the parameter, in real time different part of data require different parameter settings for optimize the clustering quality. The invalid parameter setting may affect the quality of the clustering result. All of the above three set of algorithms(BRICH,CURE, CHAMELEON) are shown best performance on some set of video files only [4]. For an example, let A, B, C are the sample video

files namely cartoon, news, movie clips. Cure may show the good performance on A, B. were birch gave better result to B, C. respective the chameleon gave better performance on A, C. As a result, each algorithm not showed best performance for all types of videos. So we propose a new hierarchical clustering algorithm that offers best performance for all types of video files. They should give good clustering performance according to cluster quality with high time complexity. [Table .4]

E. Proposed New Algorithm (PNA)

1. Find the cluster centroids from the image.
2. Find the colors value of the centroid cluster (Or central pixel value). Take a centroid value as sample value
3. Using sample value as threshold the other pixels are analyzed and form clusters[15]

In this PNA algorithm, it checks the image in a single search. At the first single search it found the centroid point and from this value it forms the next clusters like agglomerative manner. Five videos are taken as samples and are compared using the cure, birch, and chameleon and PNA mechanism. Whereas on applying PNA, the efficiency of the picture gets considerably increased and give optimum results

F. Finding centroid

$\sum$ j height

$\sum$ i width

Clrpixel=get pixel (i, j)

Cluster point = Points (i)

Color value= ClrPixel.R

If color value= threshold then

Centroid color value

III. Frame Work for Creation of Index

A general framework for video data mining was proposed to address the issue of how to extract previously unknown knowledge and detect interesting patterns. In the work, how-to segment the incoming raw video stream into meaninginful pieces, and how to extract and represent some feature (i.e. motion, object difference, text) for characterizing the segmented pieces.[6] Then, the motion in a video sequence is expressed as an accumulation of quantized pixel differences among all frames in the video segment's video data base management framework and its strategies for vide content structure and events its strategies for video content structure and events mining were introduced. Fig 1 shows the proposed framework [13]

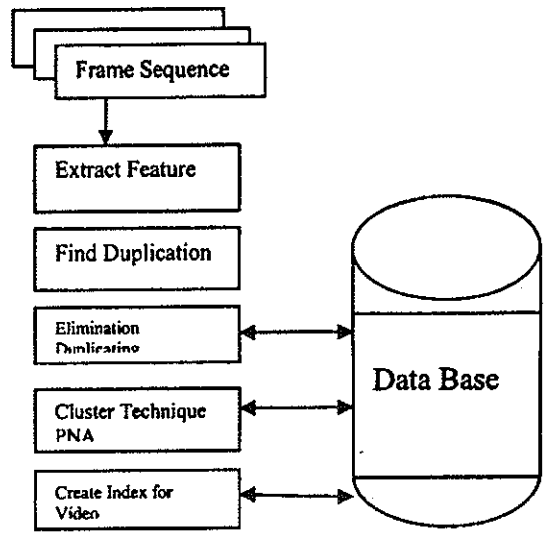


Figure 1 : A Framework for Video Data Indexing

In first, the input video is divided in frames. The frames is the basic unit which relevant to the structure o f the video. This is the one of the most important task. Divided input frames are stored in the Data Base for further operation in video data mining.

STAGE 1: The First Stage extracts the features such as object colors to characterize the frame. With help of RGB frame pixels are calculated, identify the different between two adjacent frames. To extract motion we make calculations using quantized pixel difference among all frames in segment.

STAGE 2: In stage two, find the duplication frames by using image threshold.

STAGE 3: In Stage three, duplicated frames are removed is actual mining of raw video sequence using CLUSTERING technique.

STAGE 4: Compare the existing hierarchical clustering algorithm BRICH, CURE, CHEMELEON. Based on the comparison New Clustering is proposed [10].

STAGE 5: In stage 5, we are going to create a indexing for the video file. Here we created matrix based indexing, the proposed technique is providing better result.

IV. Image Mining

There are two major issues that will affect the image data mining process. One is the notion of similarity matching and the other is the generality of the application area. For a specific application area associated domain knowledge can be used to improve the data mining task. Since data mining relies on the underlying querying capability of the Content Based Image Retrieval system, which is based on similarity of image content, With image mining we will consider the four broad problem areas associated with data mining: Finding associations, Classification, Sequential pattern and Time series pattern. With all these, the essential component in image mining is identifying similar objects in different images

A. Image Mining Algorithm Steps

The algorithms needed to perform the mining of associations within the context of image.

Image Extracted is as follows [4]

1. Feature Extracting: Segment images into regions identifiable by region descriptors (blobs) ideally one blob represents one object.
2. Object identification and record creation: Compare objects in one image to objects in every other image. Label each object with an id. We call this step the preprocessing algorithm.
3. Create auxiliary images: Generate image with identified objects to interpret the association rules.
4. Apply data mining algorithm to produce object.

V. Histogram Search

Histogram search algorithms characterize an image by its color distribution or histogram. A histogram is nothing but a graph that represents all the colors and the level of their occurrence in an image irrespective of the type of the image. (Fig.2) few basic properties about an image can be obtained from using a Histogram. It can be used to set a threshold for screening the images. The shape

and the concentration of the colors in the histogram will be the same for similar objects even though they are of different colors.

The basic concept behind the histogram generation is simple. Each pixel in the image is scanned and the respective color or intensity value is obtained for the pixel 11] [14]

iColor = (16 * p1[0]) + p1[1] * 4 + p1[2];

Then a graph is generated with total number of pixels against the pixel intensity. An array variable is chosen to store the different intensities and the counter increases for each repeated intensity counting the total number of occurrences of that particular color or intensity.

iHistoArr[iColor} = iHistoArr[iColor] +1

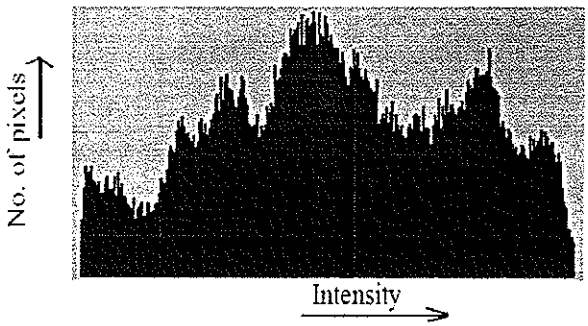


Figure 2 : Histogram Generation.

VI. Video Indexing

Due to rapid growth of media information video indexing process is needed for browsing , searching, fast retrieval based on the users input query.[1]Indexing process is to improve the performance ,without indexing process the performance of the system is reduced. Different indexing techniques were proposed each have them having own strength and weakness. In the proposed matrix based indexing technique input frame is divided into rows and columns, cell histogram value is calculated and stored on user training phase. This value is used to retrieve the image. Experiment also verified that the proposed method provide good results. [Fig 5-9].

VII. Experimental Results

Different experiments were performed, one for assessing computational performance, and one assessing robustness with respect to validate the methods we have described, we implemented the components of the video frame based retrieval system and tested with a general purpose image database including about 100 videos.) The tables given below shows the time taken for Splitting Number of frames from the image database (Tab 1, 2, 3)

After segmenting the image, Grey value represents the value of the difference between the two adjacent image grey values. By assuming a threshold for the grey value the duplicate images are found out Using file handling method the duplicate files are eliminated. After eliminated duplication the grouping frames are taking as input for proposed matrix based indexing technique. In each frame the histogram value is calculated [Table 5.] This value is stored for retrieval of user input query:

Table 1 : Experimental Result of Spitted Frames

Number Of Frames Spitted	Search Time
100	2 Seconds
1000	5 Seconds
10000	14 Seconds

Table 2 : Frame vs. Grey Value

Frame	Grey Value
1	3213382
2	3241749
3	3284197
4	3302771
5	3351903
6	3464017
7	3335886
8	3385282
9	3310658
10	3213382
11	2965735

Table 3 : Avg Search Time for Particular Frame.

Number Of Frames	Videos
13116	Cartoon
27956	Tennis
71379	News
13254	Movie Song

Table 4 : Output of PNA Clustering

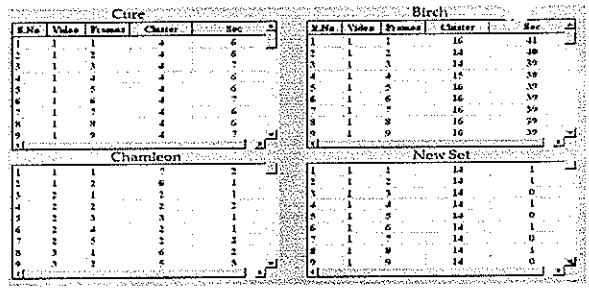
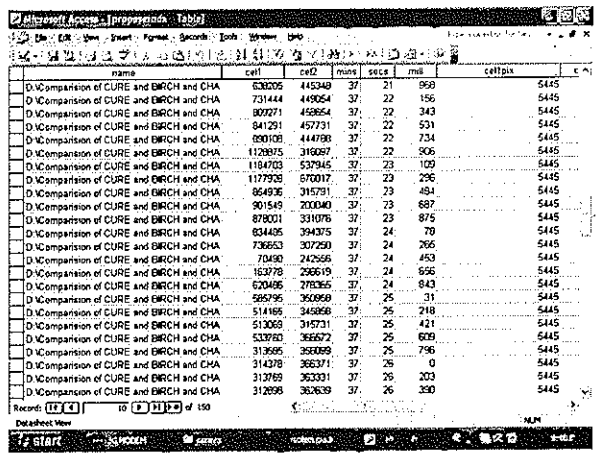


Table 5 : Histogram Value of Input Image



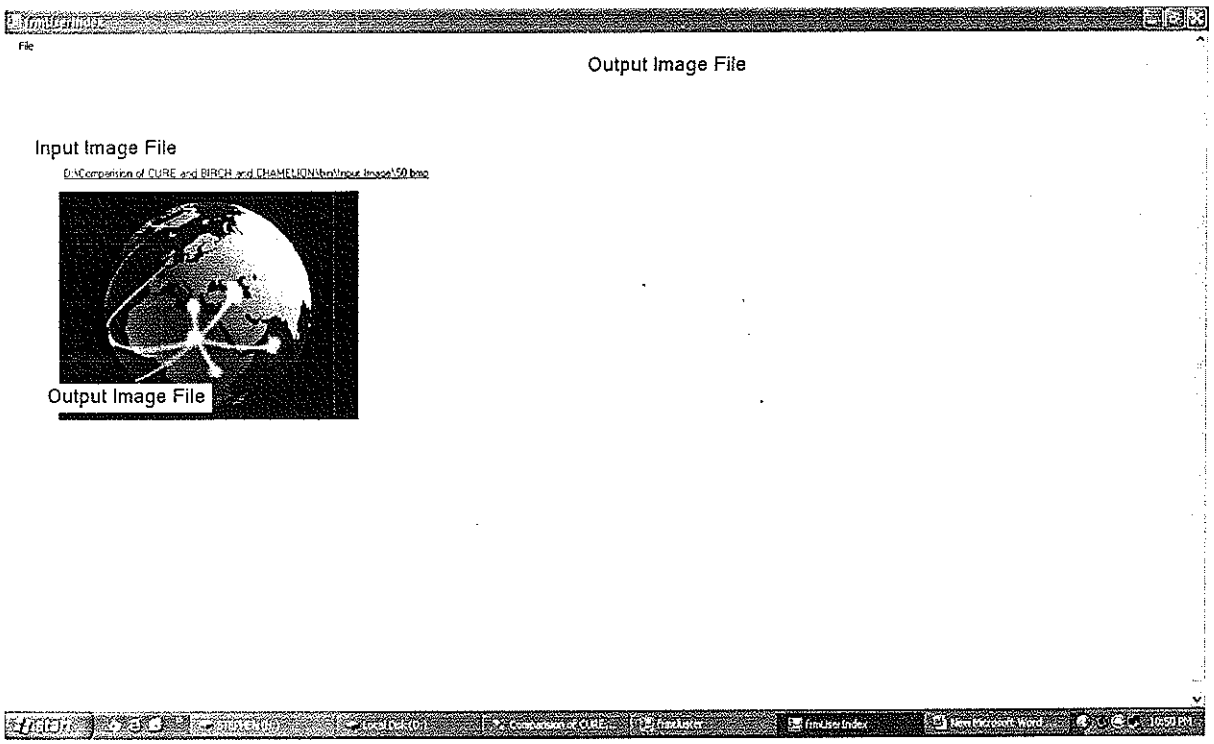


Figure 5 : Input Image

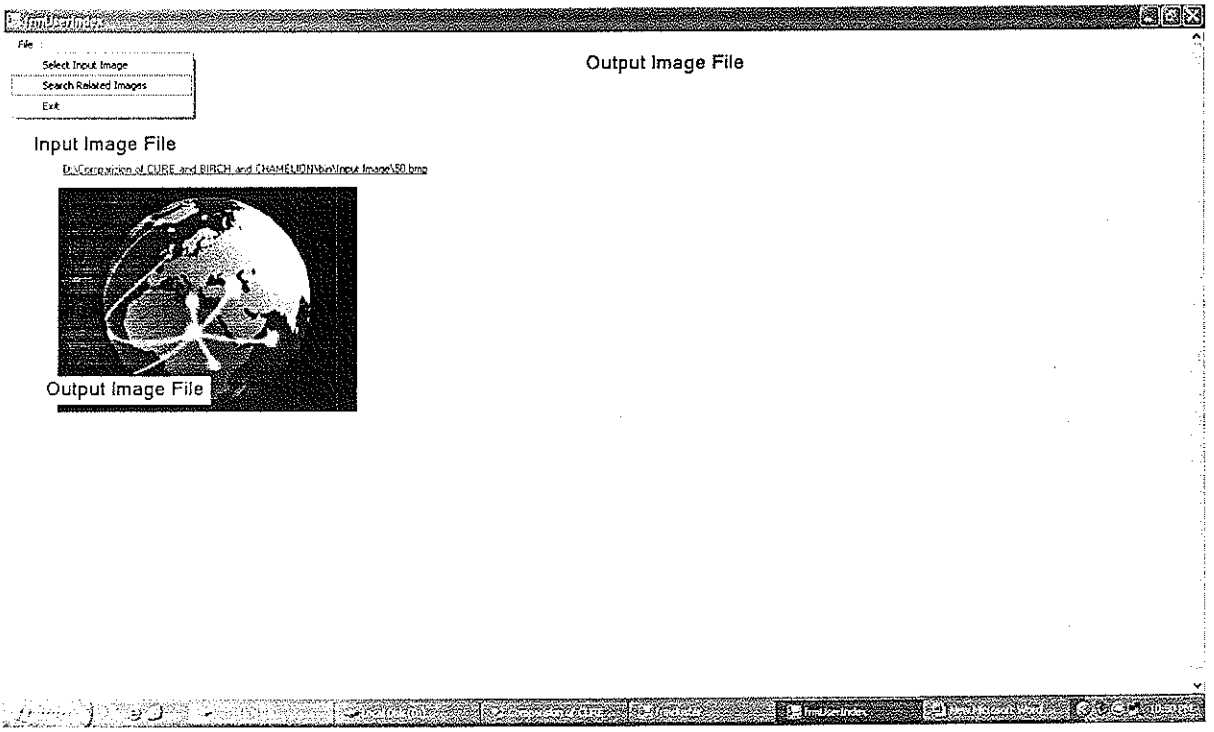


Figure 6 : Search the Related image

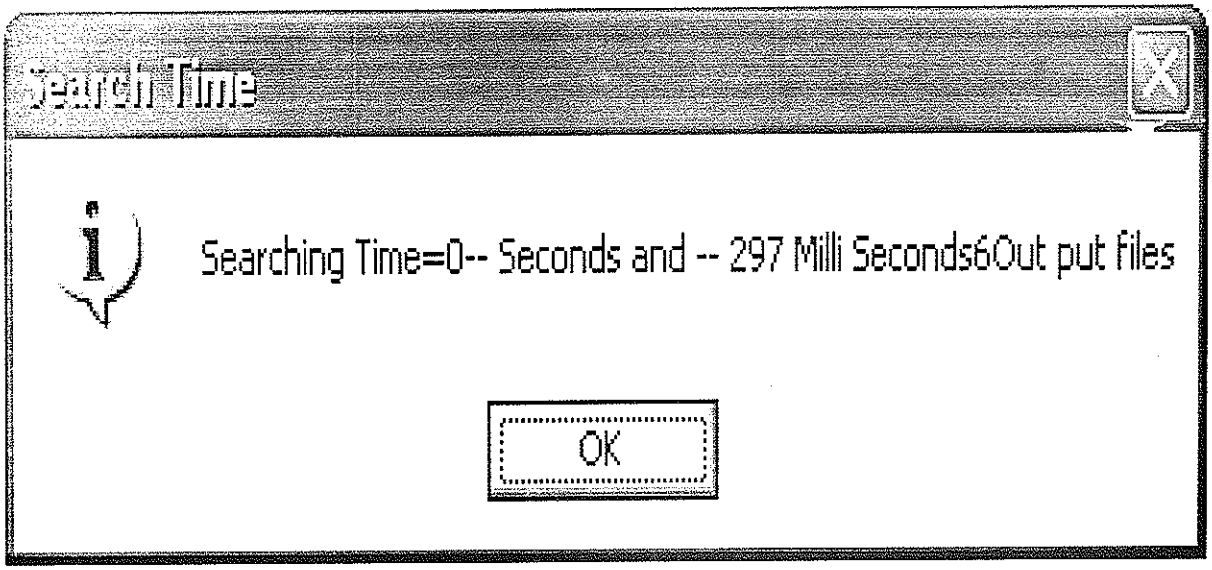


Figure 7 : Searching time for the input image in milli sec

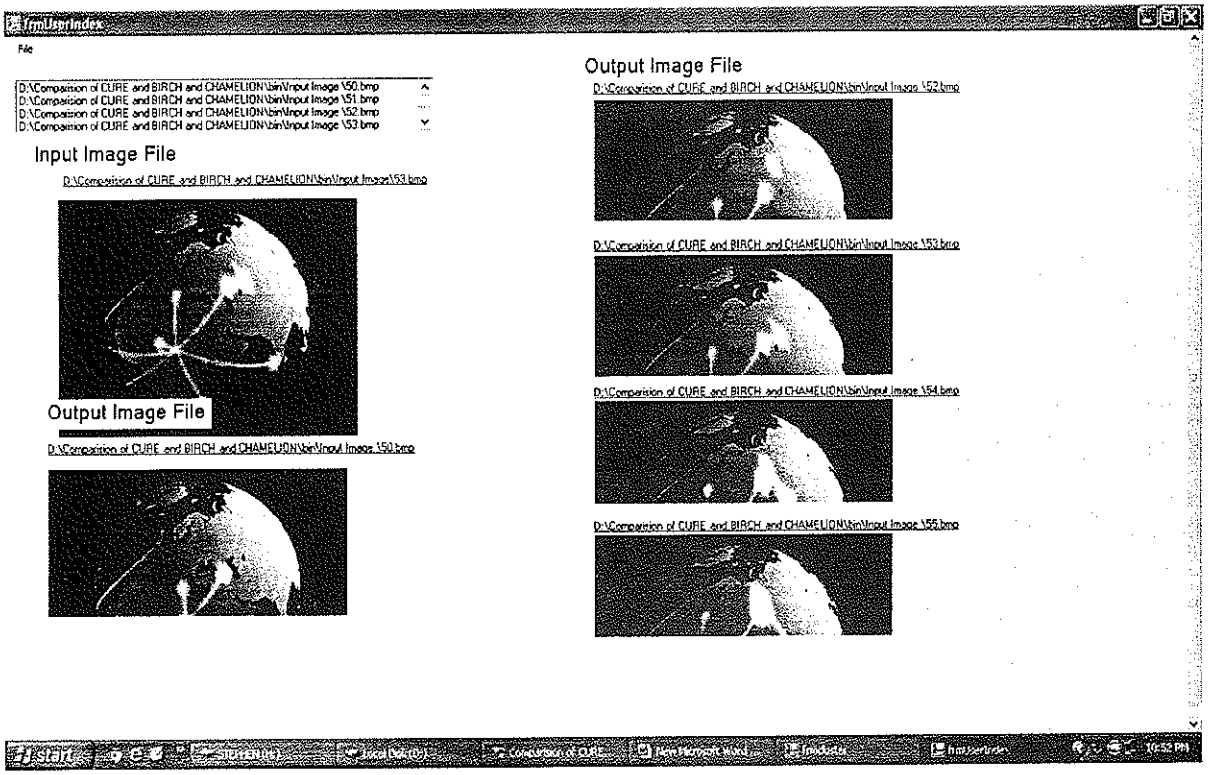


Figure 8 : Output image

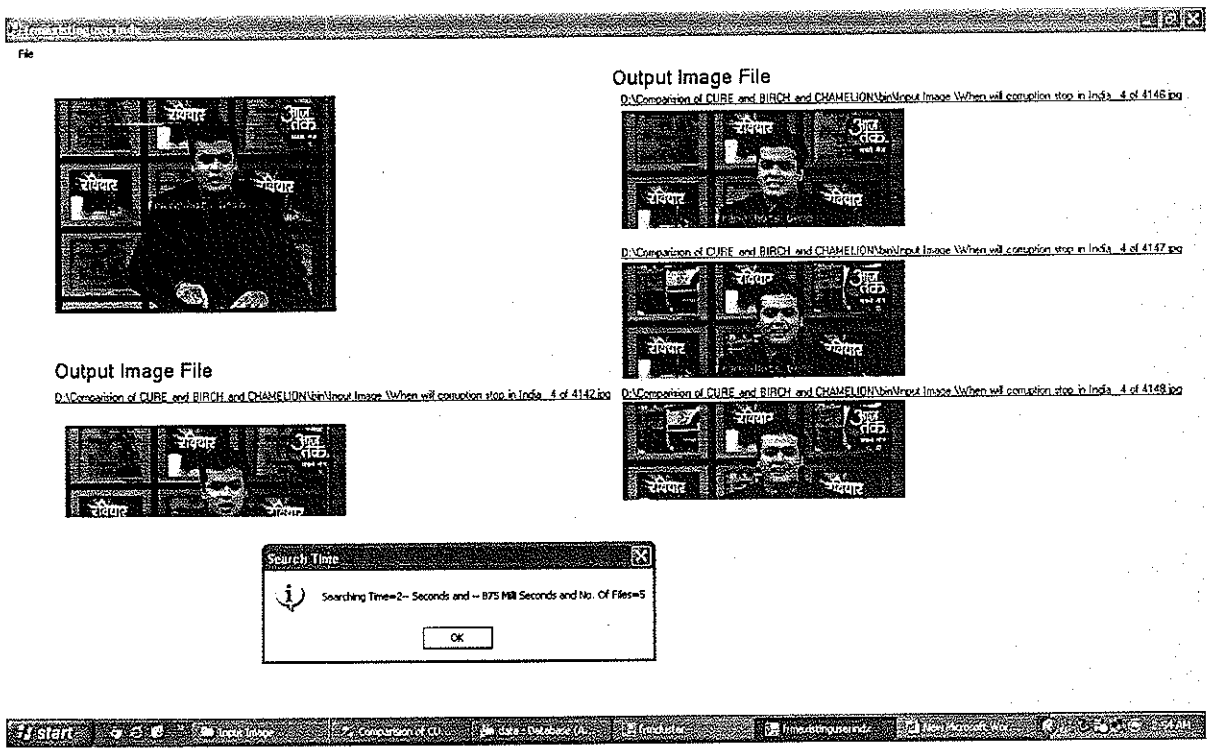


Figure 9 : Output of Indexing process

VIII. Conclusion

In this paper, we propose a general framework for video data mining to perform the video indexing tasks which are divided into frames, feature extraction, and clustering. The experimental data shows that the proposed framework is performing the fundamental tasks effectively and efficiently.

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