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Video Replica Detection and Localization Using Sequence Pattern Analysis Algorithm with Spatio-Temporal Pattern Index

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ABSTRACT: Pattern based video retrieval and video matching systems are popular in the recent technology. The Pattern based video retrieval takes a sample video clip as an input query and performs the searching operation in the video repository. This proposal introduces a novel Pattern-based video matching and copy elimination system, which helps to find the most appropriate video fragments from video database based on the given query video clip. For effective video copy elimination, the proposed system applies an Index scheme named as ST_PIndex (Spatio Temporal Pattern Index). This performs the pattern extraction, video near duplication identification, elimination and effective video matching from the video repository. This ST_PI overcomes the problem of video frame mining, by applying effective Meta information's and semantic similarity measures. The semantic similarity contains both textual and visual similarity measures. According to the discovered features, from the initial frame, the system can obtain a set of relevant video frames in the refinement process. Our proposed approach cogently finds and eliminates the duplicate frames and concatenates the extracted feature based images, these extracted frames contains the significant spatial and temporal variations. Based on the feature extraction algorithm and semantic feature identification this applies a Sequence_Pattern analysis algorithm for video frame sequence detection from the large video database framework. This algorithm is designed to localize duplicate frames and to re-rank the retrieved videos. The influence of ST_Index can be ease by time-shift -pattern similarity (TPS) measurement. For image analysis and synthesis the image information is transferred from the nearest neighbors to a query image according to the TPS.

KEYWORDS: Video Retrieval, pattern matching, video replica detection, Video Mining, Re-ranking

I. INTRODUCTION

Every day hundreds and thousands of video data are created and published over web. There are several video sharing sites such as YouTube, Flickr, Vimeo, Dailymotion etc (see fig1.0) available for video sharing. For example, Vimeo allows users to upload up to 10 videos daily and 500 MB per week. YouTube allows 100 MB of videos per hour [1].

Fig 1.0 popular video sharing sites

Among these video sharing networks and huge volumes of videos, there still exist large numbers of duplicate or near duplicate videos. As per the statistics , there are 29 percent redundant videos that are duplicate or nearly duplicate to the most popular version of a video in the search results from YouTube, Google video and Yahoo! video search engines.

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Several duplicate and copied videos are uploaded in the social sites with different names and by different users. This may results ineffective search in video search engines. So identifying unique videos is a major task for effective video management.

This video replica problem leads to two significant issues such as Copyright violation which increasing unauthorized duplicate videos replicated from copyrighted videos is uploaded on the Internet [2]. The near-duplicate videos which may infringe the copyright should be identified and removed for copyright protection. And the second one is Search result redundancy; this highly degrades the performance of the search engine. This will happen when user searches for videos on the Internet. Another issue of video replication is storage problem, which replicated video occupies more storage area in the video repository. Our proposed system aims to develop a non-duplicate video retrieval and image based video location mapping process.

II. RELATED WORK

The followings are the various techniques used in video mining using data mining techniques. This chapter shows the reviews on query types, content based video retrieval techniques, feature extraction methods and video copy detection techniques.

i. Video Retrieval types:

Video retrieval from search engines or video repository can be performed by textual queries,

1. Video retrieval based on textual queries:

Using textual queries for video retrieval helps to search videos based on its tagged keywords, metadata and annotations. This query extracts videos related to the query from video repository. In this type of retrieval, user's gives some appropriate query by a set of keywords. It is the simplest and most direct query type and it captures the semantics of videos to some extent. Keywords can refer to video metadata, visual concepts, transcripts, etc. In this paper, we mainly consider visual concepts. The fig 2.0 shows the basic process of text based video retrieval, where user enters text inputs for video retrieval. This performs basic NLP process to process the query.

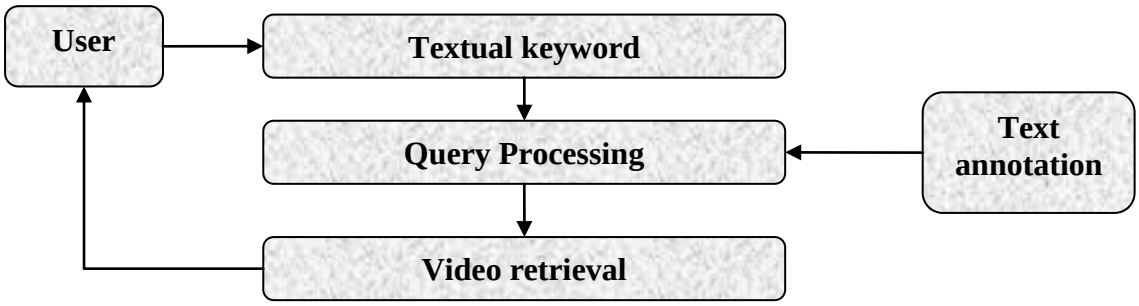

Fig 2.0 Video retrieval based on textual queries

Paper [3] presented an approach that enables search based on the textual information present in the video description. Regions of textual information are identified within the descriptions of the video. Video is then retrieved with the textual content present in the video repository. Some authors [4] presented an advanced video retrieval solution which matches text from images for retrieval, these techniques could identify the text present in the video and helps to recognize the text and finally computes the similarity between the query strings annotated textual information, which presents in the video frame. This technique suffers from various situations, such as when input video is not in a good quality and OCR failed to recognize texts properly from the frames. This is very tedious and not suitable for all video searching environments.

2. **Video retrieval based on example Image:**

Instead of text, sample video or image will be taken as input for video search, and then the video will be retrieved from the repository based on the giving example videos or frames or else some similar images.

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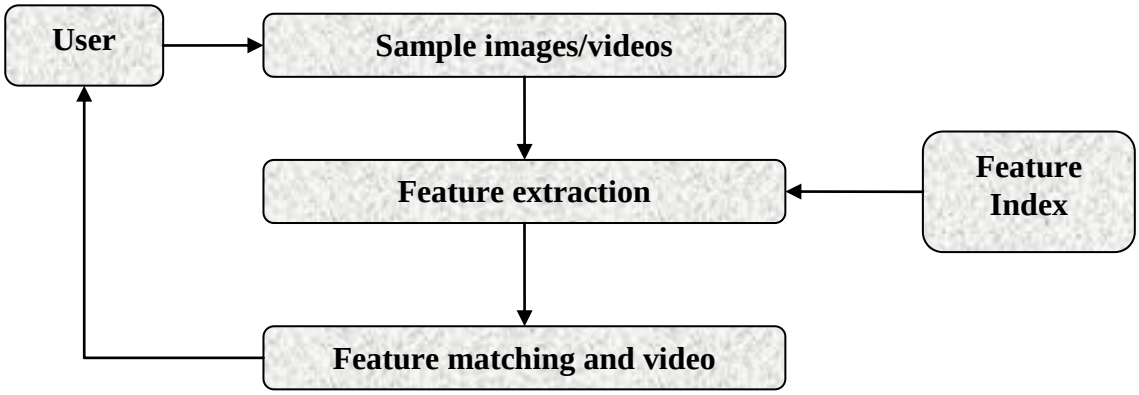

Fig 3.0 Video retrieval based on sample images/videos

This type of retrieval uses feature similarity for video retrieval shown in fig3.0. The static features of key frames are suitable for query by example, as the key frames extracted from the example videos or exemplar images can be matched with the stored key frames.

3. Video retrieval based on sketches:

Sketch based video retrieval largely focuses on the image retrieval problem. This query allows users to draw sketches to represent the videos they are searching. Features extracted from the sketches are matched to the features of the stored videos. Hu et al. [5] propose a method of query by sketch, where objects drawn by users are matched to objects extracted from videos.

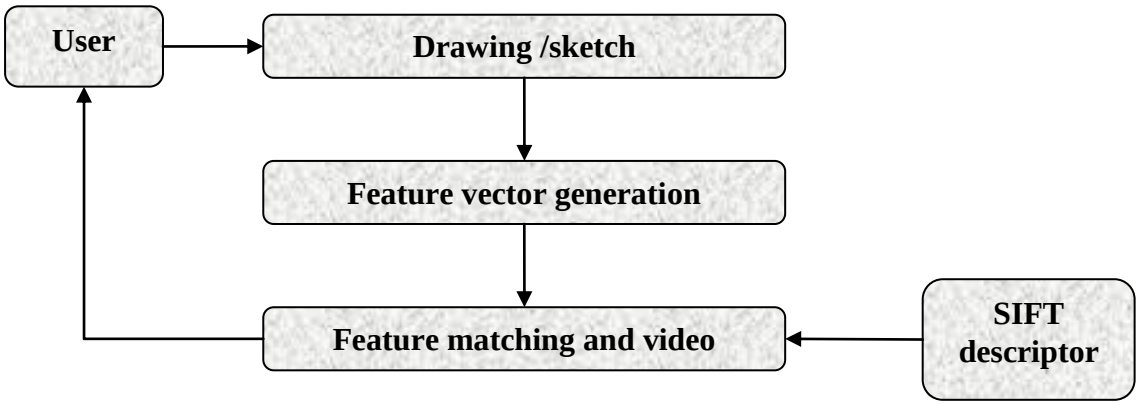

Fig 4.0 Video retrieval based on sample images/videos

Early sketch based image retrieval (SBIR) systems accepted queries comprising blobs of colored texture, matched through region adjacency and topology, shape or spectral descriptors using wavelets and SIFT descriptors. The process of SBIR is shown in fig 4.0.

4. **Query by Objects:**

This query allows users to provide an image of object. Then, the system finds and returns all occurrences of the object in the video database

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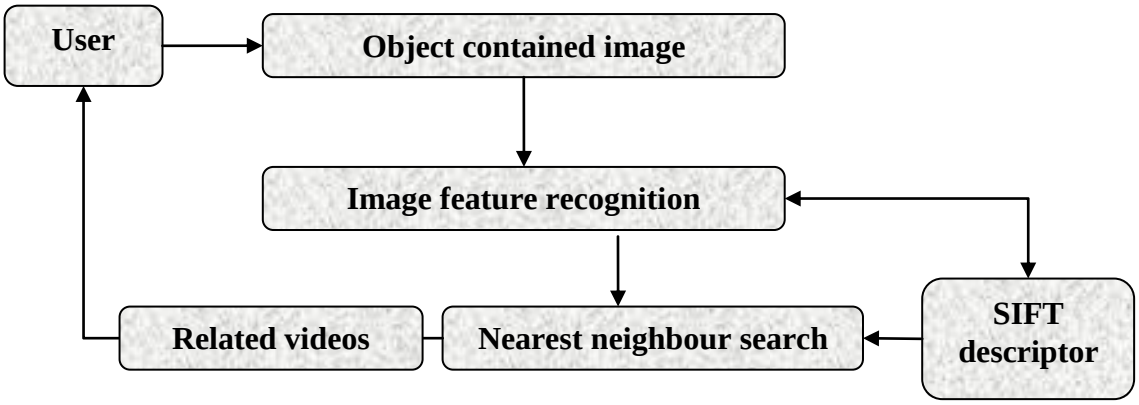

Fig 5.0 Video retrieval based on sample images/videos

In contrast with query by example and query by sketch, the search results of query by objects are the locations of the query object in the videos. Object based video retrieval uses SIFT descriptors[6] along with the nearest neighbor search concepts for video extraction shown in fig 5.0.

III. PROPOSED SYSTEM

Many commercial video search engines use only keywords as queries. Users type query keywords in the hope of finding a certain type of videos without duplicate. The search engine returns thousands of videos ranked by the keywords extracted from the adjacent keywords from the video repository. The keywords provided by users tend to be short query keywords' meanings may be richer than users' expectations. The user may not have enough knowledge on the textual description of target videos.

In numerous situations it is hard for users to describe the visual content of target videos using keywords accurately. So this leads the proposed to be implemented. Additionally there is several different existing retrieval and duplicate matching methods are implemented. Video test collections with thousands or even millions of videos are needed for the evaluation of video search Systems. Unfortunately, efforts made to build a video test collection were not successful at the previous techniques. In summary, no large scale and comprehensive video collections are available for content oriented video research. The existing collections are small in size, exhibit limited homogeneity (the degree of perceptual similarity between the frames) and heterogeneity (the degree of perceptual distance between the frames), or lack variation in content (the complexity levels of frame semantics). These parameters are often neglected by the researchers in their performance evaluation experiments, which makes these results questionable.

The key contributions of this paper are given as follows: this explores the use of **rotation-invariant feature transform (RIFT)** features to model the subjective perception of similarity between two frames that have been extracted from a video database.

This presents a video replica detection and non- replicated video Retrieval system which evolves and uses different video similarity measures for different users query image using spatio-temporal pattern index. Specifically, a user-supplied query video allows the system to determine which subset of a set of objective features approximates more efficiently the subjective image similarity of a specific users query. The system has successfully implemented the video search using Visual studio.Net and C#.net as code program. The following algorithm describes the steps involved in the proposed system, which includes the RIFT based feature extraction.

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Algorithm:
Input: Input file (F) Key Frame (K)
Output: Pattern descriptor (P
Step 1: Segment the video frames and extract features of the key frames.
The first step performs the temporal video segmentation method to segment the video sequences into frames.
Frames [K] =Split (F_T)
Step 2: Then extracts RIFT features of the key frames.
Dense RIFT technique has been applied in this step. This collects more features at each location and scale in a frame, this helps at increasing recognition accuracy accordingly.
Step 3: store the frame in the database and construct a PI.
For each pattern p from pattern set
Step 4: perform the step 2 for the query video or frame.
Step 5: Match the query video and target video by ST_PI method.
This performs the following steps

- **Spatio-temporal pattern indexing and matchin.**
- **Weight assignment based on the feature.**
- **Performs visual and textual similarity matching**

Step 6: retrieve the set of frames matched for the query frame
Step 7: perform the motion matching alignment scheme for video making from the retrieved frames
Step 8: use RIFT_PI descriptor and Patterns for alignment.

To better represent the local content of video frames, the system uses RIFT with ST_PI to represent the local content of video frames present the video sequences. On the other hand, since the number of RIFT feature points in video sequences is large, it thus exists high computational cost for video copy detection.

By using the spatio temporal indexing methods, the temporal information of the Dense RIFT feature points in different frames will be extracted. The process of this scheme is to match the two RIFT feature sets in two video frames and make use of the temporal information of video frames.Patterns are extracted even though the location has no salient feature, RIFT feature rotates the frames and finds the similarity. For the temporal dimension, the patterns are calculated in the original video clips. Frame extraction and video making with effective duplicate elimination is the highlight of the proposed system. When the query given by the user the system extracts the RIFT descriptor and matches with the video repository. In the application of video retrieval, the problem of searching for frames from huge or large databases is still a challenging one. The proposed implements the visual and textual similarity matching and aligning techniques in large set of frames using graph based approach. This means that the search will analyze the actual content of the video by using colors, shapes and textures.

A. Video replica detection using Meta information:

Our proposed work effectively prevents the replicate video uploading issues by the following way. The user uploaded videos will be summarized in fig 6.0. From the Meta data, the system finds the total similarity between the two videos.

Video 1: uploaded by User A.
No_of_frames:123
Total time:2:3 sec

Video 2: uploaded by User B.
No_of_frames:34
Total time: .34 sec

Fig 6.0 Users uploaded Videos and its Meta data

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The above fig 6.0 represents the input video of user A in the video repository. When user B tries to upload the same file in the same video repository, our proposed work eliminates the B's file from uploading.

B. Video replica detection using both pattern index and RIFT Feature and Meta information:

This can be done using ST_PI and RIFT, which compares the video frame extracted from video repository based on the selected frame description and meta data.

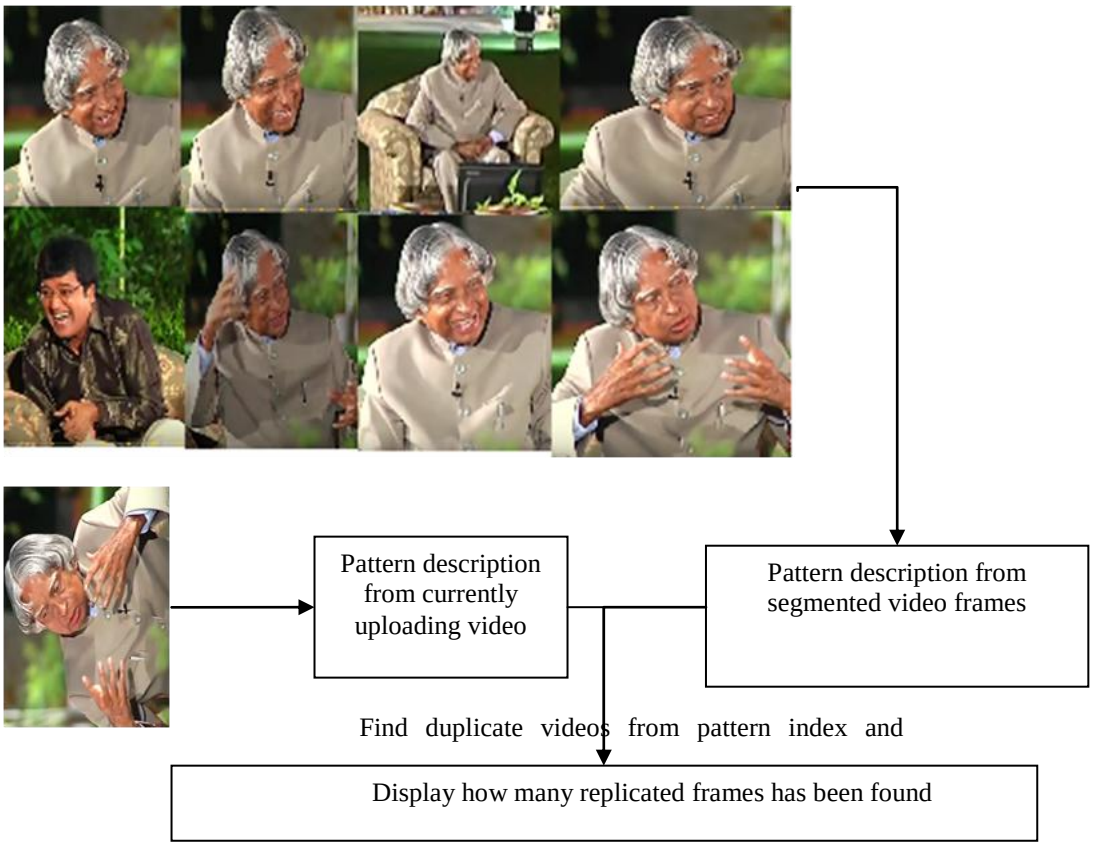

Fig 7.0 Pattern descriptor and Meta data matching for video replica detection

One process involved in the frame extraction is the RIFT descriptor (see fig 7.0), which is extracted at a single scale for all the pixels in the image after rotation of frames. Establishing correspondences between two frames is then performed either locally or by using global optimization schemes such as the RIFT algorithm.

IV. RESULTS

The results chapter shows the comparison between existing *near-duplicate video retrieval* (NDVR) and proposed ST_PI with RIFT feature selection. The comparison has been done based on two parameters, which are video replication detection delay and video retrieval delay. When the number of video and frame increase, the total detection time also increases.

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A. VIDEO REPLICATION DETECTION DELAY COMPARISON:

Performance comparison of proposed ST_PI with RIFT analysis with existing approaches based on video replication detection Delay

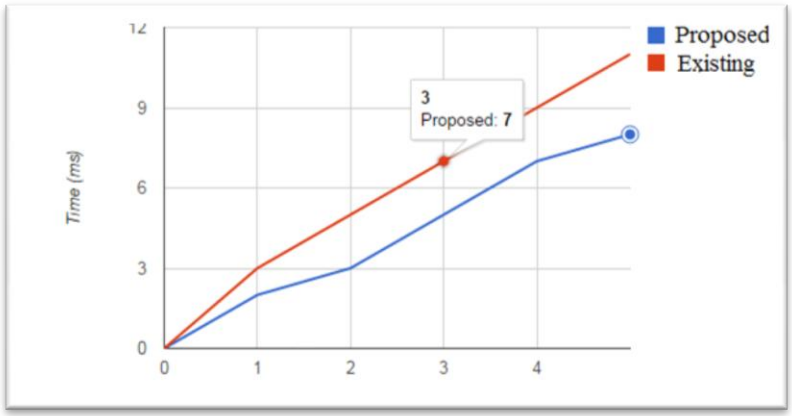

Fig 8.0: Replicate detection delay

From the above chart (see fig 8.0) it shows the performance measure based on the video replication detection delay for different number of query group and the proposed approach took less time while comparing the other methods and the worst time complexity the existing system.

B. VIDEO RETRIEVAL PROCESSING DELAY COMPARISON:

Performance comparison of proposed ST_PI with RIFT analysis with existing approaches based on retrieval Processing Delay.

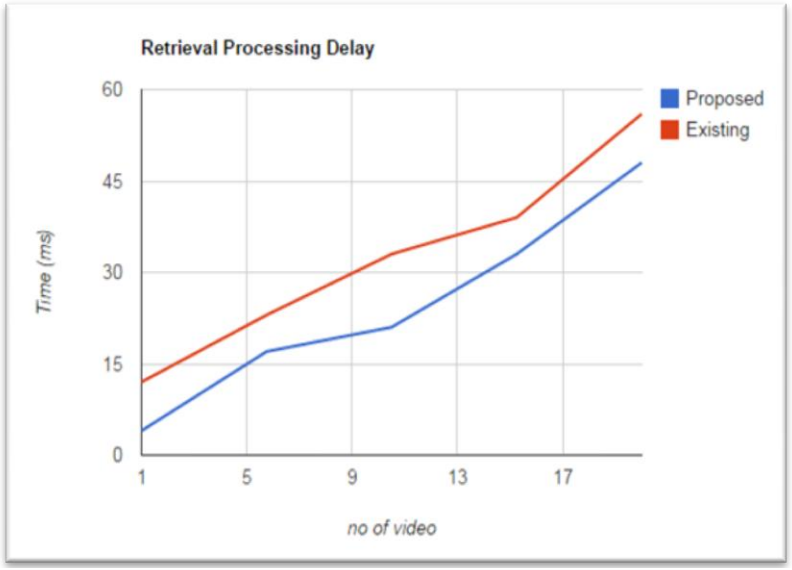

Fig 90: video retrieval delay comparison

From the above chart (see fig 9.0) it shows the performance measure based on the retrieval delay for different number of query group and the proposed approach took less time while comparing the other methods and the worst time complexity the existing system.

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V. CONCLUSION AND FUTURE WORK

Our study addressed the problem of finding replicated videos from video repository, which handles both video replica avoidance and replicated filtered video retrieval from video sharing sites. Frame descriptors have been used along with Meta data of video content. These descriptions are found best for video copy elimination. The similarity of video frames is calculated by the Pattern Index technique named as ST_PI which includes spatio temporal dimension and Rotation invariant feature extraction. the experimental evaluation using real time videos from YouTube and other synthetic dataset shows that the proposed work is an effective feature to match video clips improves the accuracy and performance. This also performed a comprehensive comparison with existing methods and showed that the ST_PI with RIFT systems outperformed. In future the system may implement strong data mining technique to deal the storage problems. The current study does not deal with the storage based issues. The system may improve with the above constraint in future.

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