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Cloud based Multimedai Application for Handheld devices: Using Python wrapper

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Abstract — the exponential growth and availability of the multimedia information had become more popular in research and technology field. The huge development of the multimedia information and obtainable bandwidth there are more demand for video retrieval system in many domains like education, entertainment, healthcare, and social media etc. The amount of data becoming very heavy, where the retrieval of the content become an issue. To overcome this issue the indexing is used. The indexing collects the data, parses the data and stores it to simplify for fast and correct information retrieval. By using cloud based multimedia computing technology (CMM) we can store and compute or process the multimedia application data on cloud in distributed manner. To extract the key frames from the video file, the open source tool FFMPEG and MPEG-7 descriptor is used with the python 3.2 wrapper and java programming language, MFCC is used to extract the audio feature, Apache Solr is used as a search engine where the index files are updated using CURL Protocol. HTML5 is used for a graphical user interface where the users can request the query, and the video data will be transferred in JSON format over the network, converting the video will be also done within the cloud, so that computational resource required in cloud not on handheld devices. As video data will be accessed from the private cloud since there will be no need of storage space for video data on handheld device. The proposed system will give 97% for trained and 94% for non-trained videos and shows the 193ms to 716ms retrieval time.

Keywords- Video indexing and retrieval, Mobile cloud network, Handheld Devices, Cloud based multimedia computing Technology (CMM), FFMPEG, Python, Apache Solr search engine

I. INTRODUCTION

The exponential growth and availability of the multimedia information had become more popular in research and technology field. The huge development of the multimedia information and obtainable bandwidth there are more demand for video retrieval system in many domains like education, entertainment, healthcare, and social media etc. Since the users moving from text based information retrieval to content based. The selection of extracted features from the media will play the important role in content based multimedia information retrieval system. Since those feature will be used for indexing, ranking and selecting, and best feature selection are may also reduce the time and space cost for retrieval process. The traditional database system consist only alphanumeric data where the multimedia database system consist not only alphanumeric but it also contains multidimensional data like image, audio and video. In multimedia database a variety of information sources like text, image, audio and video are distributed over more than one device. To handle the rich semantics of multimedia information's like text, image, video, and audio a new design of multimedia database system is required. The information required from the media is need to synchronous and it should be presented at the defined time. Where the spatial condition is, the traditional database is require to handle the media information at assured point of time. The Information's form the image or video frames, the traditional database system require to keep the relative information so the user can issue the quires such as "find a clip that has car in front of home". However for extracting the information from the image and video is time consuming, where in order to deliver fast response, the information from the image or video should be extracted in advance and stored it in storage device to retrieve it later. To extract the information from the image or video the segmentation techniques may use. The content based indexing and retrieval extract the information from multimedia system or database to accomplish the given query. The figure 1.1 shows the overview of the multimedia indexing and retrieval system. The multimedia indexing is consist low-level, Semantic indexing and Multimedia event detection etc. Low-level indexing features are commonly extracted from the video "key-frames." The feature may consist color, texture, shape, or spatial layout. Semantic Indexing, is used to identify the relationship between the words of results for analysis of text collection for e.g. the fruit mango is specified with tag line as fruit, yellow etc. Multimedia event detection, is used to identify the given or known query which are present in the video and pre-computed metadata for e.g. making a pizza etc.

The Multimedia information retrieval system will help the end user to retrieve the preferred multimedia content from the repository based on contents over user interface. The retrieval system can be divided into two modules: one is for extracting features from the given video frame and then specifying an applicable similarity to find the relevant video frame from the repository. There are various approaches to signify the video frame such as text information, color

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histogram, shape information, text analysis etc. A few methods or approaches incorporate features to increase the retrieval performance.

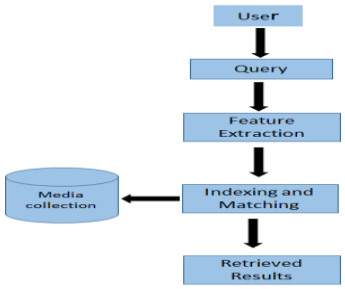

Figure 1 Structure of Multimedia indexing and retrieval

The rapid growth of internet and handheld devices in the current decade, the handheld devices which supports multimedia services will become more popular. Now a days the handheld devices not only used for voice communication it also uses for editing, capturing, sharing and browsing multimedia information. The most of the current streaming mechanisms with the fixed network streaming resources will uses the unicast mode, where the specific quality of the video will be transferred to the required user. Where if the number of user increases the video server performance will decrease to meet all users requirements. The video servers stores the huge amount of video data and those data's are consumes lot of storage. With the exponential improvement of web 2.0, the Internet multimedia is developing as a service. The multimedia computing has developed as a significant technology to produce, process and edit and search the multimedia information to provide rich media service. For the multimedia application and services over the internet and handheld devices there are a strong demand for cloud computing, since it has a significant amount of computation required for proving millions of users at the same time. By using cloud based multimedia computing technology (CMM) the users store and compute or process their multimedia application data on cloud in distributed manner. By eliminating full installation of the multimedia application software on handheld devices and improving the liability of multimedia application maintenance, upgrade, and saving the battery life of handheld devices. In mobile cloud computing, both data storage and processing happen outside of the handheld devices. Mobile cloud computing is a new emerging technology for mobile applications where the processing and storage moved from the mobile device to cloud.

Mobile cloud storage is most normally used for CMM applications where the storage is offering from many companies like Amazon, Dropbox and Google etc. These providers divers capabilities including storing documents, pictures, music, video files on cloud and accessing these multimedia files from handheld devices anywhere anytime and synchronizing data across handheld devices a typical users owns. To enable these type of services the PaaS (platform as a service) providers will ensure high availability and integrity of data and SaaS (software as a service) provider will ensure the data security and privacy.

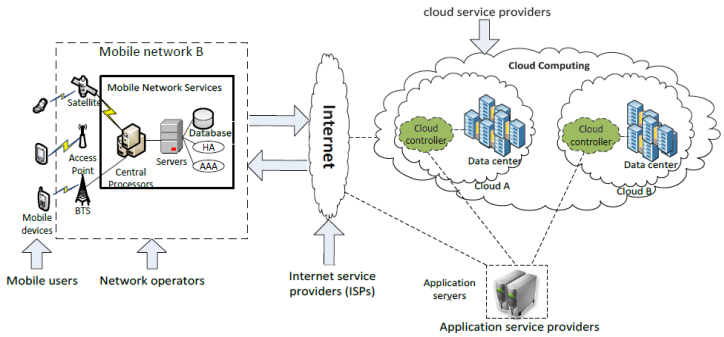

Figure 2 Mobile Cloud Computing Architecture.

In many research the indexing and retrieval method are tried to automatized data processing where those task are performed manually. The automation of indexing and retrieval process and its availability of innovative tools will help to end users to perform the task with greater flexibility and efficiency. To find the specific video by specifying one of its frame or audio which belongs to the video can be a huge task if it done manually. It's essential for provide tool those are capable to assistance users to retrieve the information's from huge multimedia data and intolerable tasks within seconds and other features like finding relevant videos.

II. LITERUTRE SURVEY

.In [1] a new novel method introduced that is an effective content based video retrieval using pattern indexing and matching technique. The high quality video retrieval using pattern based indexing and matching method. In the current

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visual based sequence matching method the consumption of the pattern based and index can effectually deal with problems of high dimension visual features.

The Particle Swarm Optimization [2] is used to search or retrieve the video requested by user as a query image. The population search algorithm is look for frames within the repository, and the fitness of each swarm is the degree of similarity between the content present in the given input image by user and video frames which are extracted by PSO. The similarity is measured by correlation based template matching, SHIFT algorithm and convolution.

The new layered methodology is introduced to multimedia content representation and storage to search and retrieval [3]. The media types such as text, audio and video will be segmented in to various events at different layer, where those layers can be aggregated into the high level events either logical or physical according to the requirement of the application.

This paper [4] gives overview of content based video indexing and retrieval methods for feature extraction, shot boundary detection, scene segmentation and key frame extraction, video data mining, relevance feedback and similarity measure, video retrieval comprising query, motion and object features, and video annotation.

The growth of multimedia and available bandwidth there is a massive demand for video retrieval systems [5], as users move from text based to content based retrieval system. The main role is played in content based video retrieval system is selection of extracted feature from the video. These features will be used for indexing, ranking and selecting according to the users request. There are many algorithms used for comparison, feature extraction and retrieval from video database. For example Color-Texture Classification where the color and texture feature is used to extract the feature from video, multi-modal Content Based Browsing and Searching Methods where it used to extract the features like shape and key frames and Automated Scene Matching is used to extract the wavelets, color description features from the video frame.

There is lot of information present in the video. In [6] the regions of textual information is identified within the frames of video. Then video is annotated with textual content which are present in the images. The tradition OCR methods used to extract the text from the video but the choice of OCR brings many limitations on language. Hence the author proposed that, by using dynamic time wrapping algorithm we can search the video where the text is present in the video where the video containing the query are retrieved from the database and the result will shows video collections in English, Telugu and Hindi.

The video is a kind of content sensitive [7] media where it carrying the rich motion information. The optimal flow field is used to provide a good communication of motion. However it is difficult to use optical flow field vectors directly as a feature vectors, to overcome this difficulty the hidden Markov models are used where it is effective sequential analysis tool and video are categorized by its content sensitive nature. The hidden Markov models captures the inherent statistical relationship among the shots. Moreover the novel representation method works well when linear discriminant analysis is applied to reduce the feature dimensionality and speed up the retrieval process.

The digital repository not only contains text information but is also contains multimedia information such as image, audio and video. Therefore [8] there is a need of index and retrieve the information from those multimedia collection. The index and retrieve information from multimedia includes extraction of text from images which will be used for finding text against background, indexing hand written and noisy printed document using matching technique like word spotting, index the images by using its content.

The image indexing and retrieve the relevant images from large repository by using semantic features like color, texture and shape. The proposed MUVIS [9] system supports indexing, querying and browsing numerous multimedia information's such as image, video, audio. To capture the information it uses MPEG-4 for encoding and generation codecs, where the indexing is recorded in such a way that it can be retrieved easily.

The video indexing and retrieval method in cloud computing environment [10] where the each videos searched from the dataset videos dynamically. To search video from the data set the indexing method will be developed. The videos will be having information's like, video metadata which contains the video link, author, description about video will be embedded and sound track, visual information etc. Multi-modality system is used to communicate with the users via different type of communication channels to extract and express meaningful information about video automatically. The frame work consist video segmentation which contains shot boundary detection, feature extraction like extracting feature from segmented video clips, video mining used to the output of extracted feature, annotation to build index, user query, and feedback and ranking.

In [11], it inspects issue of delay while downloading the multimedia file from cloud storage. The main concept is to analyze the unexpected interruption and automatic resumption from cloud. The network and device factor calculation and cloud storage were used for prediction of network and hardware features and communication frequency. By using SVC (Scalable Video Coding) method the system reduce the delay and provide multimedia data format for the device from cloud. Where SVC will play two important role which user 2 layer, one is base layer and another is enhance layer. Where each media file has a base layer information for its basic image quality. Depend on the network fluctuation SVC adds the number of enhance layer to its higher quality. If any interruption happens while downloading the video then it can be resumed automatically by checking the log file which will be stored on cloud.

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Using cloud storage and content management of multimedia content (e.g. video data) [12] across various handheld devices which should ensures high availability and integrity of data, content security and privacy. A cloud server is developed where it can be accessible for various handheld devise after authentication. The cloud can be used to store as well as synchronize the video data across the various handheld devices for user. The video data can be retrieved from various handheld devices using http request to cloud server. The RTP and RSTP protocols are used for streaming the video data, the video data will be transferred in JSON format over the network, converting the video will be also done within the cloud, so that computational resource required in cloud not on handheld devices.

In [13], The Vertical video retrieval system in mobile cloud computing environment in which the user will submit the query or key word or a video clip from handheld device. To retrieve the video from the cloud there are some techniques developed, such as video similarity measure where the similarity is measured by the percentage of the similar frames from two video clips. Packet based data transmission is used for fast data transmission and communication between the handheld device and cloud, where the video objects will be wrapped to some packages. High dimensional index support data filtering to reduce the response time.

A novel structure is used for multimodal video indexing and retrieval method [14] by using SODA (Shrinking optimized directed information assessment) for similarity measure. And RASTAPLP feature is used to extract the features of audio and the SHIFT is used to extract the features of video. Then the join probability density function is used for audio and video in order to extract the different features.

The shape and image simplification in linear and nonlinear models a indexing and retrieval is introduced [15]. The shape method is used in liner model, where the main video is used to identify the objects. To identify the video objects the contour simplification algorithm is introduced. There are two different nonlinear methods for image simplification is presented. One is generated by weighted kernel and second one is parabolic differential equation.

The automatic motion and color based video indexing and retrieval method is presented [16], where it divides a videos into sequence of shots and extract the descriptive frames from each shots. The flow field will be computed on each frame, and from the color feature the motion features will be extracted.

III. MUTLIMEDIA INDEXING AND RETRIVEAL

Multimedia information system is most important in many domains like Education, healthcare, entertainment, surveillance and other domains. The multimedia contains audio, video, image and text, since the multimedia data require huge amount of storage and computation process, so there is need of store, index and retrieve the multimedia information from the video server. In addition the video server should act as a streaming server to transfer the videos to the users, where it grows the bandwidth and computing power. In order to overcome this problem the cloud computing can be used, where in cloud architecture, the available nodes in the network are consummate the data storage and streaming, where it reduces working load of the server. Cloud computing is new paradigm where it offers storage, computing process and infrastructure at lowest cost. In cloud computing both data processing and storage happens outside the handheld devices. By using cloud based multimedia technology the user can store and compute the multimedia data on cloud in distributed manner. Where it eliminates full installation of multimedia application on handheld devices.

3.1 Video Indexing and Retrieval Framework

Step 1: Structure exploration where the detection of scene fragment, short boundary detection and key frame extraction will be process.
Step 2: The segmented video units consist static feature in the key frame, object and motion features.
Step 3: Extracting the video data or information (metadata).
Step 4: Annotation where the extracted video features will be used for indexing. The sequence of the video will be stored and indexed the vector.
Step 5: The video is searched by the given query with the help of index.
Step 6: The relevant video will be retrieved

3.2 Video Key frame extraction:

A. MPEG 7- Color layout: To capture spatial dissemination of color in the image the color layout descriptor (CLD) is intended. In CLD the extraction of the feature process will consist two parts, one is grid based and another is discrete cosine transform (DCT). The most general value of the visual contents is color hence the colors can be used to define and signify the image. The MPEG-7 has been tested the supreme efficient process for describing the color and it has provided the adequate results. The color layout is used to describe the color relation among the group of images or sequences. The Extraction of the color descriptor is consist of four stages.

1. Partitioning the image: In this stage the input image will be divided into 64 blocks to assurance of the invariance to scale or determination.
2. Illustrative color selection: After image partition, Single illustrative color will be selected from every block and the average of the pixel color in block will be calculated. The collection result will be in three 8x8 (tiny image) array with each one color. Once the tiny image is acquired the color conversion from RGB to YCB will be applied.

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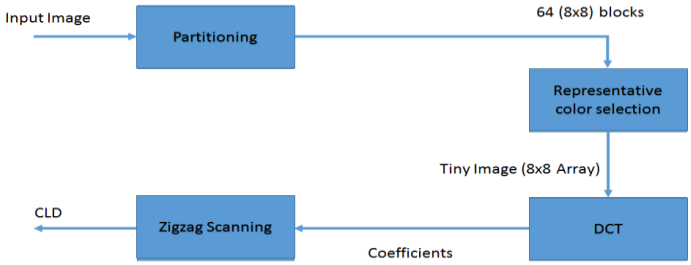

Figure 3 Process of Color layout descriptor

3. DCT transformation: In this stage the obtained 8x8 array (tiny images) will again transformed to 8x8 discrete cosine transform (DCT) to get three 8x8 DCT matrices of coefficients with YCB color for each array. To flowing equation 1 is used to compute the DCT in array.

$$B_{pq} = \alpha_p \alpha_q \sum_{m=0}^{M-1} \sum_{n=0}^{N-1} Amn \cos\frac{\prod(2m+1)q}{2N} + \cos\frac{\prod(2n+1)q}{2N}, 0 \le p \le M-1, 0 \le q \le N-1$$

4. Zigzag Scanning: The zigzag scanning will be accomplished with the three set of 8x8 DCT coefficients. Where the zigzag scan will group the low level frequency of 8x8 array (tiny image).

B. MPEG 7- Edge Histogram: The MPEG-7 is also contains edge histogram descriptor where it mainly used for retrieval of multimedia information. With the help of histogram the edge will be distributed over the images. The images will be divided in tox4 blocks where each block contains information about image. Those information will be extracted from every block and it will be represented in terms of histogram with five bins for every block. The five bin represent the information in vertical edge, 45 degree diagonal edge, non-directional edge, horizontal edge, 135 degree diagonal edge. In the each block the five types of edges will represent the information about sub image and the changes of the brightness of images in each block. The edge histogram will be constructed by 80 bins of whole image in one dimensional array where it contains 16 sub images and 5 bins. In the sub images the each edge will comprises its own edge type, where the original image will be divided into 16 blocks with equal size, then each block will be divided into 4 sub blocks and then assign the labels from 0 to 3. After assigning the labels for each sub block the average gray scale level will be computed on each block as ak(i,j), where k is location of sub block and i & j will specify the image block location. The filter co-efficient will be characterized as fv (k), fd-45(k), fND(k) , fd-135(k) and fh (k). Finally the each block with contains the images will be classified into one of the five edge.

3.3 Audio feature analysis: Mel-Frequency Cepstral Coefficient (MFCC): The audio signals will be framed into the short frames. Audio signal will be continuously change, to simplify the audio signal we assume that the short duration of the audio will not change, so we can frame the signal into 20ms to 40ms frames. From each frame the 12 set of MFCC coefficients will be extracted. For each extracted frame calculate the power spectrum. The power spectrum is used to identifying the frequencies which are presented in the extracted frame. The DCT of the each frame will be performed by using following equation.

$$S_i(k) = \sum_{n=1}^{N} s_i(n) h(n) e^{-j2\pi kn/N} \qquad 1 \le k \le K$$

Where h (n) is long analysis hamming window, K is length of the DFT, $s_i(n)$ is a speech frame. To get the complex Fourier transform the absolute value has to be taken from power spectrum and the result will be squired. Once power spectrum is obtained, apply Mel filterbank and then the energy will be summed in every filter. Filterbank energies will be calculated by multiplying the every filterbank with power spectrum and finally the sum the coefficients. Then get the logarithm value of each filterbank. After getting the logarithm value of filterbank, get the DCT from logarithm filter bank. To give the cepstral coefficents we need to take the Discrete Cosine Transform (DCT) of log filter bank.

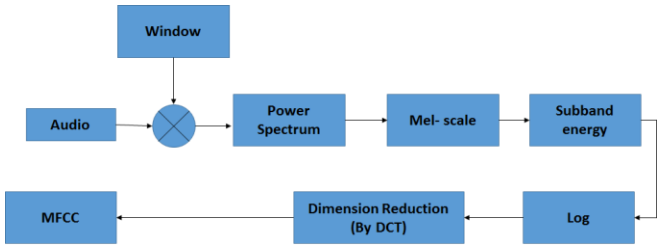

Figure 4 Feature extraction of MFCC

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IV. PROPOSED APPROACH AND IMPLIMENTATION

The proposed system will describe the design and development of the integrated video indexing and retrieval system on private cloud for handheld devices. A private cloud server is used where it can be accessible from various handheld devices. The private cloud is used to store and synchronize the video data across the various handheld devices. The video data can be retrieved from various handheld devices using Http request to private cloud server. To extract the key frames from the video the open source tool FFmpeg and MPEG-7 descriptor is used with the python 3.2 and java programming language, Apache Solr is used as a search engine where it used for index the video data in xml file, update the index file and delete the index file, HTML4 is used for a graphical user interface where the user can request the query and cURL protocol is used for streaming the video data, the video data will be transferred in JSON format over the network, converting the video will be also done within the cloud, so that computational resource required in cloud not on handheld devices. As video data will be accessed from the private cloud since there will be no need of storage space for video data on handheld device.

4.1 Apache Solr search engine

The Apache solr is an open source search platform which is built using java and lucene. It is a most popular search engine platform for web sites where its major features are indexing, searching, clustering, database incorporation, rich document management and NoSQL features etc. The both solr and lucene will share the same basic text search engine and both are written in java language. The solr is also use other core features like scalability, index and search, where it allows to encompass the database performance necessities and it will add the redundancy if needed, and it also allows an easy migration to the other system.Our system will relying on Apache Solr where it runs as a search server in standalone system. It uses the java search library lucene as its main feature for indexing and searching the multimedia information, and it has a REST like XML/HTML and JSON API's.

4.2 Algorithm for multimedia indexing and retrieval

The below figure 4.1 shows the developed system from input video dataset to the user interface for retrieval.

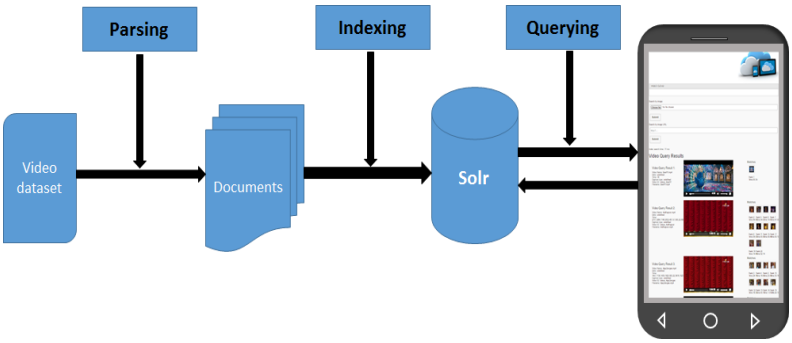

Figure 5 Block diagram of proposed algorithm

Step 1: In the first block the parsing will be performed by taking the all videos one by one from the video dataset where those videos will be given as input and output document which contains the image features which will be extracted by using color layout and edge histogram descriptor.
Step 2: In the second block the indexing will take the documents which are generated from the parsing as input and incorporate those documents to the Solr engine for retrieval.
Step 3: In the third block a web based user interface will be integrated for retrieval process. The user query will be given to the Solr search engine and the result will be retrieved or shown on handheld devices.

4.3 Parsing procedure

The videos will be stored in the cloud server in a folder structure and we provide python script to parse the dataset which performs the below actions either in UNIX or Windows system folder structure.

1. The given video dataset which are stored in the folder will generate list of supported videos in the text file "VideoFiles.txt" inside the folder structure.
2. The key frames will be extracted using the tool FFmpeg with the 1 frame/s rate 7 for videos which are stored in the folder and the extracted key frames will be stored in the separate folders.
3. The extracted key frames will be parsed with color layout and edge histogram descriptor and the results will be stored in the XML document with the format which is supported by Solr search engine. To perform this task the LIRE request handler is used which is a Solr plugin.

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4.4 Indexing procedure

Before proceeding with the index process first we need to setup and configure the Apache Solr instance, Lire plugin then add the Lire jar file to Solr class path. After this the new developed request handler will be added to the slorconfiguration.xml file then the content based retrieval will be added to index with definition of feature vectors. After successful installation of the Apache Solr and lire plugin, the XML document will be uploaded to the search engine automatically by using python script "uploadDataset.py". The XML document will contain the features which are extracted from key frames.

1. Create the list of XML files in the text file and name it as "XMLFiles.txt" which contains the all XML documents in folder structure.
2. Update the XML document files which contains the features extracted from video dataset to the Solr search engine. To upload the XML document to the Solr search engine the curl 11 is used. The Curl is open source tool which uses library and command line for transferring the data to the Solr search engine.
3. After updating to the Solr the changes can be made in the Solr search engine.

Once the above all steps is performed successfully then our collection video dataset is indexed and ready for the retrieval process.

4.4 Retrieval process

The video dataset will be indexed in the Apache Solr engine. The web based interface will be provided to the user to perform the queries. The interface will require a browser which supports HTML4 and JavaScript. The web based interface will include below feature.

1. **Query by image:** The images can be given as input query to search the specific or relevant videos from device or from the key frames from video dataset.
2. **Query by Video:** The video clip will be given as input query to search the specific or relevant videos from the device.
3. **Query by Audio:** The small audio clip will be given as input query to search the specific or relevant videos from the device.

The results will be displayed to the users are as follows:

- The video files will be displayed from the collection of the dataset query requested by user and those video files are displayed by using HTML4 video tag.
- The similar or relevant videos will be displayed with specific time.
- Information about video and specific moment time.
- The extracted key frames will be displayed if user wants to search a specific video from the dataset.
- The information and metadata about result of retrieved video and time needed to retrieve the video.
- The web based interface is independent from the operating systems, browsers and devices. To build and design the web based interface the HTML, CSS, JavaScript framework and bootstrap 12 is used for scalable and modular design so that the screen size should fits on any devices.

V. EXPERIMENTAL RESULTS

The implementation of the proposed system is designed and developed by using Eclipse Java Mars, Apache Solr Engine, Python 3.5, HTML5 and Java script. The proposed module accepts the input query as image in "JPEG" format, video as ".avi" and ".mp4" format and audio as ".wav" format. The proposed work is experimented on Windows 10, 500GB Hard disk, 2GB RAM, Core i3 processor, 4TB WD My private cloud, and Lenovo VIBE P1 LTE handheld device.

5.1 The Video Dataset

To estimate the proposed system requirements we have selected different video dataset with hours of videos. The video dataset selected to evaluate the proposed system is video songs, comedy video, and movie video dataset with large data which fits our purpose of evaluating the task of indexing and retrieving videos using queries. The following snap shot shows the videos from the video dataset.

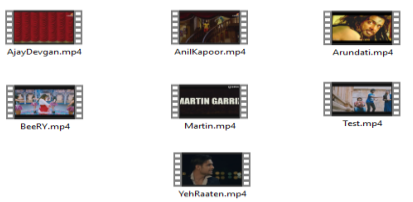

Figure 6 Collection of Video dataset

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The table1 show the Statistics of the video dataset which is used for experimentation.

SL. No	Video Name	Video duration	Number of Frames
1	AjayDevgan.mp4	1:04:58	97462
2	AnilKapoor.mp4	1:06:13	99347
3	Arundati.mp4	0:03:14	4866
4	BeeRY.mp4	0:04:08	5964
5	Martin.mp4	0:03:11	4789
6	Test.mp4	0:04:23	6320
7	YehRaaten.mp4	0:03:39	5486

5.3 Experimentation

The proposed system will offers an indexing and retrieval technique for videos. The video dataset will play important role. The video dataset are collected from various sources which is shown in section 5.1.

To maintain the video repository, the collected video dataset will be stored in the WD MY cloud storage in the given folder structure. The tool is given to the user to perform the following action automatically.

- List the Supported video files from the folder.
- Extract the key frames from the videos using FFMPEG and store it in different folder.
- Perform the parsing for all extracted key frames with color layout and edge histogram then store the result values in XML file supported by Solr search engine.
- To perform the parsing the FFMPEG and lire-request-handler.jar should be on the server system path.

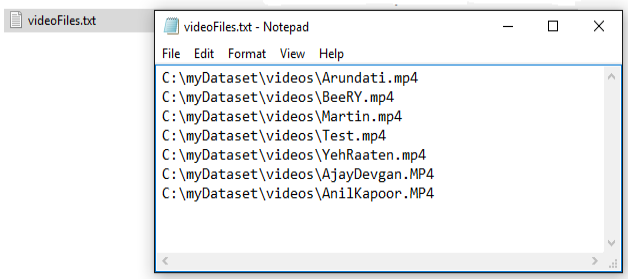

Figure 7 List the Supported video files

Extracted key frames from the collected video set by using FFMPEG tool by providing the parameters "–i" is input, "-y" overwrite the output files, "-an" disable the audio, "-qscale 0" best video quality output, "-r" set frame rate, "-loglevel quiet" show nothing, "%s" system folder. ffmpeg -i %s -y -an -qscale 0 -f image2 -r %d %s -loglevel quiet %s/%%06d.jpg

Figure 8 Extracted key frames from Supported video files

The table 2 shows the difference between original frames and extracted key frames of the video dataset by using FFMPEG tool.

SL. No	Video Name	Video duration	Number of Frames	Extracted Key frames
1	AjayDevgan.mp4	1:04:58	97462	3900
2	AnilKapoor.mp4	1:06:13	99347	3975
3	Arundati.mp4	0:03:14	4866	196
4	BeeRY.mp4	0:04:08	5964	250
5	Martin.mp4	0:03:11	4789	193
6	Test.mp4	0:04:23	6320	265
7	YehRaaten.mp4	0:03:39	5486	221

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After key frame extraction is done the features will be extracted by using color layout and edge histogram descriptor method as described in section 3 .The feature will be stored in feature vector present in the XML file format. The below figures shows the features which are extracted.

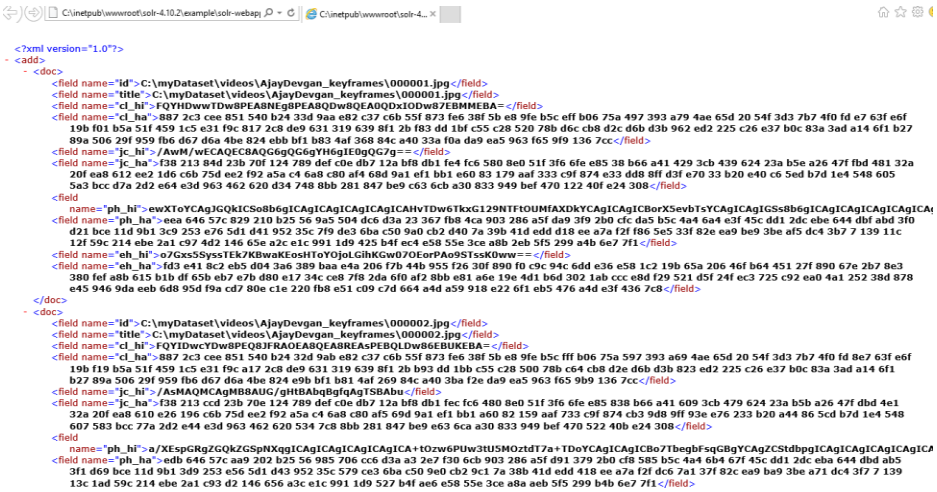

Figure 9 XML files of feature vector

Once the XML file is generated the next step is to upload the XML document files to Solr search engine for indexing. To do this process the tool is given to the user to perform the following action automatically.

- Generate the list of XML documents in text format and store it in folder structure.
- Upload the XML documents which contains the feature vectors to Solr search engine. To perform this process the commend line tool CURL is used for transferring the data.
- If any changes we can commit in the Solr core.

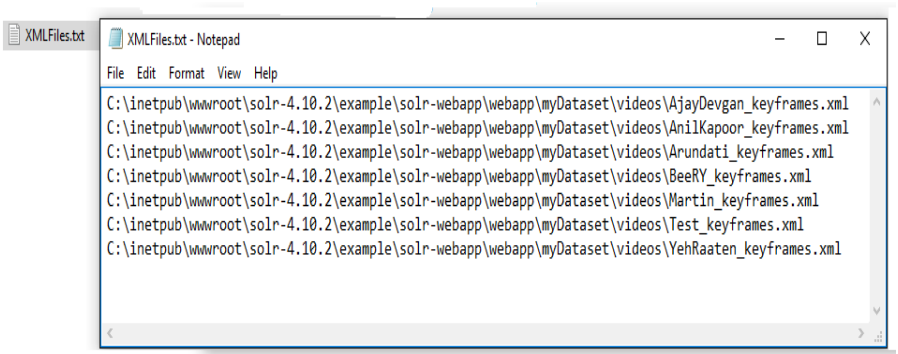

Figure 10 List of XML documents

The commend is used to update the XML file to Solr where collection1 is a core index. *: curl http://localhost:8983/solr/collection1/update -H \"Content-Type: text/xml\" --data-binary @" + XMLFile;,* The commend is used for commit the changes in collection1 is a core index:*"curl http://localhost:8983/solr/collection1/update -H \"Content-Type: text/xml\" --data-binary \"<commit/>\"";*

5.4 Analysis of the result

The given Video dataset is indexed and deployed to the Apache Solr search engine. To perform the input queries the web based interface is given to the user where it will interact with the Apache Solr. The interface is designed by using HTML5 and java script with browser independent. The HTML5 is enabled with video tag and bootstrap is used to fit the screen size for various handheld devices. The user will input the query by image or video or audio. The proposed system will search exact match of video from the repository if the exact match is not found then the system will retrieve the similar videos. The analyzed result will be considering trained and non-trained videos. The proposed system will give 97% for trained and 94% for non-trained videos.

5.5 User Interface: The Web based interface is designed by using HMTL5, bootstrap and JavaScript. The user interface contains search field, URL field and selection of descriptors. By default the application loads the videos, index time, respective video matches and key frame images with descriptors.

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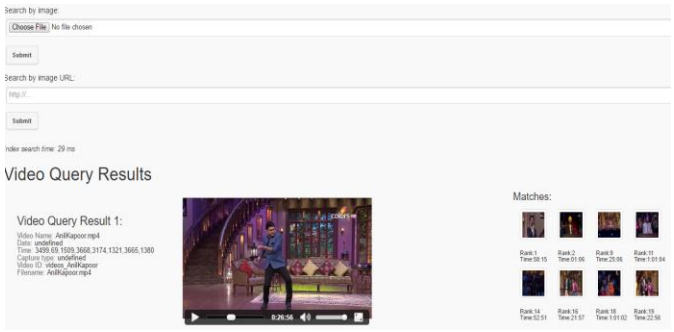

Figure 10 Web based interface for Multimedia indexing and retrieval

When the user submit the query from the handheld device, the query will be transferred to mobile network and result will be shown on handheld device. The features of the video will be extracted and indexed on Solr search engine which is running on WD MY Private cloud. For retrieving the videos from the repository the input query has to be submit from handheld device. The input queries may be image or audio or video with specified format. The videos may be retrieved from the different handheld devices by using HTTP request to the WD My private cloud. RTP and RSTP protocols are used for video streaming purpose, where the data's are transferred over the network in JASON format. The videos are accessed from WD MY Private cloud so the computational process and storage space of the videos will stored on cloud not on handheld devices.

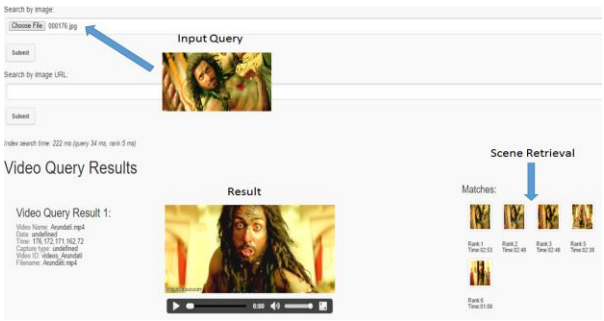

Figure 11 Query result and sequence of clips

The system will retrieve the exact video by matching the feature vector and also it retrieves the similar videos.

Figure 12 Similar videos and sequence of clips

The system will also show the related key frame images by matching the feature vector. The user can select the respective descriptors below the image and the system will retrieve the related videos.

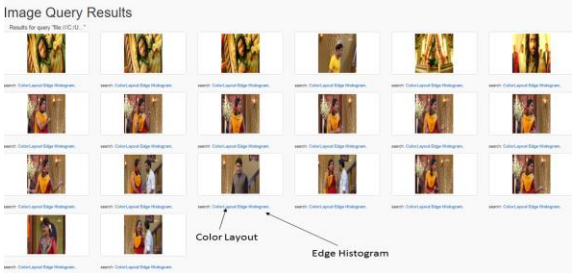

Figure 5.13 Image query results

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V. CONCLUSION

In current decade the video data is increasing rapidly and it is very difficult to retrieve the video data from large repository. To access the video data easier the term indexing and retrieval is used. There are many approaches proposed by researchers about video indexing and retrieval system. The cloud based video indexing and retrieval is rarely found. The proposed system will mainly focus on XML based indexing on Apache Solr engine where the feature extraction is done by using open source tool FFMPEG, Python 3.2 wrapper and Java programming then the extracted features are stored in XML document. The CURL protocol is used to update or delete the index files on Solr engine and the video will be retrieved by using JSON. HTML5, bootstrap 12 are used for web based interface to users where it is a platform and browser independent. The video data and Apache Solr search engine will be stored on WD my private cloud where the storage and computational process happens on cloud in distributed manner. Hence the user can access video data from anywhere within the network from their handheld device since the storage and processing will happen on cloud. The experimentation results has showed the efficient retrieval for trained video is 97% and 94% for non-trained videos and it shows the average retrieval time 193ms to 716ms.

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