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Implementation of Content Based Lecture Video Retrieval by Text

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ABSTRACT

E-Teaching is becoming popular nowadays, as a result of this there is huge increase in the amount of lecture video data on the World Wide Web. Lecture videos contain text information in the visual channels: the presentation slides and lecturer's speech. Therefore, a more effective method for retrieval of video within large lecture video archives is needed. So, in this paper we present an approach for automated video indexing and searching of video in archives. Firstly, we apply automatic video segmentation which will fragment the video into number of frames and then key-frame detection is applied to offer a visual guideline for the video content navigation. Subsequently, by applying video Optical Character Recognition (OCR) technology on key-frames we extract textual metadata. The OCR detects as well as transcripts slide text for keyword extraction, by which all keywords are extracted from video for content based video browsing and search.

Keywords: Lecture videos, Video Segmentation, Optical Character Recognition (OCR), Keyframe detection, Indexing, Ranking.

I. INTRODUCTION

DIGITAL video has become a popular storage and exchange medium due to the rapid development in recording technology, improved video compression techniques and high-speed networks in the last few years. Therefore audiovisual recordings are used more and more frequently in e-lecturing systems .Number of Universities and Institutions are taking opportunities to record their lectures and publish them online for students to access. It is impossible to find desired videos without search function within video archive. Even when user has found related video it is still difficult for him to judge whether the video is useful or not only glancing at title. Therefore beyond current approaches method for retrieval urgently needed. Moreover, the requested information may be covered in only a few minutes, the user might thus want to find the piece of information he requires without viewing the complete video. The problem becomes how to retrieve the appropriate information in a large lecture video archive more efficiently.

Therefore, beyond the current approaches, the next generation of video retrieval systems apply automatically generated metadata by using video analysis technologies. The relevant metadata can be automatically gathered from lecture videos by using appropriate analysis techniques. They can help a user to find and to understand lecture contents more efficiently, and the learning effectiveness can be improved. We present an approach for automated video indexing and video search in large lecture video archive. We extract outline of lecture from visual resources and organize videos based on contents.

Proposed System provides different functionality for two main clients-which are Administrator and user. Administrator is responsible for controlling the entire database including security and adding, updating and deleting videos to and from database. Administrator also can add or remove the user as well as it can search the specific video by using text query. User can only retrieve videos based on submitted query based on content i.e. text.

II. METHODS AND MATERIAL

1. Flow of System

We present an approach for automated video indexing & video search engine to find particular video from large

lecture video archives. It will extract outline of the lectures from visual resources and organize the videos based on the contents. This method will reduce time required for searching the desired video. The process flow for intended retrieval system is described below.

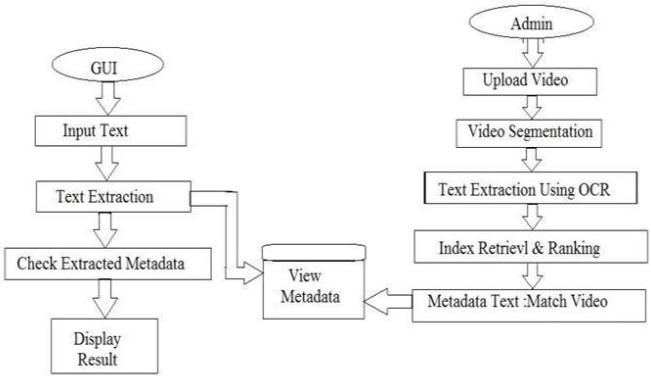


Figure 1. Flow of System

We propose to develop and implement a system for searching the specific video from large video database. The content based lecture video retrieval system is to search lecture video efficiently within lecture video database using text occurs in the lecture videos. In the system's flow process the entire video is analyzed first, then the process of segmentation is carried out on that video. We try to capture frames from video by providing appropriate time interval, this provides us multiple redundant frames. For removing these redundant frames we use sequential comparison based approach. After gathered these key-frames we apply OCR(Optical character recognition) technique, which will extract textual metadata. This data is then index by using inverted indexing.

For retrieval the specific video system should know the weight age of every word which is occurred in the document. TF-IDF(Term Frequency-Inverse Document Frequency) is an weighting factor used for getting the how many time the word is occurred in document? Then videos are arranged in decreasing order of the calculated frequency. Ranking of videos is done by Relevance Feedback method, this method will improve the retrieval performance. We will use vector space model which contain three module TF-IDF weighting factor, inverted indexing and relevance feedback method.

2. Positioning Techniques

This section presents the various techniques that are appropriate for Content Based Leture Video Retrieval By Text.

- **Video Segmentation**

In the proposed algorithm, a large video is being taken as an input and a multiple frames are created as an output. Steps for the algorithm are as follows:

1. Input Video.

Create frames from the input video after every constant interval of the time till video ends.

- **Sequential Comparison Based Approach for key frame selection**

In these algorithms, frames subsequent to a previously extracted key frame are sequentially compared with the key frame until a frame which is very different from the key frame is obtained. This frame is selected as the next key frame. The merits of the sequential comparison based algorithms include their simplicity, intuitiveness, low computational complexity, and adaptation of the number of key frames to the length of the shot.

However, these algorithms suffer from problems such as the key frames represent local properties of the shot rather than the global properties, the irregular distribution and uncontrolled number of key frames make these algorithms unsuitable for applications that need an even distribution or a fixed number of key frames and also redundancy can occur when there are contents appearing repeatedly in the same shot.

3. Optical Character Recognition For Text Extraction

OCR is the electronic conversion of scanned images of printed text into computer-readable text.

OCR is used for text extraction of an video. It is a common method of digitizing printed texts so that they can be easily edited, searched, stored more compactly, displayed on-line, and used in machine processes such as

machine translation, text-to-speech, key data extraction and text mining. OCR is a field of research in pattern recognition, artificial intelligence and computer vision .

3.Vector Space Model

A. Inverted Indexing

1. Fetching the Document

The job is really simple if I get a text file (.txt). But if it was a doc or pdf, I'll need to parse them using some libraries to retrieve their text. Let's say I'm successful in reading the text. What next?

2. Removing the Stop Words

We denote the most occurring words as "stop words" and remove them so that I don't get indexes for words like "I", "the", "we", "is", "an". In regular use, we have a list of 500-1000 words. But it may differ depending on use.

3. Stem to the Root Word

Then comes Stemming. Now whenever I want to search for "retrieval", I want to see a document that has information about it. But the word present in the document is called "retrieve" instead of "retrieval". To relate the both words, I'll chop some part of each and every word I read so that I could get the "root word".

4. Record Document IDs

Every document I have has got an unique document id. As I encounter a non-stop word that is stemmed now, I save it in my memory in the form : retrieve ==> docID104007

If I get same word in some other document, very soon I've to combine them in a single list retrieve ==> docID104007&docID154033 I can further improve by writing how many timed did the word occur in the document so that we can rank the more important documents while retrieving.

Retrieve ==>
docID104007|5|&docID154033|2| 5. Merge
and Store the Terms

Finally, we save all of them in disk files. It's great if we sort the index based on the words for quick and easy retrieval.

B. TF-IDF Weighting Factor

TF-IDF: It is used as a weighting factor in information retrieval and text mining. The tf-idf value increases proportionally to the number of times a word appears in the document, but is offset by the frequency of the word in the corpus, which helps to control for the fact that some words are generally more common than others.

TF: term frequency tf(t,d), the simplest choice is to use the raw frequency of a term in a document, i.e. the number of times that term t occurs in document d. If we denote the raw frequency of t by f(t,d), then the simple tf scheme is

$$tf(t,d) = f(t,d)$$

IDF: The inverse document frequency is the logarithmically scaled fraction of the documents that contain the word, obtained by dividing the total number of documents by the number of documents containing the term, and then taking the logarithm of that quotient.

$$idf(t,d) = log \frac{N}{|\{d \in D : t \in d\}|}$$

Then tfidf is calculated as –

$$tfidf(t,d,D) = tf(t,d) * idf(t,D)$$

5. Relevance feedback method for ranking

To improve the retrieval performance, relevance feedback technique can be used Systems using relevance feedback are effective in ranking and retrieving similar videos. Relevance feedback is an important strength of the vector-space model. The idea is that queries specified by end users typically fail to describe completely what those users want.

Thus, typical queries miss many relevant documents. However, if the user can identify some retrieved documents as relevant, then the system can use this information to reformulate the original query into a new

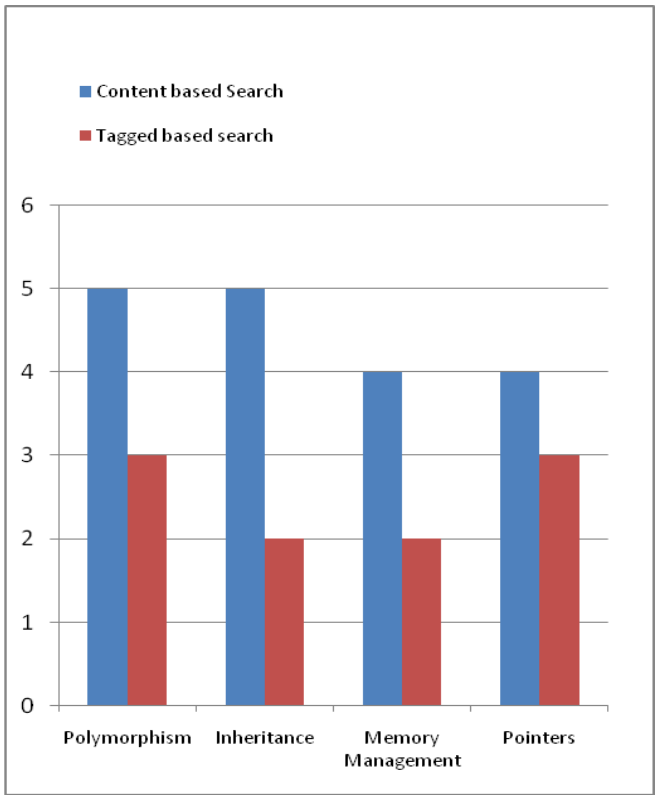
one that may capture some of the concepts not explicitly specified in the original query. medium-, and low-frequency terms, respectively, from the relevant text for query expansion.

III. RESULTS

We have compared the result of our system with that of search that depends on tagged videos. We gave same query for searching videos with two different types of system. As the result of tagged videos depends upon the average ranking given by the user, the results vary greatly. It happened that most of the users which find the video relevant did not gave rating to the video and some user gave higher ratings to the irrelevant videos. This affected the results we got after the search was performed. Below is the graph for all the scenarios.

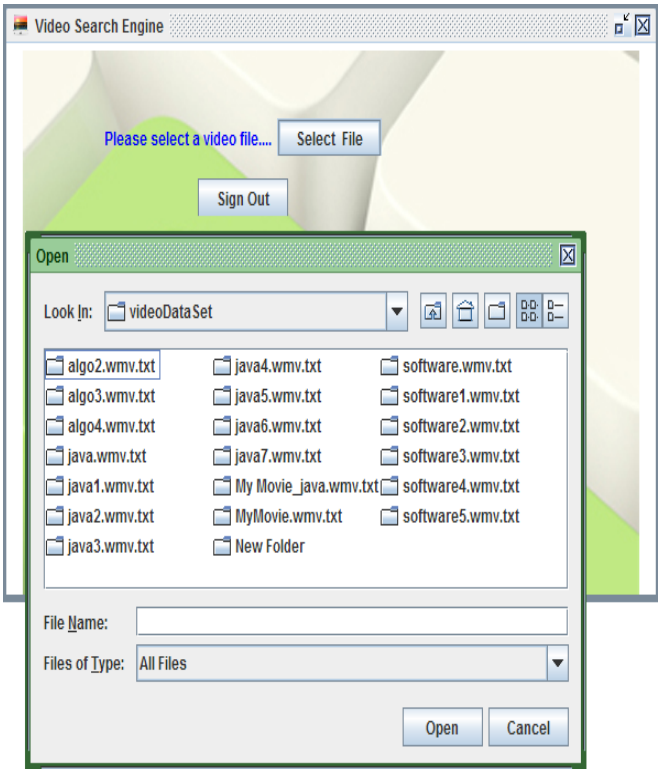
Below graph shows the search results which provided 5 videos for every query. Blue coloured bar shows the number of videos which user found relevant when searched using content based search engine and red coloured bar shows the number of relevant videos when searched using tagged based search. x- axis shows the query which we used for comparing the search results.

- **Search Result**



- **Login Page**

- **File Chooser**



- **Uploaded Successfully**

- **Display Result**

IV. CONCLUSION

The existing search engines results are not that much content based, one cannot judge whether it contains required data thoroughly, required information may be covered within few minutes. So content based lecture video retrieval approach presents an appropriate method to retrieve the de-sired video more efficiently which is more content specific, which in turns increases learning effectiveness. This will also reduces the required time for searching.

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