



CONTENT-BASED RETRIEVAL SYSTEMS

Shamik Palit

Manipal Academy of Higher Education Dubai Campus
shamik.palit@manipaldubai.com

Chandrima Sinha Roy

St. Merry's Technical Campus Kolkata
mail2chandrima@gmail.com

Manuscript History

Number: IRJCS/RS/Vol.05/Issue11/DCCS10083

Received: 05, December 2018

Final Correction: 16, December 2018

Final Accepted: 26, December 2018

Published: December 2018

Citation: Shamik & Chandrima (2018). Content Based Retrieval Systems. IRJCS:: International Research Journal of Computer Science, Volume V, 513-516. doi://10.26562/IRJCS.2018.DCCS10083

Editor: Dr.A.Arul L.S, Chief Editor, IRJCS, AM Publications, India

Copyright: ©2018 This is an open access article distributed under the terms of the Creative Commons Attribution License, Which Permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited

Abstract— Content based search engines have been around for awhile but not many are made aware of it. This report talks about the working of Content-based Retrieval Systems (CBRS) and how they can be incorporated to develop a more powerful search engine. This paper will provide information and algorithms used for the various processes like Video Structure Analysis, Key Frame Extraction, Scene Segmentation, and Feature Extraction using feature vectors developed from spatial and temporal features of videos and images. After which, these shots or images are classified for easier retrieval during querying. My proposed idea involves incorporating a Knowledge Management System (KMS) to the Content Based Retrieval System Framework that will provide users with more information from the Knowledge Data Warehouse containing a collection of related data. This would help in fields like Crime Prevention, Education etc. Intensive research has gone into this project to propose this idea for a DSS supported CBR System for a search engine that will help users receive and retrieve better found results with the help of previously done research.

Keywords— Video Analysis; Scene Segmentation; Decision Support; Knowledge Management;

INTRODUCTION

During the past 10 years, content-based image retrieval has advanced remarkably in the field of computer vision such as medical imaging, geographical information, crime prevention, education and training, personal photos etc. The initial content-based image retrieval system was presented in the early 1990s to address the problem of retrieving relevant images from the image database [HYPERLINK \l "Man14" 1]. The way Content-based Video Retrieval Systems (CBVRS) work is by dividing the video clip into frames and then perform pattern matching and indexing algorithms to the key frame to yield results similar or close to being identical from an archive of saved video clips. These stored clips are indexed based on their features i.e color, texture, shape and temporal features. Since videos are essentially a collection of images, images are stored in the same manner. In fact, key frames are matched to the image of the results of the search. From a surveillance point of view, incorporation of a Content-based Audio Retrieval System (CBARS) to an ill-advised/undesirable action helps fetch a narrowed list of interested videos that could potentially fight terrorism or any criminal activity caught on CCTV but CBAR is still in its infancy. The working of CBR systems requires the understanding of Computer Vision, Artificial Intelligence, Pattern Recognition algorithms, Databases, Signal Processing and Semantics2]. The Knowledge Management System (KMS) may greatly increase the outcome of perceiving the querying case in different kinds of angles.

CONTENT-BASED VIDEO RETRIEVAL

Advances in data storage and image acquisition technologies have enabled the creation of large multimedia datasets. In this scenario, it is necessary to develop appropriate information systems to efficiently manage these collections. The commonest approaches use the so-called Content-Based Retrieval (CBR) systems [HYPERLINK \l "Tor06" 3].

Content-based Video Retrieval works in the following way:

- Video Structure Analysis
- Key Frame Extraction
- Scene Segmentation
- Feature Extraction (Spatial and temporal)
- Video Classification
- Querying and Retrieval

These topics are going to be covered herewith.

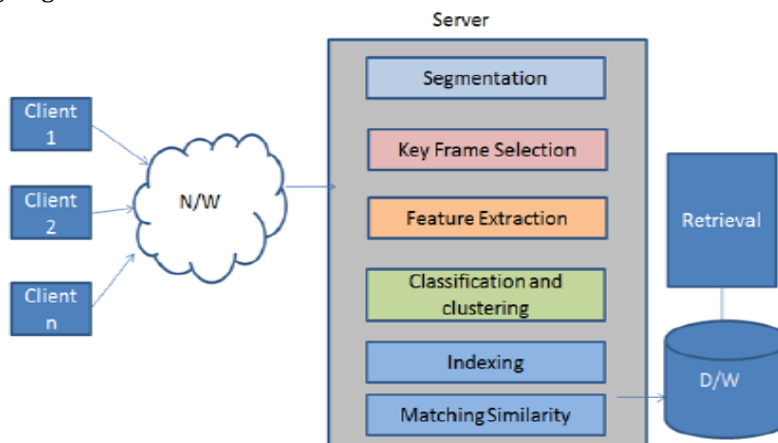


Figure 2.1 Execution Flow of System

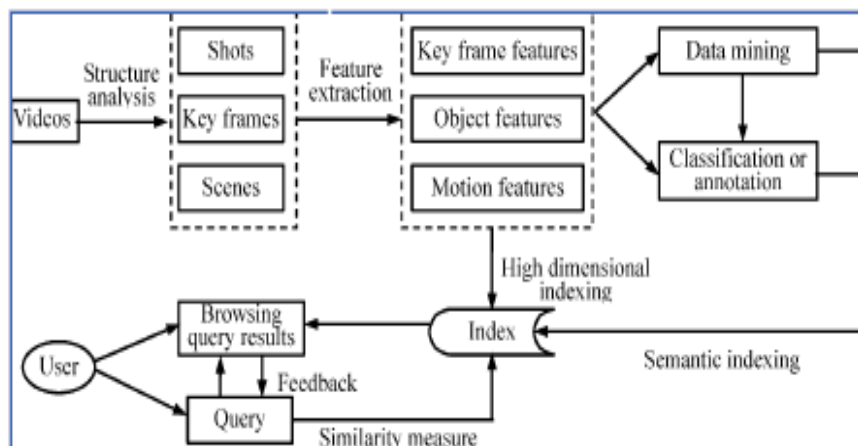


Figure 2.2 Generic framework for visual content-based video indexing and retrieval.

Need for Content-Based Retrieval Systems

Content Based Searching (CBS), in itself, is related to Semantic understanding of user queries. Hence, this study is directed towards proposing a framework for better understanding of the video queried and the data that is present in the Knowledge Warehouse. Content based searching is an extremely exceptional concept that can accelerate intelligence in fields such as Machine Learning and Artificial Intelligence. Areas that can avail of this facility are the military where for instance in a video with muffled audio or a plain audio track, the CBR system can implement a Noise Detection and Content-Based Audio Retrieval algorithm to help detect noise and unwanted signals and a removal algorithm to get the required speech signal and amplify them.

In Crime Prevention point of view, criminal instances and situations captured by CCTV cameras can undergo the said CBVR system, have its contents classified and stored accordingly in the Knowledge Data Warehouse and then a pattern matching algorithm will be implemented to retrieve similar instances of crime available in the warehouse. This will help Police, Government and Federal agencies decipher more information from the captured CCTV videos from the similarities of the retrieved videos. . For educational purposes, semantically analyzing video and audio can provide lecture videos specifically catering to the user needs. In medicine, most of the images are scanned copies of X-Rays, Sonogram, Ultrasound, MRI etc. A content based retrieval system for this database can aid in research studies and teaching purposes. Speaking of Content based Audio Retrieval systems (CBAR), interpretation of audio content would ultimately ease many multimedia applications. These include digital libraries, sports and news footage, surveillance as well as sound browsers for musicians and effect designers [4].

Video Structure Analysis using Shot Boundary Detection

The first stage involves segmenting videos into shots i.e a consecutive sequence of frames caught between the start and end operation during recording, this in turn points out the boundaries of the shots [HYPERLINK \l "HuW11" 5]. These shots have semantic meaning and are therefore used during the process of classification. Shot boundary detection algorithms usually first retrieve the visual information of each frame, perform similarity measurements after which a boundary is made between frames that are dissimilar. A variety of aspects are considered for the algorithm including:

- Color Histogram
- Block Color Histogram
- Edge Change Ratio
- Motion Vectors

Together with other important elements like:

- Scale invariant feature transform

Corner points

- Information saliency map and so on depending on requirements5]

After highlighting the features to be extracted, a feature extraction algorithm will be implemented which will be discussed in the coming chapters. A number of algorithms are available but Euclidean distance algorithm is the most commonly used and so will my proposal. Now, the shot boundary detection algorithm will be implemented to detect the boundaries. There are two approaches:

- Threshold Based and
- Statistical Learning based [HYPERLINK \l "HuW11" 5].

We will be using a form of the latter which follows Unsupervised Learning based algorithms. These algorithms are of two types:

- Frame similarity based and
- Frame Based.

We will be using the K-means clustering algorithm because it's the simplest unsupervised learning algorithm that solves the clustering problem faced in Frame similarity based approach.

Key Frame Extraction

After shots have been made, among them are multiple frames that reiterate. For this purpose, only frames that possess the required features to represent the shot are picked up as key frames. Redundancies have to be avoided as much as possible. The elements used for the extraction of the key frames include:

- Colors
- Edges
- Shapes
- MPEG 7 and so on5].

Scene Segmentation

A Scene is basically a collection of shots that have an underlying semantic meaning. To acquire optimum video retrieval results, the use of such scenes are required. There are 3 types of scene segmentation:

- Key Frame based
- Audio-Visual based and
- Background based.

As mentioned in the title, we are moving forward with the Audio-Visual based algorithm. This is approach uses the concept of a time constraint nearest neighbor algorithm to achieve scene segmentation.

BIBLIOGRAPHY

1. Marjan Mansourvar and Maizatul Akmar Ismail, "Content-Based Image Retrieval (CBIR) in Medical Systems," International Journal of Information Technology, vol. 20, no. 2, 2014.
2. Madhav Gitte, Harshal Bawaskar, Sourabh Sethi, and Ajinkya Shinde, "CONTENT BASED VIDEO RETRIEVAL SYSTEM," IJRET, vol. 3, no. 6, pp. 430 - 435, June 2014.
3. Ricardo Da Silva Torres and Alexandre Xavier Falcão, "Content-Based Image Retrieval: Theory and Applications," RITA, vol. XIII, no. 2, pp. 165 - 189, 2006.
4. Erling Wold, Thom Blum, Douglas Keislar, and James Wheaton. MuscleFish LLC. [Online]. HYPERLINK "http://www.musclefish.com/crc/crcwin.html" <http://www.musclefish.com/crc/crcwin.html>
5. John Eakins and Margaret Graham, "Content-based Image Retrieval," University of Northumbria, Newcastle, 1999.