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A Review Paper on Content Based Image Retrieval

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Abstract - ***Content Based Image Retrieval is most recently used technique for image retrieval from large image database. The reason behind using CBIR is to get perfect and fast result. There are many technique of CBIR used for image retrieval. A Block Truncation Coding technique is the famous method used for image retrieval. BTC is an image compression method uses two stages namely encoding and decoding. BTC is also used to index the images in database. BTC further has been inspired by many coding techniques for achieving its stability and simplicity. In proposed system the advanced technique of BTC is used that is Ordered Dither Block Truncation Coding (ODBTC). In this approach the CBIR is applied on video instead of images. ODBTC technique is used as an indexing scheme for indexing the images from video and as the video is a collection of image frames so the ODBTC technique is directly applied on it.***

Key Words: *Bit pattern feature, color co-occurrence feature, content-based image retrieval, ordered dither block truncation coding.*

1. INTRODUCTION

1.1 Content Based Image Retrieval (CBIR):

Content Based Image Retrieval (CBIR) is the method of retrieving images from the large image databases as per the user demand. It is also known as Query By Image Content (QBIC) and Content Visual Information Retrieval (CBVIR). In CBIR, content based means the searching of image is proceed on the actual content of image rather than its metadata. The Content Based Image Retrieval System is used to extract the features, indexing those features using appropriate structures and efficiently provide answers to the user's query. To provide the satisfactory answer to the user query, CBIR provides some flow of work. Firstly CBIR system takes the RGB image as an input, performs feature extraction, performs some similarity computations with the images stored in database and retrieves the output image on the basis of similarity computation. There are some basic CBIR fundamentals and are divided into three parts such as feature extraction, multidimensional indexing and Retrieval system architecture.

Feature Extraction:

Features are divided into two categories respectively text based and visual based. Textual features are keywords, tags, annotations etc. Visual features are color, space and texture etc. Visual features are the important features of an image for pattern recognition.

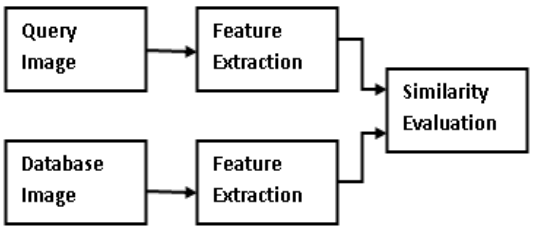

Fig 1: Block Diagram of CBIR

i. Color:

This is one of the most important feature of CBIR. Histogram, Block based, Color histogram moments are some examples where color features are used to retrieve images. It is widely used for image representation and independent of size of an image. Color feature extraction uses color space, color quantization and similarity measurement key components. RGB and HSV are two color based and hardware based color models used for feature extraction.

ii. Texture:

Texture describes visual pattern and it contains important information about structural arrangement of the surface including cloud, trees, bricks, hair and fabric and its relationship to the surrounding environment. Some methods of classifying texture include:

a) Color Co-Occurrence Matrix
b) Low Texture Energy.
c) Wavelet Transform.

iii. *Shape:*

Shape does not refer to the shape of an image but to the shape of a particular region that is being sought out. Shape descriptors may also need to be invariant to translation, rotation and scale. Some shape descriptor includes:

a) Fourier Transform
b) Moment Invariant

Multidimensional Indexing:

Multidimensional indexing techniques are mainly used to make the CBIR truly scalable large size image collection. Most of the images are having high dimensionality. So the best way to index such images is to reduce the dimensionality and then indexing the images. For dimension reduction, clustering is used. Clustering can be used in various forms like pattern recognition, speech analysis and information retrieval. Clustering can be performed row wise as well as column wise to perform recognition or grouping.

Retrieval System Architecture and Similarity matching:

Images are indexed after feature extraction and then similarity measurement is performed. Similarity evaluation is done between the features of the query image and the features of the target image in the database. Similarity measure computes the degree of similarity between a pair of images. It represents the distance between feature vectors representing the images. Similarity images should have smaller distance between them and different images should have large distance.

2. APPLICATIONS OF CBIR

Following are some applications where CBIR technique is mainly used.

i) CBIR is popular for police force for picture recognition in crime prevention.
ii) Medicine Diagnosis.
iii) Architectural and Engineering Design.
iv) Fashion and Publishing.
v) Geographical information and remote sensing.
vi) Home Entertainment.

3. CBIR TECHNIQUES

There are some techniques the content based image retrieval system used for image retrieval in many applications.

Relevance Feedback:

As per time varies different users may have different need. User follows the following typical scenario for relevance feedback in CBIR:

i) Machine provides early image retrieval results.
ii) User provides his opinion that whether the retrieved image is relevant or not.
iii) Machine takes the user feedback and again search for images according to user query.

Semantic Template:

This technique is generated to support high level image retrieval and not so widely used. This technique is usually defined as the representative feature of concept calculated from a collection of sample images.

Wavelet Transform:

Wavelet transform is based on diminutive waves called wavelet of varying frequency and limited duration. Discrete Wavelet transform divides the images into four different parts namely higher frequency part (HH), High Low Frequency part (HL), Low High Frequency part (LH), and Lower frequency part (LL). After doing the vertical parts as 1-level images decomposition, it computes moments of all parts and store and use it as feature to obtain images.

Gabor Filter:

It is widely used for texture analysis because of its similar characteristics with human perception. A two dimensional Gabor function g(x, y) consists of a sinusoidal plane wave of some frequency and orientation (Carrier), and two dimensional translated. Gaussian Envelope is used to modulate it.

Support Vector Machine:

It is supervised learning technique in which data is analyzed and identify pattern used for classification purpose. In classification it takes set of input, read it and forms output for each desired input and if the output is continuous then regression is performed.

4. LITERATURE REVIEW

In previous work CBIR system is developed using BTC [1]. Here two image features have been proposed namely block color co-occurrence matrix and block pattern histogram, to index a set of images in database [2]. In [2] RGB color space used for the generation of image feature whereas the image indexing scheme in [3] used YCbCr color space respectively, the BTC encoding is performed only for Y color space, By employing VQ, two image features (contrast and visual pattern co-occurrence matrix and color pattern co-occurrence matrix) are generated from a YCbCr image. Some improvements on the BTC-based image retrieval system can also be found in [4] and

[6] in which both methods utilize the RGB color space for the extraction of the image feature descriptor.

In [4], the BTC encoding is performed on each color space (Red, Green and Blue) separately. The traditional color histogram and bit pattern codebook are subsequently extracted from each color channel.

In [11], Content Based Image Retrieval techniques are applied using half toning block truncation coding. In this Ordered Dither Block Truncation Coding (ODBTC) method is used to compress and decompress the image and also used for indexing the image blocks.

Nowadays this CBIR technique is applied on video retrieval. In [7], a new approach is introduced to facilitate the searching and browsing of large image collections over World Wide Web. In this Paper, low level visual properties extracted from video frame and then video analysis is done on these video frames. In this technique multiple features from video frames are extracted for indexing. In [8], new approach is introduced in which multimedia retrieval framework focusing on video objects, which uses MPEG-7 standard. This approach mainly used for bandwidth limited web applications in which it provides the content based retrieval interface.

5. CONCLUSIONS

As the Content Based Image Retrieval technique is applied only on images, in proposed system this CBIR technique is applied on videos. Video is a collection of image frames so each individual frame is considered as the single image. Feature extraction is done on each image frame. This approach is used only for the live streaming video of .avi file format.

In this approach the ODBTC indexing technique is used for indexing the images but in video, the image frames are already in sequence so ODBTC is directly applied on the predefined sequence of image frames in video.

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