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COMBINATION OF CONTENT BASED IMAGE RETRIEVAL TECHNIQUES FOR PERFORMANCE IMPROVEMENT

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***Abstract*- Image retrieval is a poor stepchild to other forms of information retrieval (IR). Image retrieval has been one of the most interesting and vivid research areas in the field of computer vision over the last decades. Content-Based Image Retrieval (CBIR) systems are used in order to automatically index, search, retrieve, and browse image databases. Color and texture features are important properties in content-based image retrieval systems. In this paper we have mentioned detailed classification of CBIR system. We have defined different techniques as well as the combinations of them to improve the performance. We have also defined the effect of different matching techniques on the retrieval process [1].**

***Keywords*: CBIR, Feature Extraction, Image Retrieval**

I INTRODUCTION

During the past few years, Content Based Image Retrieval (CBIR) has gained much devotion for its potential application in multimedia management. It is motivated by the fiery growth of image records and the online accessibility of remotely stored images. In the current stage, an effective search engine is needed for huge dataset. Different from traditional search engine, in CBIR search will analyses the actual contents of the image rather than the metadata such as keywords, tags, and descriptions associated with the image. The term 'content' in this context might refer to colors, shapes, textures, or any other information that can be derived from the image itself. It is also known as Query By Image Content (QBIC) and Content-Based Visual Information Retrieval (CBIR) [4].

The CBIR system have used in varies applications such as Crime prevention, The military, Intellectual property, Architectural and engineering design, Fashion and interior design, Journalism and advertising, Medical diagnosis, Geographical information and remote sensing systems ,Cultural heritage, Education and training, Home entertainment and web searching.

II CLASSIFICATION OF IMAGE RETRIEVAL SYSTEM

Current image retrieval techniques can be classified according to the type and the nature of the features used for indexing. Detailed Classification of complete retrieval system is given in below:

CBIR—

1) Color---
- Histogram
  --Global
  --Local
- Mean

2) Texture---
- Structural
- Model
- Filter based

3) Shape---
- Tile based
- Region based

III CONTENT BASED IMAGE RETRIVAL

A growing interest in the area of CBIR is found in recent years due to the hope that the above-mentioned problems might be solved. It is a central issue in CBIR to identify a set of salient image features for indexing and similarity evaluation. Color, shape, texture and spatial relationships among segmented objects are typical features employed for image indexing. Some researches combine two or more of these features to improve retrieval performance.

The main goal in CBIR system is searching and finding similar images based on their content. To accomplish this, the content should first be described in an efficient way, e.g. the so-called indexing or feature extraction

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and binary signatures are formed and stored as the data. When the query image is given to the system the system will extract image features for this query. It will compare these features with that of other images in a database. Relevant results will be displayed to the user. Fast and accurate retrievals among the data collections can be done according to the content description of the query image.

There are many factors to consider in the design of a CBIR systems based on the domains and purposes, choice of right features, similarity measurement criteria, indexing mechanism, and query formulation technique. The most important factors in the design process is the choice of suitable visual features and the methodologies to extract them from raw images, as it affects all other subsequent processes.

By the nature of its task, the CBIR technology boils down to two intrinsic problems: (a) how to mathematically describe an image which can also be called as feature extraction.(b) how to assess the similarity between a pair of images based on their abstracted descriptions. Which can also be called as matching.[5]. In typical content-based image retrieval system the visual contents of the images in the database are extracted and described by multi-dimensional feature vectors. The feature vectors of the images in the database form a feature database. To retrieve images, users provide the retrieval system with example images or sketched figures. The feature vector of this query image is extracted. Then the extracted feature vector of query image is compared with the feature vector in the database. As a result of the query, similar images are retrieved according to their similarities between the feature vectors of the query example or sketch and those of the images in the database. We use color histogram, histogram equalization, HSV histogram and compared the result as a color descriptors and discrete descriptors .Both color and texture features of images are extracted and stored as feature vectors in a database. During the retrieval process, the color and texture feature vector of the query image is computed and matched against those features in the database. We used Euclidean distance method, Canberra distance and city block distance method for similarity measurement and compared the result.

IV IMAGE RETRIEVAL USING COLOR AND TEXTURE FEATURE

Most of the early studies on CBIR have used only a single feature among various color and texture features. However, it is hard to attain satisfactory retrieval results by using a single feature because, in general, an image contains various visual characteristics. Recently, active researches in image retrieval using a combination of color and texture features have been performed. For an advanced CBIR, it is necessary to choose efficient features that are complementary to each other so as to yield an improved retrieval performance and to combine chosen features effectively without increase of feature vector dimension.Fig.1 is the block diagram of the proposed retrieval method. When an RGB query image enters the retrieval system, it is first transformed into HSV color image then color feature is extracted and formed the color feature vector. Similarly the texture feature is extracted and formed the texture feature vector. After the color and texture feature vectors are extracted, the retrieval system combines these feature vectors, calculates the similarity between the combined feature vector of the query image and that of each target image in an image database, and retrieves a given number of the most similar target images.

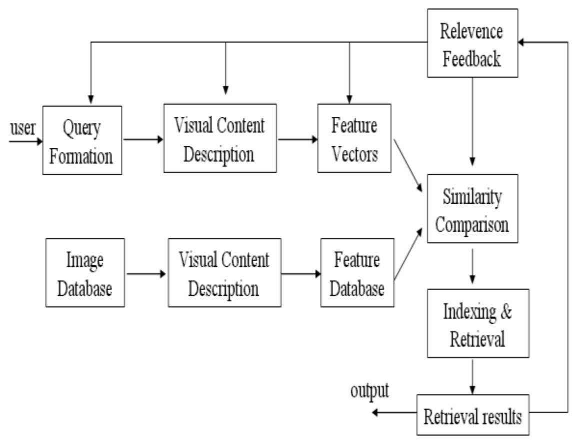

Figure1. Block Diagram of CBIR System

A. Color Features

Several methods for retrieving images on the basis of color similarity have been described in the literature, but most are variations on the same basic idea. Each image added to the collection is analysed to compute a colour histogram which shows the proportion of pixels of each colour within the image the colour histogram for each image is then stored in the database. At search time, the user can either specify the desired proportion of each colour (75%) olive green and 25%red, for example), or submit an example image from which a colour histogram is calculated. Either way, the matching process then retrieves those images whose colour histograms match those of the query most closely. we can used the Global color histogram, Local color histogram, HSV method for extracting the color feature and matched the result by using Euclidean distance, Canberra distance ,and city block distance method and showed the result.

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B. Texture feature

In CBIR, texture features play a very important role in computer vision and pattern recognition, especially in describing the content of images. Texture features typically consist of contrast, uniformity, coarseness, and density. Importance of the texture feature is due to its presence in many real world images: for example, clouds, trees, bricks, hair, fabric etc., all of which have textural characteristics .Earlier methods [3][4] for texture image retrieval suffer from two main drawbacks. They are either computationally expensive or retrieval accuracy is poor. Here we concentrate on the problem of finding good texture features for CBIR, which are efficient both in terms of accuracy and computational complexity. There are two main approaches for texture representations, statistical method and transform method. Here we have calculated mean and standard deviation of the query image and of the database image and compared the result. We have also used the DWT .The wavelet representation of a discrete signal X consisting of N samples can be computed by convolving X with the low pass and high pass filters and down sampling the output signal by 2, so that the two frequency bands each contains N=2 samples. With the correct choice of filters, this operation is reversible. This process decomposes the original image into two sub-bands: the lower and the higher band. This transform can be extended to multiple dimensions by using separable filters. A 2D DWT can be performed by first performing a 1D DWT on each row (horizontal filtering) of the image followed by a 1D DWT on each column (vertical filtering). In order to form multiple decomposition levels, the algorithm is applied recursively to the LL sub band.

V MATCHING TECHNIQUES

Distance between two images has to be calculated to find if there is any match or not. Distance will help us in finding degree of matching for the entire data base. There are different distances available which are used and compared the performance of all these distances.
Euclidean distance method is calculated using equation

$$d = \sqrt{\sum_{i=1}^{n} (Xi - Yi)}^2$$

City Block Distance is calculated using equation

$$dij = \sum_{k=1}^{n} |Xij - Xjk|$$

Canberra Distance method is calculated using equation

$$dij = \sum_{k=1}^{n} \frac{|Xik - Xjk|}{|Xik| + |Xjk|}$$

VI ISSUES

The biggest issue for CBIR system is to incorporate versatile techniques so as to process images of diversified characteristics and categories. Many techniques for processing of low level cues are distinguished by the characteristics of domain-images. The performance of these techniques is challenged by various factors like image resolution, intra-image illumination variations, non-homogeneity of intra-region and inter-region textures, multiple and occluded objects etc. The other major difficulty, described as semantic-gap in the literature, is a gap between inferred understanding / semantics by pixel domain processing using low level cues and human perceptions of visual cues of given image. In other words, there exists a gap between mapping of extracted features and human perceived semantics. The dimensionality of the difficulty becomes adverse because of subjectivity in the visually perceived semantics, making image content description a subjective phenomenon of human perception, characterized by human psychology, emotions, and imaginations. The image retrieval system comprises of multiple inter-dependent tasks performed by various phases.

VII CBIR SYSTEMS

A brief summary of some of the CBIR systems has been presented in this section. QBIC - Query By Image Content system, developed by IBM, makes visual content similarity comparisons of images based on properties such as color percentages, color layout, and textures occurring in the images. The query can either be example images, user-constructed sketches and drawings or selected color and texture patterns The IBM developed QBIC technology based Ultimedia Manager Product for retrieval of visually similar images Virage and Excalibur are other developers of commercial CBIR systems. VisualSEEk - a joint spatial-feature image search engine developed at Columbia University performs image similarity comparison by matching salient color regions for their colors, sizes and absolute & relative spatial locations. Photobook developed at Media Laboratory, Massachusetts Institute of Technology – MIT for image retrieval based on image contents where in color, shape and texture features are matched for euclidean, mahalanobis, divergence, vector space angle, histogram, Fourier peak, and wavelet tree distances. The incorporation of interactive learning agent, named *FourEyes* for selecting & combining feature-based models has been a unique feature of Photobook MARS -Multimedia Analysis and Retrieval Systems and FIRE- Flexible Image Retrieval Engine incorporate relevance feedback from the user for

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subsequent result refinements. Similar images are retrieved based on color features, Gabor filter bank based texture features, and Fourier descriptor based shape features and spatial location information of segmented image regions in NeTra.
For efficient indexing, color features of image regions has been represented as subsets of color code book containing total of 256 colors. The frame work proposed in has been incorporated for image segmentation in NeTra. PicSOM (Picture & Self-organizing Map) was
Implemented using tree structured SOM, where SOM was used for image similarity scoring method Visual content descriptors of MPEG-7 (Moving Pictures Expert Group Multimedia Content Description Interface) were used in PicSOM for CBIR techniques and performance comparison with Vector Quantization based system was proposed. Incorporation of relevance feedback in it caused improvements in the precision of results of Picsom.

VIII CONCLUSION

CBIR is used to search a specific image from a large database .The main challenge in front of the CBIR system is time complexity and to design the good, efficient GUI. The road map of development of CBIR techniques began with simple primitive features based indexing methodologies that later got enhanced with combinational features. Two major issues, semantic-gap and subjectivity of semantics are addressed by the state of the art techniques. Many state of the art techniques incorporate iterative relevance feedback from user for refinement of results. Semantic gap bridging approaches based on fuzzy, evolutionary and neural network have also been reported. Hierarchical approaches for feature extraction and representations achieve hierarchical abstraction; help matching semantics of visual perception of human beings. Several modern techniques focus on improvements on processing of low level cues so as to precisely extract features.

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