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Content Based Image Retrieval

Showkat Ahmad Dar[1], Zahid Gulzar Khaki[2]
[1]*(Department of Computer Science Engineering, Islamic University of Science and Technology, Awantipora*
[2]*(Department of Electronics & communication Engineering, Islamic University of Science and Technology, Jammu and Kashmir 192221, India*

Abstract: *With the passing years, many advanced technologies have come into existence for efficientimage retrieval. Research in content-based image retrieval (CBIR) in the past has been focused on image processing, low-level feature extraction. The accuracy of retrieval has subsequently increased with the use of low level features such as color, texture, shape etc. But still image retrieval using low level features has been restricted to a specific efficiency. Extensive experiments on CBIR systems demonstrate that low-level image features cannot always describe high-level semantic concepts in the users" mind. Because, using low level features only does not include human perception. If human intervention is allowed in the image retrievalsystem the efficiency boosts up. Therefore, in this research my aim is to reduce the semantic Gap between the low level and high level features because the CBIR systems should provide Maximum support in bridging the "semantic gap" between low-level visual features and the Richness of human semantics.*
Keywords- *CPW, CST, FR4, LAN, WiMAX*

I. Introduction

Recent advances of technology in digital imaging and digital storage devices make it possibleto easily generate, transmit, manipulate and store large number of digital images and documents. As a result of advances in the Internet and new digital image sensor technologies, the volume of digital images produced by scientific, educational, medical, industrial, and other applications available to users increased dramatically. Various methods and algorithms have been proposed for image addressing. Such studies revealed the indexing and retrieval concepts which have further evolved to Content Based Image Retrieval (CBIR).Concept of CBIR evolved in early 1990"s.

Content Based Image Retrieval (CBIR) is any technology that helps to organize and retrieve digital image database by their visual content. It is the process of retrieving image from a collection based on automatically extracted features by generally using low level features. It uses the visual contents of an image such as colour, shape, texture, and spatial layout to represent and index the image. In typical Content-based image retrieval systems (Fig.1.2.2), the visual contents of the images in the Database are extracted and are then described by feature vectors. The feature vectors of the Images in the database form a database. To retrieve images, users provide the retrieval system With example images or sketched figures. The system then changes these examples into its internal representation of feature vectors. The similarities between the feature vectors of the query example and those of the images in the database are then measured and retrieval is performed with the aid of an indexing scheme. The indexing scheme provides an efficient way to search for the image database. Recent retrieval systems have incorporated users' relevance Feedback to modify the retrieval process in order to generate semantically more meaningful retrieval result.

1.2 Types of image retrieval

Image retrieval can be of two types:

- Text Based Image Retrieval
- Content Based Image Retrieval

1.2.1 Text based image retrieval: It uses traditional database techniques to manage images. Through text descriptions, images can be organized by topical or semantic hierarchies for easy navigation and browsing based on some standard Boolean queries. However, since automatically generating descriptive texts for a wide spectrum of images is not feasible, most text-based image retrieval systems require manual annotation of images. Text retrieval is the basis of image retrieval since many techniques come from this domain

- Text has more semantics than visual features, but it has many other problems associated.
- Text and image features combined have highest chances for success. Text should be used wherever applicable.
- Multilinguality is an important issue as most of the web is very multilingual.

- In it images are indexed using keywords, headings, codes, which are then used as Retrieval keys.

Disadvantages
- It is non-standardized because different users use different keywords for annotation.
- It is sometimes incomplete.
- Humans are required to personally describe every image, therefore, cumbersome and labor intensive.

1.2.2 BLOCK DIAGRAM

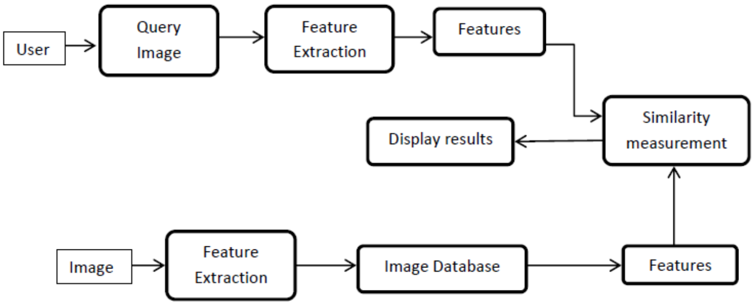

Figure 1.2.2

1.2.3 APPLICATIONS:
- Feature Extraction
- Image Database
- Features
- Display results
- Similarity measurement
- Image
- Commercials
- Governmental purposes
- Academic institutes such as libraries
- Remote sensing and surveillance
- Crime prevention
- Medicine
- Architecture design
- Fashion Industry
- Engineering Applications
- Journalism and Advertising

II. Different Techniques Of Image Retrieval

2.1 Content based image retrieval using advanced color and texture features: it uses two feature extraction techniques have been employed. In it color and texture features are used i.e. low level features. The texture features were extracted from the query image by applying block wise DCT and from the retrieved image the color features were extracted by using moments of color. Here 3 different techniques were used for the retrieval of images: Using colour and texture (HSV and YCbCr), Using only color, Using only texture. Among the three techniques the first one i.e. using colour and texture gave better results as compared to the other two techniques. This system provided an efficiency of 60% .

2.2 Recompressing images to improve image retrieval performance: Image compression has been an important aspect in image retrieval system. Most of the images are compressed in jpeg format because of ease of its use. However compression of an image drops the performance of the system i.e. content based image retrieval. In this paper it is shown that this drop can be reversed. This is achieved by compressing the images even more. This is done by recompressing images to their lowest common image quality setting. Looking at the results, it can be said that proposed method does indeed provide a significant boost in terms of Retrieval performance. In almost all cases, retrieval performance improves.

2.3 Content-Based Microscopic Image Retrieval System for Multi-Image Queries: the design and development of a multitiered content-based image retrieval (CBIR) system for microscopic images utilizing a reference database that contains images of more than one disease. The proposed CBIR system uses a multitiered approach to classify and retrieve microscopic images involving their specific subtypes, which are mostly difficult to discriminate and classify. This system enables both multi-image query and slide-level image retrieval in order to protect the se-mantic consistency among the retrieved images. New weighting terms, inspired from information retrieval theory, are defined for multiple-image query and retrieval. The performance of the sys-tem was tested on a dataset including 1666 imaged high power fields extracted from 57 follicular lymphoma (FL) tissue slides with three subtypes and 44 neuroblastoma (NB) tissue slides with four subtypes

2.4 Image Retrieval using Shape Feature: The retrieval of image in this paper is on based on shape feature The major problem in the use of shape feature is how to represent shape information, and how to describe the shape of an object. The proposed method is a contour based approach. Canny operator is used to detect the edge points of the image. The contour of the image is traced by scanning the edge image and re-sampling is done to avoid the discontinuities in the contour representation. The resulting image is swept line by line and the neighbor of every pixel is explored to detect the number of surrounding points and to derive the shape features. The average retrieval efficiency for the top 20 images is 71.17%

2.5 An Image Retrieval System with Automatic Query Modification: A novel idea iPURE (Perceptual and user friendly retrieval) has been introduced that uses the method of intra-query modification and learning. Color, shape and spatial features of individual segments are used for image representation and retrieval. The proposed system automatically generates a set of modifications by manipulating the features of the query segments. An initial estimate of user perception is learned from the user feedback provided on the set of modified images. This largely improves the precision in the first database search itself and alleviates the overheads of database search and image download. Precision-to-recall ratio is improved. It differs from the traditional approaches in that it employs a methodology of intra-query modification and learning to reduce the need for traditional compute-and bandwidth-intensive relevance feedback mechanism

2.6 Image Retrieval Using Local Color Features: In this study, an image indexing and retrieval approach using local color features and a modified weighted color distortion measure is proposed. In the proposed approach, each image is segmented into several regions by a watershed segmentation algorithm, and then the mutual relationships between connected color regions are extracted as local color features. That is, an image can be represented as 8 set of connected (adjacent) color regions and the mutual relationships between connected color regions. In the image retrieval stage, the similarity between a query image and a target image will contain not only direct region correspondence but also the mutual relationships between connected color regions

III. Comparison Of Various Techniques

1.TECHNIQUE	It is based on Relevance feedback with a history log where the user can store relevance feedback information. To avoid errors, a technique named "soft label support vector machine" has been introduced
ADVANTAGE	Relevance feedback when used alone was very time consuming, boring and tiring for the user. With this technique introduced, it does not remain so. SVM is capable of handling noisy data.
DISADVANTAGE	Computational complexity. Computational cost is high.
FUTURE PROSPECT	In the current scheme, only the classification model in the space of image features is considered. It would be possible to apply the method in the reverse direction by first computing the soft labels from the image features and then building a classification model in the space of the users" relevance judge men
2.TECHNIQUE	It used two features namely, colour and texture. The texture features are extracted by applying block wise DCT on the whole image and from retrieved images the colour features are extracted by calculating the moments of colours
ADVANTAGE	Does not need complex computation.
DISADVANTAGE	For the analysis of a texture image, it requires large storage space and a lot of computation time to calculate the matrix of feature.
3. TECHNIQUE	The proposed technique is contour based approach using canny operator for detecting edge points
ADVANTAGE	Retrieval efficiency is found to be 71.17% for the top 20 images. It is simple and effective for shape based image retrieval
DISVANTAGE	The efficiency is low when compared with retrieval involving other features like colour, texture etc.

IV. Approaches For Reduction Of The Semantic Gap

The aim of this paper work is to reduce the semantic gap between the low level and high level features. Now days, in order to improve the retrieval accuracy of content-based image retrieval systems, research has been shifted from designing sophisticated low-level feature extraction algorithms to reducing the "semantic gap" between the visual features and the richness of human semantics. Humans tend to use high-level features, such as keywords, text descriptors, to interpret images and measure their similarity. While the features automatically extracted using computer vision techniques are mostly low-level features (color, texture, shape, spatial).

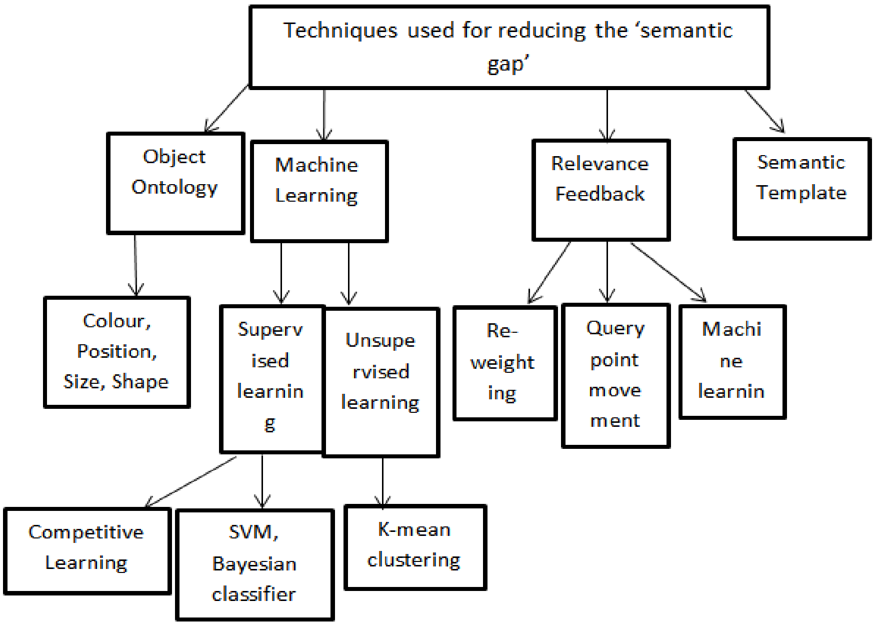

Fig. (3.1) Techniques that can be used for reducing the semantic gap.

4.1 Using object ontology to define high-level concepts: In some cases, semantics can be easily derived from our daily language. For example, sky can be described as „upper, uniform, and blue region". In systems using such simple semantics, firstly, different intervals are defined for the low-level image features, with each interval corresponding to an intermediate-level descriptor of images, for example, "light green, medium green, dark green". These descriptors form a simple vocabulary, the so-called "object-ontology" which provides a qualitative definition of high-level query concepts.

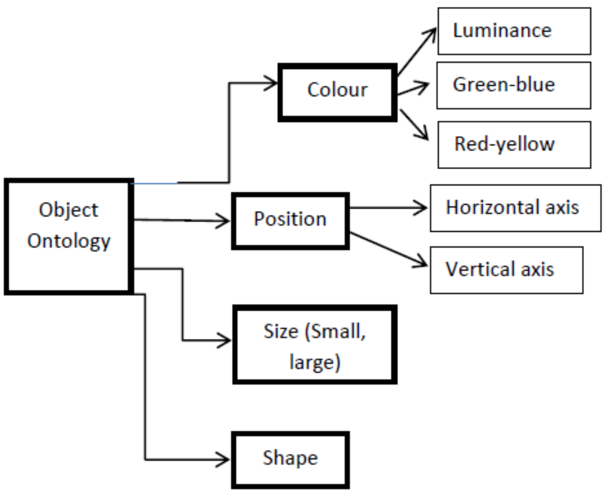

Fig.(4.1) Object Ontology.

4.2 Using machine learning tools: to associate low-level features with query concepts: to derive high level features machine learning can be done in two ways, namely supervised and unsupervised. Inn supervised learning the value of the output is based on set of input measure. In unsupervised learning, there is no outcome measure and the goal is to depict how the input data is clustered. An example of supervised learning is Support Vector Machine (SVM). SVM has been used for object recognition, text classification.

4.3 Introducing relevance feedback (RF): into retrieval loop: RF is a process which tries to learn the user's intentions. RF is a powerful tool traditionally used in text-based information retrieval systems. It was introduced to CBIR during mid-1990s, with the intention to bring user in the retrieval loop to reduce the "semantic gap" between what queries represent (low-level features) and what the user thinks.

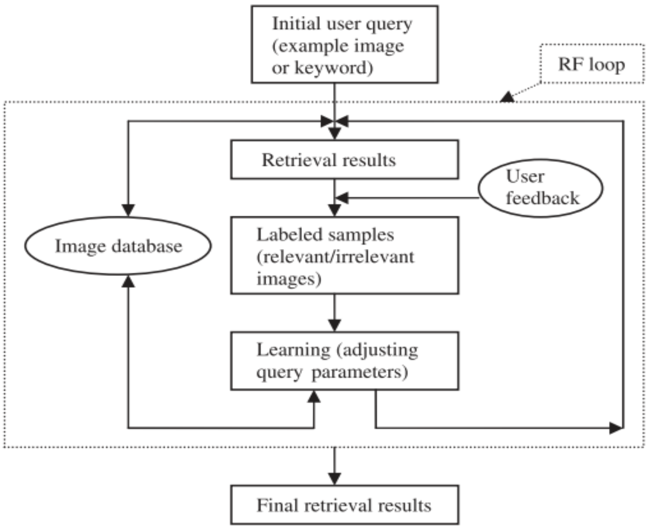

Fig.(4.3) CBIR with Relevance Feedback

4.4 Generating semantic template (ST) : To support high-level image retrieval: Semantic template is a promising technique in semantic based image retrieval. ST is a map between high-level concept and low-level visual features. ST is usually defined as the „representative" feature of a concept calculated from a collection of sample images.

4.5 Proposed Technique: The accuracy of retrieval has subsequently increased with the use of low level features such as colour, texture, shape etc. But still image retrieval using low level features has been restricted to a specific efficiency. As we have seen before, the techniques involving only low level features, gave results which were good and appropriate for specific type of images or database. If we apply the same techniques to large number and variety of images, the results were not appropriate. Experiments on CBIR systems demonstrate that low-level image features cannot always describe high-level semantic concepts in the users" mind. Because, using low level features only, does not include human perception. If human intervention is allowed in the image retrieval system the efficiency 999999999boosts up. In order to improve the efficiency of the CBIR systems we need to introduce high level features also. With the involvement of the high level features, the user's role comes into the play. Not only the efficiency of the CBIR system increases rather it gives every user an opportunity to retrieve images according to his choice and thinking. The aim of this dissertation work is to reduce the semantic gap between the low level and the high level feature. For achieving the same, the approach followed should use techniques including both low level features (color, texture etc.) and high level features (relevance feedback etc.). Therefore, the technique introduced for reducing the semantic gap is named as **"Relevance feedback based Adaptive Clustering for Content Based Image Retrieval**

V. Conclusion

In the recent trends, requirement of efficient image retrieval plays an important role. Therefore, for better retrieval results the technique should not only focus on visual content of the image but also on the semantics of the image. Many techniques have been introduced for efficient image retrieval which is solely based on low level feature extraction. But the aim of this dissertation work is to reduce the semantic gap between the low level and the high level features. Therefore, in this proposed technique, the focus is based on extracting low level features (color, texture, shape) and then applying Relevance Feedback and Adaptive Clustering on the initially retrieved results and then obtaining the final results. By using this technique, user intervention comes into play and helps bridging the gap between low level and high level features. This technique has proved to be efficient when compared with techniques which use only low level features. The comparison is based on the values of Precision and Recall. The values of both have shown a significant improvement after applying this technique.

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