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# A Content Based Image Retrieval Using Soft Computing Technique

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## ABSTRACT

The CBIR tends to index and retrieve images based on their visual content. CBIR avoids many problems associated with traditional ways of retrieving images by keywords. Thus, a growing interest in the area of CBIR has been established in recent years. The performance of a CBIR system mainly depends on the particular image representation and similarity matching function employed. The CBIR tends to index and retrieve images based on their visual content. CBIR avoids many problems associated with traditional ways of retrieving images by keywords. Thus, a growing interest in the area of CBIR has been established in recent years. The performance of a CBIR system mainly depends on the particular image representation and similarity matching function employed. So a new CBIR system is proposed which will provide accurate results as compared to previous developed systems. Soft technique will be used in this system. Based Image Retrieval system which evaluates the similarity of each image in its data store to a query image in terms of various visual features and return the image with desired range of similarity. To develop and implement an efficient feature extraction NN to extract features according to data set using Auto calculate the feature weight by neural network. The precision and recall graph in gui according to the retrieved contents of the images from the datasets. To Apply back propagation or feed forward algorithm for neural network classification. To calculate cross correlation and apply regression model for feature matching.


**Keywords :** CBIR, NN, ABIR, Precision, Recall

## I. INTRODUCTION

Image Processing is a process to convert an image into digital form and perform some operations to get an enhanced image and extract useful information from it. It is a study of any algorithm that takes an image as input and returns an image as output. Image processing is referred to processing of a 2D picture by a computer. It is a form of signal privilege in which image is input similar to video frame or photograph and is image or characteristics associated with that image may be output. Image processing system treat images as two dimensional signals and set of signals processing methods are applied to them. It is latest technology and its applications in various aspects of a business.

There are different types of image processing fields like computer graphics where images are created, image processing where manipulation and enhancement of images are to be done and computer vision where analysis of images is done.

## II. METHODS AND MATERIAL

### 1. Content Based Image Retrieval

As the use and processing of digital images increased now days, researchers are continually developing improved access methods to retrieve images from a large database.

Generally, image retrieval procedures can be roughly divided into two approaches :

1. Annotation-based image retrieval (ABIR)
2. Content-based image retrieval (CBIR).
3.

In ABIR, images are often annotated by keywords. Although ABIR potentially offers the most accurate information when images are well-named or annotated, it still has some drawbacks such as: the manual image annotation is time-consuming, human annotation is subjective, and some images could not be annotated because it is difficult to describe their content with words. The CBIR tends to index and retrieve images based on their visual content. CBIR avoids many problems associated with traditional ways of retrieving images by keywords. Thus, a growing interest in the area of CBIR has been established in recent years. The performance of a CBIR system mainly depends on the particular image representation and similarity matching function employed [1].

## 2. The Semantic Gap

The fundamental difference between content-based and text-based retrieval systems is that the human interaction is an indispensable part of the latter system. Humans tend to use high-level features (concepts), 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 layout, etc.). In general, there is no direct link between the high-level concepts and the low-level features [2]. Though many sophisticated algorithms have been designed to describe color, shape, and texture features, these algorithms cannot adequately model image semantics and have many limitations when dealing with broad content image databases [12]. Extensive experiments on CBIR systems show that low-level contents often fail to describe the high level semantic concepts in user's mind [13]. Therefore, the performance of CBIR is still far from user's expectations.

## 3. High-Level Semantic-Based Image Retrieval

How do we relate low-level image features to high-level semantics? Our survey shows that the state-of-the-art techniques in reducing the 'semantic gap' include mainly five categories: (1) using object ontology to define high-level concepts, (2) using machine learning tools to associate low level features with query concepts, (3) introducing relevance feedback (RF) into retrieval loop for continuous learning of users' intention, (4) generating semantic template (ST) to support high-level image retrieval, (5) making use of both the visual content of images and the textual information obtained from the Web for WWW (the Web) image retrieval. Retrieval at Level 3 is difficult and less common. Possible Level 3 retrieval can be found in domain specific areas such as art museums or newspaper library. Current systems mostly perform retrieval at Level 2. There are three fundamental components in these systems: (1) low-level image feature extraction, (2) similarity measure, (3) 'semantic gap' reduction. Excellent survey on low-level image feature extraction in CBIR system can be found in Ref. [11]. In this we focus on CBIR with high-level semantics. The rest of the paper is organized as follows. we briefly review various low-level image features used in high-level semantic-based CBIR systems.

## 4. Low-Level Image Features

Low-level image feature extraction is the basis of CBIR systems. To performance CBIR, image features can be either extracted from the entire image or from regions. As it has been found that users are usually more interested in specific regions rather than the entire image, most current CBIR systems are region-based. Global feature based retrieval is comparatively simpler. Representation of images at region level is proved to be more close to human perception system[6]. In this, we focus on region-based image retrieval(RBIR).To perform RBIR, the first step is to implement image segmentation. Then, low-level features such as color, texture, shape or spatial location can be extracted from the segmented regions. Similarity between two images is defined based on region features. This section includes a brief description of these three parts focusing on what are used in RBIR system with high-level semantics.

## 5. Image Segmentation

Automatic image segmentation is a difficult task. A variety of techniques have been proposed in the past, such as curve evolution [7], energy diffusion [9], and graph partitioning[19]. Many existing segmentation techniques work well for images that contain only homogeneous color regions, such as direct clustering methods in color space [9]. These apply to retrieval systems working only with colors [6].However, natural scenes are rich in both color and texture, and a wide range of natural images can be considered as a mosaic of regions with different colors and textures. Texture is an important feature in defining high-level concepts. As stated in [13], texture is the main difficulty in a segmentation method. Many texture segmentation algorithms require the estimation of texture model parameters which is a very difficult task [13]. 'JSEG' segmentation [13] overcomes these problems. Instead of trying to estimate a specific model for texture region, it tests for the homogeneity of a given color-texture pattern. ‘JSEG’ consists of two-steps. In the first step, image colors are quantized to several classes. Replacing the image pixels by their corresponding color class labels, we can obtain a class-map of the image. Spatial segmentation is then performed on this class-map which can be viewed as a special type of texture composition. The algorithm produces homogeneous color-texture regions and is used in many systems [12]. Fig. 1 gives two examples. Blob world segmentation [12] is another widely used segmentation algorithm .It is obtained by clustering pixels in a joint color-texture-position feature space. Firstly, the joint distribution of color, texture, and position features is modelled with a mixture of Gaussians. Then expectation maximization (EM) algorithm is used to estimate the parameters of the model. The resulting pixel-cluster membership provides a segmentation of the image. The resulted regions correspond roughly to objects. Some systems design their own segmentations in order to obtain the desired region features during segmentation, be it color, texture, or both [9,11]. These algorithms are usually based on k-means clustering of pixel/block features. In [9], firstly, an image is segmented into small blocks of size 4*4 from which color and texture feature are extracted. Then k-means clustering is applied to cluster the feature vectors into several classes with each class corresponding to one region. Blocks in same class are classified into same region. A so-called KMCC (k-means with connectivity constraint)is proposed in [11] to segment objects from images. It is extended from the k-means algorithm. In this algorithm, the spatial proximity of each region is taken into account by defining a new canter for the k-means algorithm and by integrating the k-means with a component labelling procedure. The use of segmentation algorithm depends on the requirements of the system and the data set used. It is hard to judge which algorithm is the best. For example, JSEG provides color-texture homogeneous regions, while KMCC intends to obtain objects which are usually not homogeneous. Compared with JSEG, KMCC is computationally more intensive. JSEG and Blob world segmentations seem to be the most widely used so far.

**RGB**

Human color perception combines the three primary colors: red (R) with the wavelength $l$=700 nm, green (G) with the wavelength $l$=546.1 nm and blue (B) with the wavelength $l$=435.8 nm. Any visible wavelength $L$ is sensed as a color obtained by a linear combination of the three primary colors (R, G, B) with the particular weights $c$R( $l$ ), $c$G( $l$) , $c$B( $l$):

$$F(l) = \mathrm{R}c\mathrm{R}(l) + \mathrm{G}c\mathrm{G}(l) + \mathrm{B}c\mathrm{B}(l)$$

## 6. Problem Definition

Content-Based Image Retrieval (CBIR), also known as Query by Image Content (QBIC) and Content-Based Visual Information Retrieval (CBVIR) is the application of image retrieval problem, searching for digital images in large database. Then there is inconsistency problem is faced in the CBIR. In the CBIR system regression problem is occurred. Their is build-up of noise and signal distortion during processing of Query images. In the previous system genetic algorithm and neural network is used to match the images but not extract the contents of the image. The fast retrieval of images from large databases is an important problem that needs to be addressed. High retrieval efficiency and less computational complexity are the desired characteristics of CBIR systems.The performance of a CBIR system mainly depends on the particular image representation and similarity matching function employed. So a new CBIR system is proposed which will provide accurate results as compared to previous developed systems. Soft technique will be used in this system.

## 7. Methodology/Planning of Work

We are proposing a technique for Content based image retrieval. The step by step methodology for the research process consists of preprocessing the image with suitable technique if the image is not clear or it require further enhancement. It increases the quality of the image. The next step consists of representation of an image into something that is more meaningful and easier to analyze. Then a feature extraction algorithm is implemented to extract suitable feature according to the data set available using soft computing techniques. A Content Based Image Retrieval system is developed which has high similarity measure between the query image and the database image. Finally the system is to be checked for effectiveness by means of recall precision graph.

**The proposed Steps for the work are given below:**

**Step 1:** Start
**Step 2:** Browse the input image dataset
**Step 3:** Select the choice
1.Color
2.Texture
3.Color sketch
4.Fusion Level
**Step 4:** Select Local and Global technique for retrieval
**Step 5:** Apply color histogram and HSV histogram
Or
**Step 6:** Apply Color Structure Descriptor (CSD)
**Step 7:** Select the number of binary matrix size
**Step 8:** Apply the different distances i.e. Euclidean, Quadric, KS, chi2, KL
**Step 9:** Apply texture extraction features: EHD, wavelet, HTD and Tamura
**Step 10:** Apply color sketch
**Step 11:** Apply Fusion level
**Step 12:** Apply back propagation or feed forward algorithm for neural network classification for content retrieval
**Step 13:** Analysis the precision and recall values according to the datasets.
**Step 14:** Repeat the Step 2 to Step 13 for multiple images
**Step 15:** Stop

## III. RESULTS AND DISCUSSION

Local level feature selection with correlation metrics

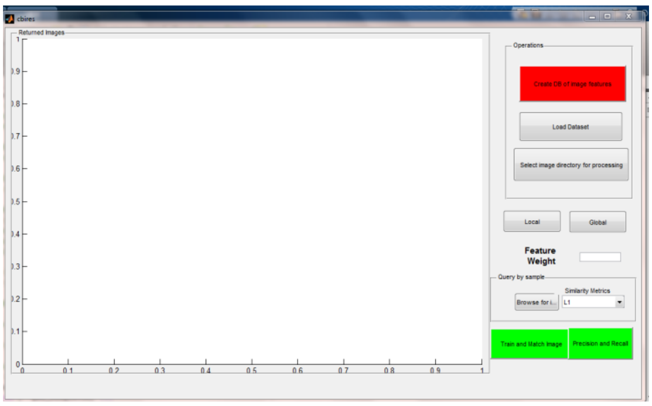

**Figure 1.** user interface for browsing the image

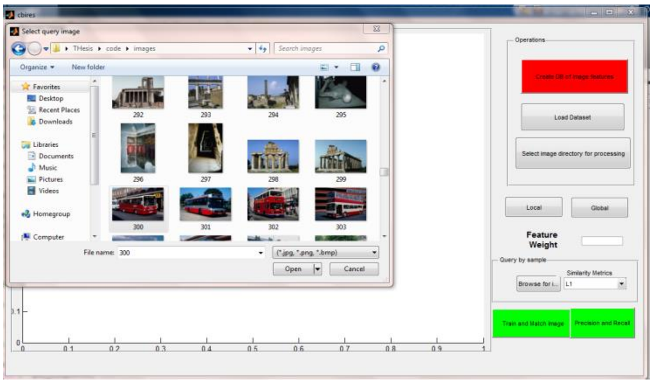

**Figure 2.** Browsing the image

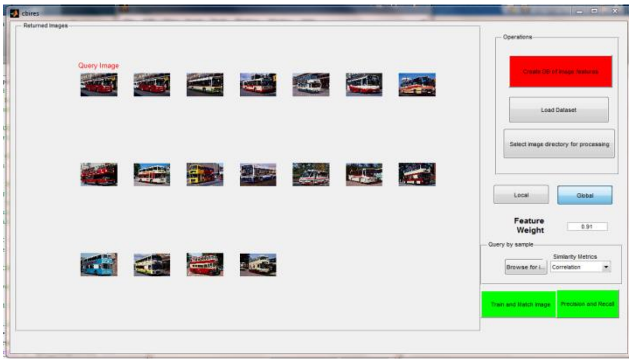

**Figure 3.** Output images w.r.t to query image

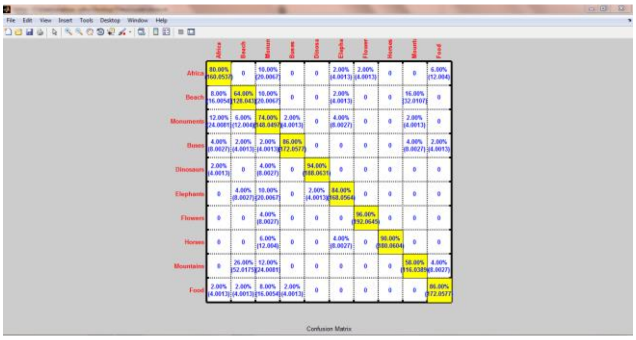

**Figure 4.** Confusion matrix of the datatset

**Table I.** Precision Values for Each Class

| Category ID | Category | Precision |
|---|---|---|
| 1 | Food | 0.90 |
| 2 | Buildings | 0.95 |
| 3 | Beach | 0.97 |
| 4 | Elephants | 0.91 |
| 5 | Buses | 0.99 |
| 6 | Dinosaurs | 0.92 |
| 7 | Flowers | 0.86 |
| 8 | Horses | 0.98 |
| 9 | Mountains and glaciers | 0.99 |
| 10 | Africa people and village | 0.97 |
| **Average** | | **0.98** |

**Table II.** Recall Values for Each Class

| Category ID | Category | Precision |
|---|---|---|
| 1 | Food | 0.65 |
| 2 | Buildings | 0.72 |
| 3 | Beach | 0.76 |
| 4 | Elephants | 0.61 |
| 5 | Buses | 0.67 |
| 6 | Dinosaurs | 0.60 |
| 7 | Flowers | 0.65 |
| 8 | Horses | 0.69 |
| 9 | Mountains and glaciers | 0.70 |
| 10 | Africa people and village | 0.60 |
| **Average** | | **0.60** |

From the above **Table I** and **Table II** is define the previous work comparison with our research work .In the previous work the precision is 88 % and recall is 78 % but in my research work 98% and the recall is 60% that is the improvement of the work.

## IV. CONCLUSION

Image Processing is a process to convert an image into digital form and perform some operations to get an enhanced image and extract useful information from it. It is a study of any algorithm that takes an image as input and returns an image as output. Image processing is referred to processing of a 2D picture by a computer. It is a form of signal privilege in which image is input similar to video frame or photograph and is image or characteristics associated with that image may be output. The CBIR tends to index and retrieve images based on their visual content. CBIR avoids many problems associated with traditional ways of retrieving images by keywords. Thus, a growing interest in the area of CBIR has been established in recent years. The performance of a CBIR system mainly depends on the particular image representation and similarity matching function employed. The fast retrieval of images from large databases is an important problem that needs to be addressed. High retrieval efficiency and less computational complexity are the desired characteristics of CBIR systems. The performance of a CBIR system mainly depends on the particular image representation and similarity matching function employed.

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