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A HYBRID TECHNIQUE FOR CONTENT BASED IMAGE RETRIEVAL USING DWT AND MODIFIED K-MEANS

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Abstract— From the last few years, researchers published more and more information in the field of computer science which are in the readable form for computers. Most of this information is present in newspapers, journals and book but not in digitized form, but researcher made it in digitized form for computers. There are big repositories are present which has the collections of movies, newspapers, satellite images, magazines, books etc. all the information are easily available on the internet for the interested users. For the humans it's a great invent that all these information available easily. Now with this huge amount of information the problem for the interested users is to access the fruitful data from these large information's. Internet user only knows about what type of information they want, but the problem is that where to find this information in bulk storage. For this problem search engines are introduced that help us to find the appropriate information on the internet.

We proposed algorithms on the basis of texture, shape,and color based feature extraction and matching of color and texture.We will use concept of Discrete Wavelet transform for euclidian distance and calculate clusters using modified K-Means clustering.We extract texture,shape, and color snd finaly meauser similarity between query image and database image. Integrated approach retrive more accurate image, reduce semantic gap between local and high level features.Modified K-Means takes less time of computation in comparison to other algorithms.It is more optimized for small as well as large database.

I. INTRODUCTION

Annual Annotation technique was very tough due to huge amount of collection of images in early days. Content Based Image Retrieval has been proposed to overcome these problems. In CBIR computer vision to the image has been solved. This techniques works on image instead of textual keyword for visual content. It may be shape, color or texture and its also known as general framework of image retrieval. Retrieval system design, visual feature extraction, multidimensional indexing are three basic concepts for content based image retrieval. The color aspect can be achieved by the techniques like averaging and histograms. The texture aspect can be achieved by using transforms or vector quantization .The shape aspect can be achieved by using gradient operators or morphological operators. Image processing is any form of signal processing where the input can be a photograph or a video frame and the output may be either an image or a set of parameters related to the image. An image retrieval system is a system which allows us to browse, search and retrieve the images. Content Based Image Retrieval is the process of retrieving the desired query image from a huge number of databases based on the contents of the image. Color, texture, shape and local features are some of the general techniques used for retrieving a particular image from the images in the database. Content Based Image Retrieval systems works with all the images and the search is based on

comparison of features with the query image. The main components of CBIR are the features which includes the Geometric shape, colors and the texture of the image. Features can be of two types like local features and global features. Object recognition can be done easily using the local features. The next component is the associated text in which the images can also be retrieved using the text associated with the image. The other component is the relevant feedback where it helps to be more precise in searching the relevant images by taking up the feedbacks of the user

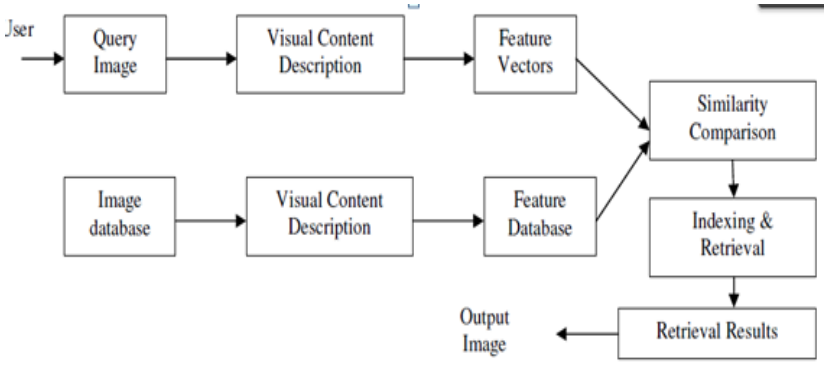

Fig 1: CBIR Architecture

In the past decade, more and more information has been published in computer readable formats. In the meanwhile, much of the information in older books, journals and newspapers has been digitized and made computer readable. Big archives of films, music, images, satellite pictures, books, newspapers, and magazines have been made accessible for computer users. Internet makes it possible for the human to access this huge amount of information. The greatest challenge of the World Wide Web is that the more information available about a given topic, the more difficult it is to locate accurate and relevant information. Most users know what information they need, but are unsure where to find it. Search engines can facilitate the ability of users to locate such relevant information.

II. CONTENT BASED IMAGE RETRIEVAL

The search for similar images in large-scale image databases has been an active research area in the last couple of years. A very promising approach is content based image retrieval (CBIR). In such systems, images are typically represented by approximations of their contents. Typical approximations consist of statistics, and Fourier or wavelet transformations of the raw image data. This so-called feature extraction aims at extracting information that is semantically meaningful but needs a small amount of storage [7]. The information gained by feature extraction is used to measure the similarity between two images. Images are represented by points in the high dimensional feature space. Each extent of the feature corresponds to one dimension in the feature space. A metric is defined to calculate the actual similarity between two of these points [8], the search for images similar to a query image ‘q’ results in finding the ‘k’ nearest neighbors of ‘q’. The model can be extended to support more complex queries that can consist of more than one query image and more than one feature type.

III. PRINCIPLE OF CBIR

Content-based retrieval uses the contents of images to represent and access the images. A typical content-based retrieval system is divided into off-line feature extraction and online image retrieval. A conceptual framework for content-based image retrieval is illustrated in Figure 1[9]. In off-line stage, the system automatically extracts visual attributes (color, shape, texture, and spatial information) of each image in the database based on its pixel values and stores them in a different database within the system calleda feature database. The feature data (also known as image signature) for each of the visual attributes of each image is very much smaller in size compared to the image data, thus the feature database contains an abstraction (compact form) of the images in the image database. One advantage of a signature over the original pixel values is the significant compression of image representation. However, a more important reason for using the signature is to gain an improved correlation between image representation and visual semantics [10].

IV. PROBLEM IN PREVIOUS TECHNIQUES

- Automatic generation of textual annotations for a wide spectrum of images is not feasible.
- Annotating images manually is a cumbersome and expensive task for large image databases.
- Manual annotations are often subjective, context-sensitive and incomplete.
- Google, Yandex and others use text-based search. Results are not perfect. However, now it is much better, than a couple of years ago!

- Initially it working based on text of image. Text Based Image Retrieval is having demerits of efficiency, lose of information, more expensive task and time consuming. Overcome these problems by using Content Based Image Retrieval (CBIR) system for image retrieval.

V. LITERATURE REVIEW

ManimalaSingha and K.Hemachandran et.al. [1] The increased need of content based image retrieval technique can be found in a number of different domains such as Data Mining, Education, Medical Imaging, Crime Prevention, Weather forecasting, Remote Sensing and Management of Earth Resources. This paper presents the content based image retrieval, using features like texture and color, called WBCHIR (Wavelet Based Color Histogram Image Retrieval).The texture and color features are extracted through wavelet transformation and color histogram and the combination of these features is robust to scaling and translation of objects in an image. The proposed system has demonstrated a promising and faster retrieval method on a WANG image database containing 1000 general-purpose color images. The performance has been evaluated by comparing with the existing systems in the literature.

S. MangijaoSingh , K. Hemachandran et.al.[2] Content based image retrieval (CBIR) has become one of the most active research areas in the past few years. Many indexing techniques are based on global feature distributions. However, these global distributions have limited discriminating power because they are unable to capture local image information. In this paper, we propose a content-based image retrieval method which combines color and texture features. To improve the discriminating power of color indexing techniques, we encode a minimal amount of spatial information in the color index. As its color features, an image is divided horizontally into three equal non-overlapping regions. From each region in the image, we extract the first three moments of the color distribution, from each color channel and store them in the index i.e., for a HSV color space, we store 27 floating point numbers per image. As its texture feature, Gabor texture descriptors are adopted. We assign weights to each feature respectively and calculate the similarity with combined features of color and texture using Canberra distance as similarity measure. Experimental results show that the proposed method has higher retrieval accuracy than other conventional methods combining color moments and texture features based on global features approach.

P.S. Suhasini ,Dr.K.Sri Rama Krishna, Dr. I. V. Murali Krishna et.al.[3]Advances in data storage and image acquisition technologies have enabled the creation of large image datasets. In this scenario, it is necessary to develop appropriate information systems to efficiently manage these collections. The most common approaches use Content-Based Image Retrieval (CBIR). The goal of CBIR systems is to support image retrieval based on content e.g., shape, colour, texture. In this paper colour extraction and comparison were performed using the three color histograms, conventional color histogram (CCH), invariant color histogram (ICH) and fuzzy color histogram (FCH) .The conventional color histogram (CCH) of an image indicates the frequency of occurrence of every color in an image. The appealing aspect of the CCH is its simplicity and ease of computation. There are however, several difficulties associated with the CCH. The first of these is the high dimensionality of the CCH, even after drastic quantization of the color space. Another downside of the CCH is that it does not take into consideration color similarity across different bins and cannot handle rotation and translation. To address the problem of rotation and translation an invariant colorhistograms(ICH) based on the color gradients is used and to address the problem of spatial relationship fuzzy linking color histogram (FCH) is used.

Michele Ceccarelli, et.al.[4] Image descriptions aimed at the realization of content-based image retrieval (CBIR) should include the vagueness of both data representations and user queries. Here we show how multiscale textural gradient can be used as an efficient visual cue for image description. This feature has been already efficiently used in problems of image segmentation and texture separation. Our main idea is based on the assumption that, for image description, shape and textures should be considered together within a unified model. We report an efficient image description algorithm where the multiscale analysis is modeled by a differential morphological filter. Experiments with large image databases and comparisons with classical methods are reported'

Amit Jain, RamanathanMuthuganapathy, and KarthikRamani et.al.[5]Content based image retrieval (CBIR), a technique which uses visual contents to search images from the large scale image databases, is an active area of research for the past decade. It is increasingly evident that an image retrieval system has to be domain specific. In this paper, we present an algorithm for retrieving images with respect to a database consisting of engineering/computer-aided design (CAD) models. The algorithm uses the shape information in an image along with its 3D information. A linear approximation procedure that can capture the depth information using the idea of shape from shading has been used. Retrieval of objects is then done using a similarity measure that combines shape and the depth information. Plotted precision/recall curves show that this method is very effective for an engineering database.

FelciRajam, and S. Valli et.al.[6]Content Based Image Retrieval (CBIR) is a very important research area in the field of image processing, and comprises of low level feature extraction such as color, texture and shape and similarity measures for the comparison of images. Recently, the research focus in CBIR has been in reducing the semantic gap, between the low level visual features and the high level image semantics. This paper provides a comprehensive survey of all these aspects. This survey covers approaches used for extracting low level features; various distance measures for measuring the similarity of images, the mechanisms for reducing the semantic gap and about invariant image retrieval. In addition to these, various

data sets used in CBIR and the performance measures, are also addressed. Finally, future research directions are also suggested.

VI. PROPOSED SYSTEM

We proposed algorithms on the basis of texture, shape,and color based feature extraction and matching of color and texture.We will use concept of Discrete Wavelet transform for euclidian distance and calculate clusters using modified K-Means clustering.We extract texture,shape, and color snd finaly meauser similarity between query image and database image. Integrated approach retrive more accurate image, reduce semantic gap between local and high level features.Modified K-Means takes less time of computation in comparison to other algorithms.It is more optimized for small as well as large database.

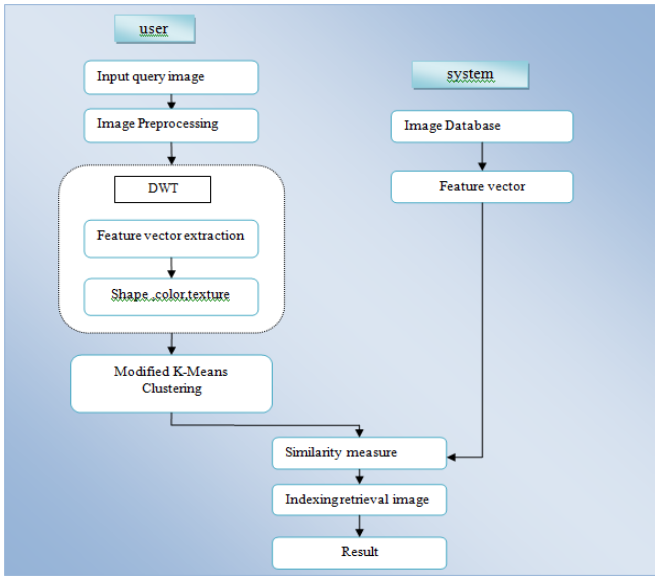

Fig 2: Proposed Architecture

Image input

In first step we perform indexing of the database by browsing it from the system from which you want to search a desired image. We input the desired query image by browsing it from the system which we want to search. The reason behind inputting the query image is to find the images from the database which are most similar to the query image.

- Give input images for query input.

Image Preprocessing

Pre-processing is the name used for operations on images at the lowest level of abstraction. The aim of the pre-processing is an improvement of the image that suppresses unwilling distortions or enhances some image features, which is important for future processing of the images. This step focuses on image feature processing. Process is performed. This is the process in which RGB value of query image is calculated and compared its values with each RGB values of the database images. Basically the similarity of query image to the database images is calculated based on color content. Then the resultant images are grouped based on the similarity levels this provides random image groups.

- ***Image resizing****:* The input images captured by different cameras may have different sizes which can affect the result, so initial resizing is necessary.
- ***RGB to Gray Scale Conversion***: Convert the RGB value of a pixel into its gray value.
- ***Gray to Binary Image Conversion****:* Binarization is done using otsu method, it can be done using gray thresh function in MATLAB.
- ***Morphological Processing****:* Closing and Filling operations are performed using a disk type structuring elements of radius 2 to fill any holes in the images.

Feature extraction Using DWT

In the developed system, images are analyzed based on the color feature. We currently use RGB color feature. We use of descriptive statistics parameters for feature extraction. Example of Statistical feature extraction techniques include mean and standard deviation computations we are using mean in this system for measure of location Following shape and color features are extracted using dwt for each Input Image.

The wavelet transform provides an appropriate basis for image handling because of its beneficial features. The assets of the wavelet transform are:

- The ability to compact most of the signal's energy into a few transformation coefficients, which is called energy compaction.
- The ability to capture and represent effectively low frequency components (such as image backgrounds) as well as high frequency transients (such as image edges).
- The variable resolution decomposition with almost uncorrelated coefficients.
- The ability of a progressive transmission, which facilitates the reception of an image at different qualities.

1. **Shape feature extraction***:* Following shape features are considered.
   - Image boundary
   - Image edge

Image Boundary

- Step1 :Cropping image
- Step2 :Count white pixel which is boundary of seed calculated by moving in following direction-(L->R,T->B,R->L,B->T)

Image Edge

- Step1: Sobel edge detection to gray scale image using threshold values.
- Step 2:Apply AND operation(erode seed image)
- Step 3: Count the remaining pixels.
- Step 4: Divide the remaining pixels with the area of image.

Modified K-Mean Algorithm

A. Modified approach K-mean algorithm: The K-mean algorithm is a popular clustering algorithm and has its application in data mining, image segmentation, bioinformatics and many other fields. This algorithm works well with small datasets. In this paper we proposed an algorithm that works well with large datasets. Modified k-mean algorithm avoids getting into locally optimal solution in some degree, and reduces the adoption of cluster -error criterion.

Algorithm: Modified approach (S, k), S={x1,x2,…,xn }
Input: The number of clusters k1(k1> k) and a dataset
containing n objects(Xij+).
Output: A set of k clusters (Cij) that minimize the Cluster - error criterion.
Algorithm
1. Compute the distance between each data point and all other data- points in the set D
2. Find the closest pair of data points from the set D and form a data-point set Am (1<= p <= k+1) which contains these two data- points, Delete these two data points from the set D
3. Find the data point in D that is closest to the data point set Ap, Add it to Ap and delete it from D
4. Repeat step 4 until the number of data points in Am reaches (n/k)
5. If p<k+1, then p = p+1, find another pair of data points from D between which the distance is the shortest, form another data-point set Ap and delete them from D, Go to step 4
Algorithm A

- For each data-point set Am (1<=p<=k) findthe arithmetic mean of the vectors of datapoints Cp(1<=p<=k) in Ap.
- Select nearest object of each Cp(1<=p<=k)as initial centroid.
- Compute the distance of each data-point di(1<=i<=n) to all the centroids cj(1<=j<=k+1) as d(di, cj)
- For each data-point di, find the closestcentroid cj and assign di to cluster j
- Set ClusterId[i]=j; // j:Id of the closestcluster
- Set Nearest_Dist[i++]= d(di, cj)
- For each cluster j (1<=j<=k), recalculate thecentroids
- Repeat

VII. RESULTS

We proposed a content based image retrieval system. This content based image retrieval system used Wang's dataset for verification of places of interest photos. Experimental result of our proposed system proved that designed CBIR work very well for image retrieval as well as improved its precision value. In proposed CBIR modules are segmentation of images, Feature extraction of images than applied modified K-means clustering module. First very important contribution of modified k means is identification of edges of each grid image of our proposed work. Discrete wavelet transform(DWT) is second important contribution for feature based concept in CBIR architecture. From result of proposed work it is confirmed that

proposed CBIR is better solution for image retrieval. In our project integration of two best techniques achieve good result in comparison to previous.

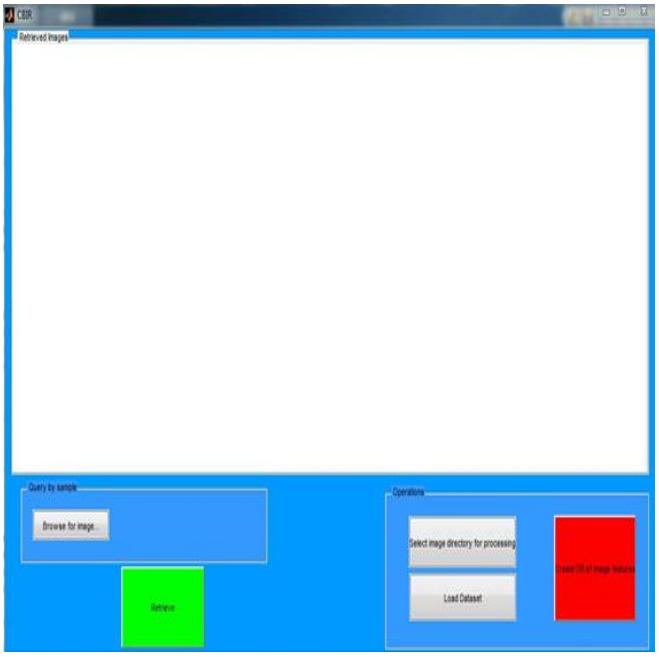

Fig 3: GUI of Proposed Work

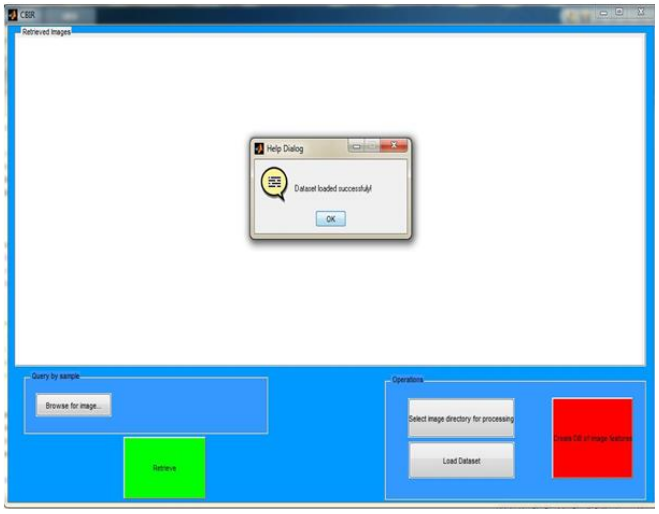

Fig 4: Load Dataset

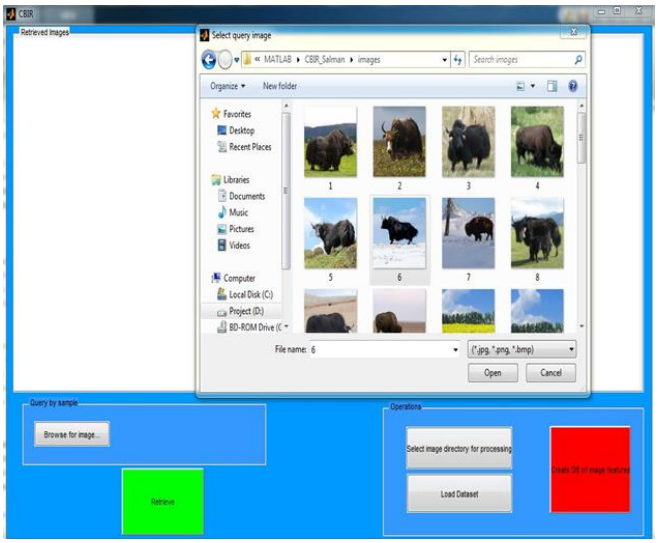

Fig 5: Input Query Image

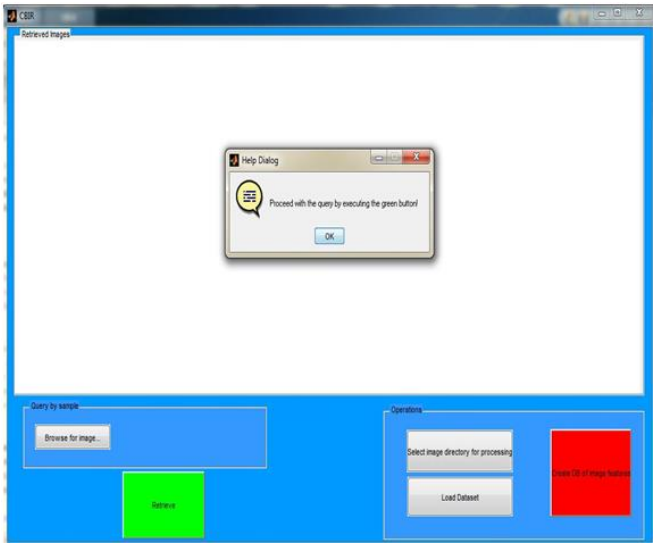

Fig 6: Processing of Input Image

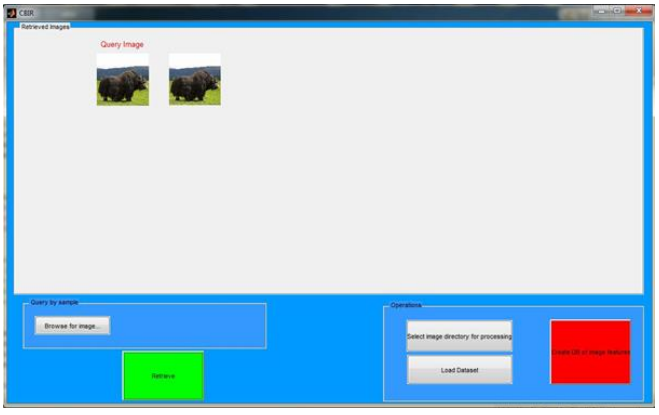

Fig 7: Query Image Retrieval using Modified K means and DWT

VIII. CONCLUSION

Experiment showed that our proposed CBIR system performance is good for image retrieval and accuracy of the system also improved. We integrate modified k means and dwt for achieving better result and for verification tested this system from other images collected from internet. For segmentation and grid modulation we proposed modified k means and for feature extraction we used dwt. Modified k means is more effective than k means which eliminate the blank cluster creation by modified k means. Result of experiment show that proposed modified k means deals with empty cluster without any loss in performance of the previous algorithm. Feature extraction quality of DWT performed excellent in our proposed work.

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