

An Enhanced Method for Content Based Image Retrieval

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Abstract-The content based image retrieval (CBIR) is the well-liked and heart favorite area of research in the field of digital image processing. The key goal of content based image retrieval (CBIR) is to excerpt the visual content of an image directly, like color, texture, or shape. There are several applications of the CBIR technique such as forensic laboratories, crime detection, image searching etc. For the purpose of feature extraction of well-matched images from the database, a universal CBIR system utilizes texture, color and shape based techniques. In this presented work, we have offered an efficient approach for the content based image retrieval, where images are decomposed using the wavelet transform, it means that the image features are converted in the matrix form and a color feature data set is prepared. In order to improve search results we have used k-means algorithm. It is shown by experimental results that, the efficiency of the proposed method is improved in contrast with the existing method.

Keywords: Image Retrieval, Clustering, Wavelet Transform, Feature Extraction, k-Means.

I INTRODUCTION:

Due to development of multimedia technology and increasing vogue of the computer network, the conventional information retrieval systems are not able to overcome the users' current need. Lately, the content-based image retrieval has grown as hot topic and the methods of content-based image retrieval are recognized as a great development work [1].

There are various areas in which digital images are used such as-crime prevention, commerce, finger print recognition, surveillance, hospitals, engineering, architecture, fashion, graphic design, academics, historical research, and government institutions etc. Because of this widespread demand we need to enhance in retrieval precision and minimized retrieval time. The prior methods were only dependent on text based searching instead of its visual feature. Many times just one keyword is redundantly used with more than one images, therefore it leads to erroneous outcomes. Consequently, Content Based Image Retrieval (CBIR) is evolved to defeat the restriction of text based retrieval [2].

There are two fundamental principles of Content Based Image Retrieval systems for the image retrieval and they are- feature extraction and matching. When we gave the image as input to the image retrieval system, then it extorts the features of image and these features were compared with the features of images which are already stored in the

database. After that image retrieval system figure out the distance between input image and further images which are already stored in the database and then images are shortlisted based upon their distance. At this time we have a list of the images that have smaller distance with input image or image to be searched and these images are considered as outcome of the image retrieval system. This searching process is depends on most identical image that are already stored in the database, instead of exact match of a searched image [3]. To describe the image through small number of descriptors, feature extraction is one of the most essential steps in the image retrieval system. The fundamental visual features of the images comprise color and texture [4]. The color feature provides user an experience related to visual similarity, however the texture doesn't provide much of visual experience, yet it helps in retrieving depending upon patterns / textures [5] [6][7]. Second most important feature of images is texture. Whose representation is being used for pattern recognition and computer vision.

II. LITERATURE SURVEY:

A lot of work has been done in the field of image retrieval in image processing and still a lot need to be done on it. Many researchers have proposed work in this field some of the most remarkable works are shown in this section.

Devayani Soni and K. J. Mathai [2] have presented a technique for image retrieval dependent upon text, color space methodologies by means of color correlogram and color histogram. Color space methods utilized global color histogram and local color histogram and those are putted on both color spaces- RGB color space and HSV color space, and then they were compared. The color correlogram is the second order statistical method to compute spatial correlation. In this work, firstly the image will be investigated according to annotated text and then the color features will be taken out with the help of color histogram and color correlogram. At the end, with the help of GUI, the final outcomes will be shown as output.

John M. Zachary et al [8] have presented the issues from the perspective of real-world system formation. It also discusses some of the major feature extraction methods utilized in existing CBIR systems, and review numerous CBIR system implementations.

Wei-Ying Ma et al [9] have proposed a model for image retrieval system which was evolved at the University of

California at Santa Barbara. For feature extraction this system utilizes a hybrid methodology which integrates texture, color, and shape details from an image using indexing technique. The most significant characteristic of the NETRA is to utilize segmented local regions for indexing of images inside the database. So that, global and local both types of characteristics are utilized.

Swapnalini Pattanaik and D.G. Bhalke [10] have demonstrated the basic idea of proficient retrieval of images with the help of most common features of Mpeg-7 (Multimedia Content Description Interface- 7). To present a set of standard techniques for demonstrating multimedia content is the foremost goal of Mpeg-7 and it also permitted fast and efficient content identification with supporting a great amount of applications. Here, color structure descriptor is utilized for color and edge histogram descriptor is utilized for texture by the authors. We can also increase the performance of CBIR system by utilizing these two features. Here, authors also presented the efficiency of some of the methods with their results.

Chin-Chin Lai et al [11] have tried decrease the gap among the retrieval outcomes and the users' anticipation by demonstrating an interactive genetic algorithm (IGA). Here, authors have utilized the attributes of color like the standard deviation, mean value, and image bitmap. The features of texture for example entropy depend upon the gray level co-occurrence matrix and the edge histogram which are utilized by the authors. The results were computed and compared with other methods and it is found that the methodologies proposed by authors leads to a better result.

E.L. van den Broek et al [12] have proposed a CBIR system with Color Selection scheme which provides facilities for query-by-color, which is depends on 11 color categories, utilized for color scheme by everyone. Here images are extracted via low frequency DCT coefficients which are changed from YUV color space [13]. Thus ultimately system proposed by authors provides improved retrieval performance to help people choose from the dominant features of query images. This methodology will ultimately improve effective retrieval based on people preferences on the queried image. In Region of Interest Image Indexing System [14], a person can search images from database through the use of region of interest (ROI) also this will provide you results based on region preferences while searching through database.

Sagar Soman et al [15] have utilized Content Based Image Retrieval (CBIR) technique on color and texture of images. Here, author demonstrates two different methods for feature extraction. General CBIR system utilizes color, texture and shape as the base criterion for feature extraction technique to get better search results if we query images from databases. In proposed CBIR system, author proposes use of color and texture for feature extraction. In order to retrieve texture features they are applying block wise Discrete Cosine Transforms (DCT) on complete image and to extract color feature they have utilized moments of colors (Deviation, Mean and Skewness) on the set of

queried images from database. For obtaining better results in image retrieval they were comparing feature vectors of the query image with the feature vectors of the images in database. They were computed the separate and combined vectors by utilizing color and texture features and in comparison they showed that combined feature vector outcomes were comparatively better.

III. PROPOSED METHOD:

Here, we will propose a unique and efficient technique for the content based image retrieval. It will utilize a combination of both-wavelet transform and the K means clustering algorithm. Figure- 1 shows the proposed system for image retrieval. As shown in figure-1 there are four important phases of proposed system that are- image decomposition, feature extraction, indexing & clustering and feature comparison. The brief explanation of these phases is as follows-

- **Image Decomposition & Feature Extraction:** Image will be decomposed with the help of wavelet transform. It means that the image will be decomposed and the color feature data base will be prepared for all the images. In decomposition, each image is converted in matrix form, it means that the image features are converted in the matrix form and a color feature data set is prepared.
- **Image indexing & Image clustering:**

After the image decomposition, we get all the image features in the form of the matrix. Then the images indexed and images with similar features are kept in a cluster using the k-means algorithm. This process is known as indexing & clustering. It will help in improving the search results and ultimately makes image retrieval efficient.

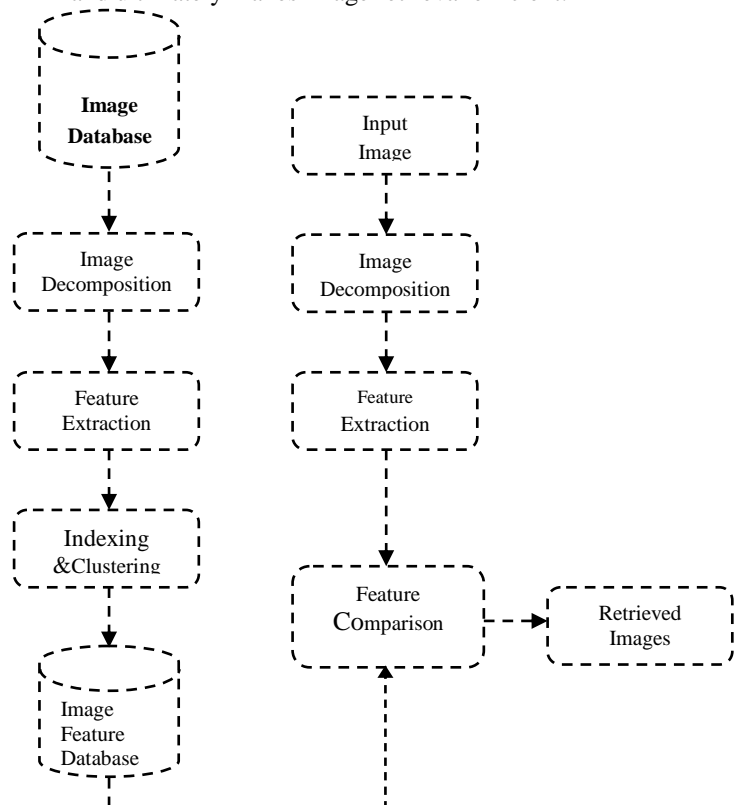


Figure- 1: Proposed System for Image Retrieval

• Image Search & Image Retrieval:

Sample image is given as input and the proposed system returns all the similar images as output. The sample image is decomposed and the features are extracted in the form of matrix, and a color dataset is prepared. Then the features of the input image are compared with the features of the images resides in the database and on the basis of Euclidian similarity measure the relevant images are returned as output. The Euclidian similarity measure for finding the distance is given as follows-

$$D = \sqrt{\sum_{i=1}^n (X_i - Y_i)^2}$$

Where, X for the input image and Y for the image in the database.

IV .EXPERIMENTAL RESULTS:

For this research work, we have utilized two datasets- a dataset of dinosaurs and a mix dataset that contains buses, dinosaurs, mountains, flowers and horses. All the experiments were performed with the help of NetBeans IDE 7.3.1.

When the user enters an image as input, then all the identical images from the database are retrieved and displayed. Figure- 2 shows that when we gave an image as input then proposed system search and display the identical images for dinosaur dataset. Figure- 3 & figure- 4 shows the resultant images for the mixture dataset.

Table- 1: Efficiency/Recall Rate of Proposed System

Category	Efficiency/Recall Rate
Dinosaurs	80
Horses	85
Buses	75
Flowers	70
Mountains	55
Average	74

Table- 2: Comparison of Different Techniques of Image Retrieval

Techniques	Funt's Method	DCT & Color Moments	Proposed Technique
Efficiency	36%	60%	74%

Thus, the proposed system offers improved results as compared to other existing CBIR feature extraction techniques for example Funt's Method, Swain's Method, and DCT & color moments technique.

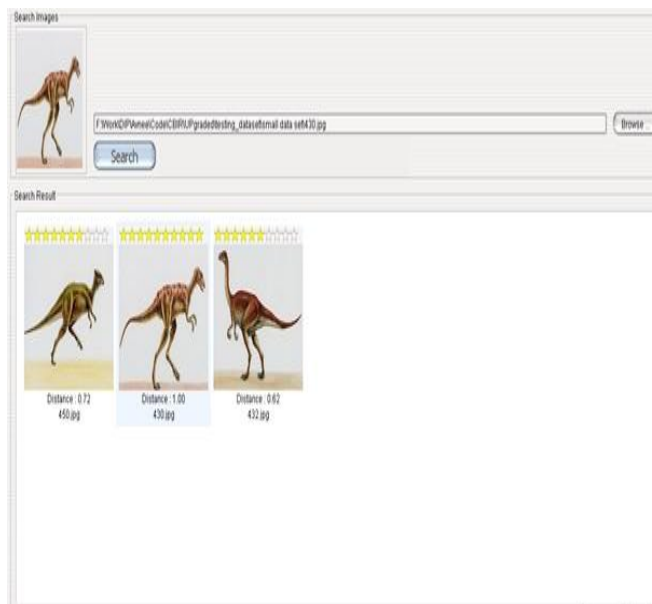


Figure- 2: Resultant images retrieved by proposed system for dinosaur's dataset

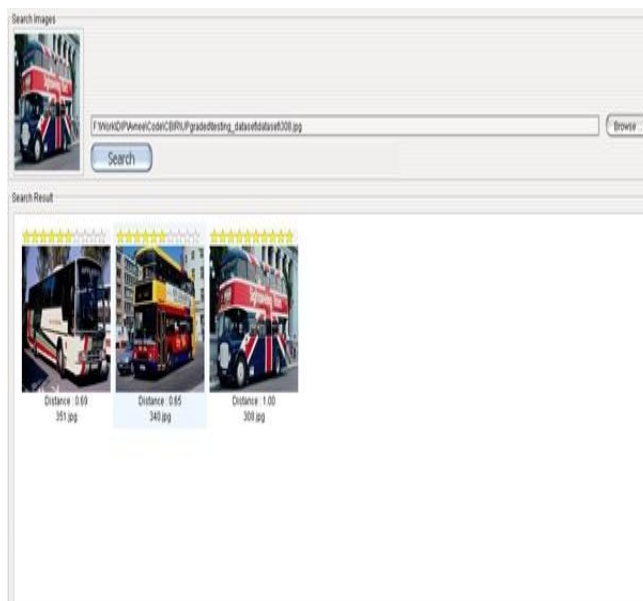


Figure- 3: Resultant images retrieved by proposed system for Mixture dataset

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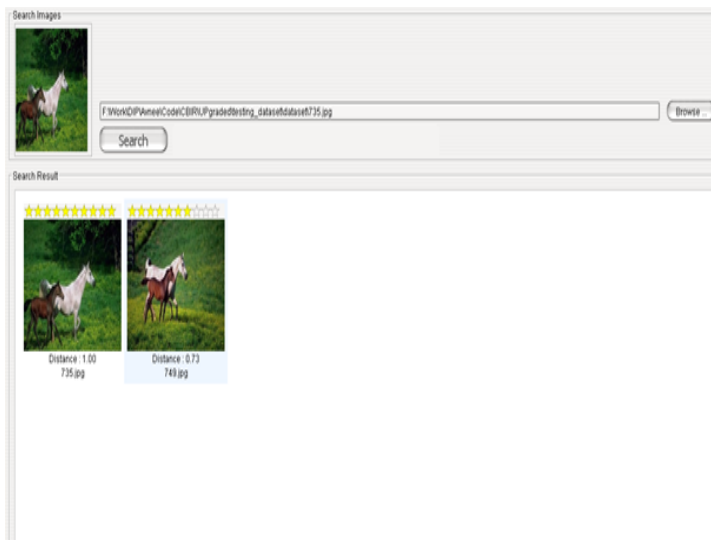


Figure- 4: Resultant images retrieved by proposed system for Mixture dataset

V. CONCLUSION:

Content based image retrieval is really a very good field from research point of view. In this paper, we presented a novel and proficient technique for the content based image retrieval. In this technique, we utilized the combination of both wavelet transform and k-means algorithm to make the image retrieval process efficient. For the purpose of similarity computation between input image and other images of dataset, we utilized Euclidian similarity measure. It is shown by experimental results that, the proposed system performs better than the existing CBIR techniques (Funt's Method, Swain's Method, and DCT & color moments technique).