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Image Retrieval Based on CBIR and SVM Classifier

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Abstract

In modern age, Content Based Image Retrieval system is used for retrieving the images from web pages. In order to retrieve an image; three visual features may help, that are color, texture and shape. Image retrieval system is used to search images from database that are content fully same as that of query image. The substantial method that help in the retrieval of images from a large database is the Content Based Image Retrieval (CBIR) with SVM. In proposed scheme, CBIR approach along with Support Vector Machine algorithm is used for retrieval. Proposed method has been provided higher accuracy with the help of SVM classifier.

Keywords

Content Based Image Retrieval, Support Vector Machine, HSV, GLCM.

I. INTRODUCTION

An image retrieval system is a computer system used for browsing, searching and retrieving images from a large database of digital images. Content Based Image Retrieval is the best technique to get relevant images with higher accuracy. CBIR will be provided extensive research into image retrieval systems. In CBIR image-based search is used instead of text-based search. Image retrieval systems was to search through a database to find images that are similar to a query image. Most proposed CBIR techniques [1, 2] automatically extracted low-level features that are color, texture, and shape to measure the similarities among images by comparing the feature differences. Color, texture and shape features have been used for describing image content. Content of query image is same as images have to be find, image retrieval systems tried to search through a database. Color histogram, color correlogram as conventional color features are used in CBIR. To represent color in terms of intensity values, a color space is defined as a model. Texture is a key part of human visual perception. Everyone can identify texture, but it is more complicated to define. Unlike color, rather than at a point texture occurs over a region. It is usually perceived by intensity levels. Commonly, the shape features are different from other elementary visual features such as texture or color features and the shape carries semantic information. Ultimately, shape features can be classified as region-based and boundary-based. Implementation of CBIR system which is based on dominant color, shape and texture.

This method [1] yielded average recall with reduced feature vector dimension and higher average precision. An effective color image retrieval scheme for combining all the three i.e. texture, shape, and color information, which achieved higher retrieval efficiency is presented in [2]. By using fast color quantization with clusters combining, the image is pre-set, and then a small number of dominant color and their percentages can be obtained. Trademark image retrieval (TIR) system is projected in [3] to deal with the immense number of trademark images

in the trademark registration system. This method started with the extraction of edges using the canny edge detector, a shape normalization method, and then extracted the local and global features. Then visual feature extraction is performed, in [4]. The job of color feature extraction is done according to the Hue, Saturation, value (HSV) color space. The procedure is as given in non-equal intervals, the color space is measured, one dimension feature vector is made and by cumulative histogram color feature is represented.

An image retrieval system, in which HSV color space [5] and wavelet transform are used for feature extraction. In [6], A comprehensive survey, highlighting current progress, emerging directions and techniques for evaluation relevant to the domain of image retrieval is used. It conceived that the field will be experienced a prototype shift in the foreseeable future, with the focus being more on domain-specific work, application-oriented, developing considerable impact in day to day life. MPEG-7 proposed [7] Dominant Color Descriptor (DCD). DCD is one of the color descriptors, which has been extensively used for retrieval of an image. A CBIR technique based on an efficient combination of multi resolution color [8] and texture feature is presented. Color auto correlogram of the saturation and hue element images in HSV color space are utilized as its color features. An evaluation of the use of texture features in a query- by- example technique to image retrieval is used in [9]. Image retrieval mechanism [10] is explored based on combination of texture and color features. The discrete wavelet frame analysis is used, which is an over complete decompositions in orientation and scale, texture features are extracted. On the rigorous review of above literature, we are inspired to propose the method of CBIR for web searching application by using SVM. Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. Support Vector Machine (SVM) [12] is the technique used which combines active learning with support vector machine. SVM is used to separate [11, 12] the relevant images from irrelevant images with hyper plane in projected space which is very high dimensional. The projected points on one side of hyper plane are relevant and others are non-relevant. The SVM is supplied with the feature vector of the query image and the category of the query image is predicted [13]. Based on classified category the corresponding color histograms of the images from the same categories are considered for further matching. The classification technique, Support Vector Machine (SVM) is used to classify the features of a query image by splitting the group [14] such as color, shape and texture. Finally, the relevant images are retrieved from the database. Accuracy and error rate are found by this technique.

II. PROPOSED IMAGE RETRIEVAL SYSTEM

Proposed image retrieval system is based on CBIR and SVM classifier. The need to find desired images from a collection [12] is shared by many professional groups, including journalists, design engineers and art historians. In this method, CBIR technique was used for the combination of active dominant color, shape and texture features. Versatile approaches have been highly developed for retrieval of an image but CBIR with SVM was found an adequate and an efficient method to retrieve images. SVM classifier made query database on the basis of vectors, so that it will be classified similar as well as non-similar images accurately. To depict an image from the various prospects in order to get better search results and to evince more image information. The shape, texture and color features are considered united.

Algorithm of proposed method:

1. Select each query image from database.
2. By using Support vector machine, each query image is divided uniformly.
3. For each division, choose the centroid as its dominant color.
4. Inherit texture feature by forming vectors with the help of SVM.
5. Inherit shape features by forming vectors with the help of SVM.
6. For shape, color and texture construct a united feature vector.
7. Measure the distances between the feature vectors of target images and feature vector of query image.
8. Find out the distances.
9. Retrieve most similar images with minimal distance.

III. FEATURE EXTRACTION

Image retrieval system considered global features while using CBIR and SVM. HSV color space is widely used in computer graphics, visualization in scientific computing and other fields [4]. In this space, hue is used to distinguish colors, saturation is the percentage of white light added to a pure color and value refers to the perceived light intensity. HSV color space was closer to human conceptual understanding of colors and has the ability to separate chromatic and achromatic components. Color histogram is derived by first quantize colors in the image into a number of bins in a specific color space, and counting the number of image pixels in each bin. Color Histogram gave HSV color space [5] and RGB color space. The matching method, then retrieved the images whose color histograms equivalent those of the query most narrowly. Color moments are used to distinguish images on the basis of their color features. These moments gave a dimension for color similarity between the images. These similarity values can be matched to the values of images indexed in a catalog for content based image retrieval.

Figure 1. Query Image (Beach)

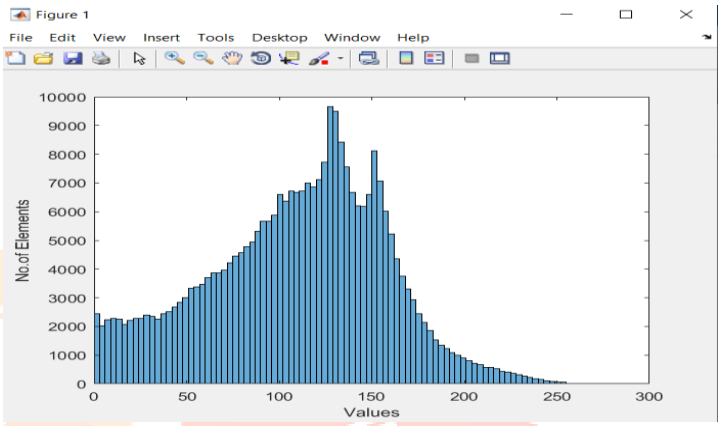

Figure 2. Histogram of Query Image (Beach)

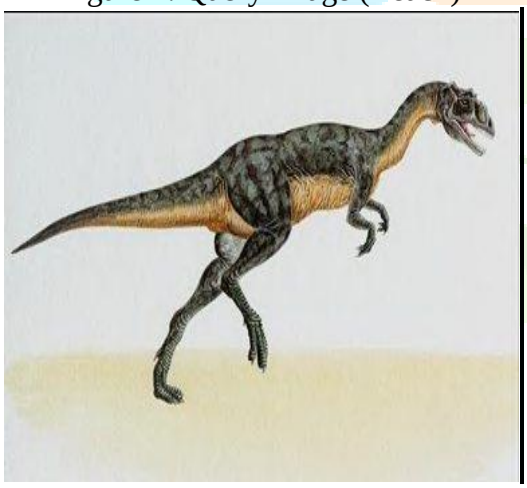

Figure 3. Query Image (Dinosaur)

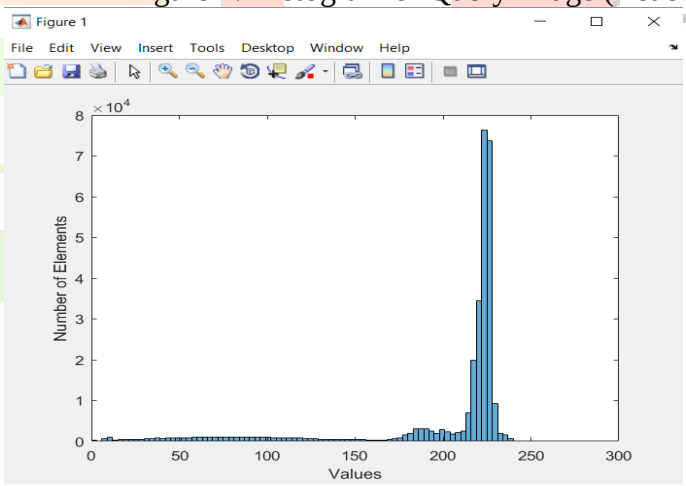

Figure 4. Histogram of Query Image (Dinosaur)

GLCM [11] is created a matrix with distances and directions among the pixels, and then removed significant figures from the matrix as texture features. There were four features including energy, contrast, correlation, homogeneity. Homogeneity was a grayscale image texture calculates of homogeneity varying, shiny the distribution of images grayscale regularity of weight and texture. The main element of Support Vector Machine was to create hyper planes with the help of support vectors in a higher dimension space. SVM [11] is used for classification. SVM divided the space into two half spaces. A 'good separation' is reached through hyper planes that have the major closest data distance to the points. Here decent separation means superior the division between two hyper planes gave lesser generalization error. That's why it is known as a maximum margin classifier. If geometric gap between the hyper planes more elevated than classification error is low.

IV. EXPERIMENTAL RESULTS

Database has been made, which is the collection of different images such as Africa, Beach, Monuments, Buses, Dinosaurs etc. Codes for image retrieval system based on CBIR and SVM algorithm were prepared in matlab. All the three features such as texture, shape and color combined with SVM algorithm. Image directory has been selected for processing and dataset was loaded. Then database of image features created. After that browsed for an image and number of relevant images in return has been entered. Graphical user interface (GUI) displayed relevant images to a query image. With the help of SVM algorithm images have been classified. Accuracy calculated and displayed on the screen in the form of confusion matrix. Following GUI has been shown retrieval results of beach and dinosaur. In proposed scheme, two query images have been used, beach and dinosaur. When beach was used as a query image, then 84% accuracy has been found and when dinosaur was used as a query image, then 100% accuracy has been found.

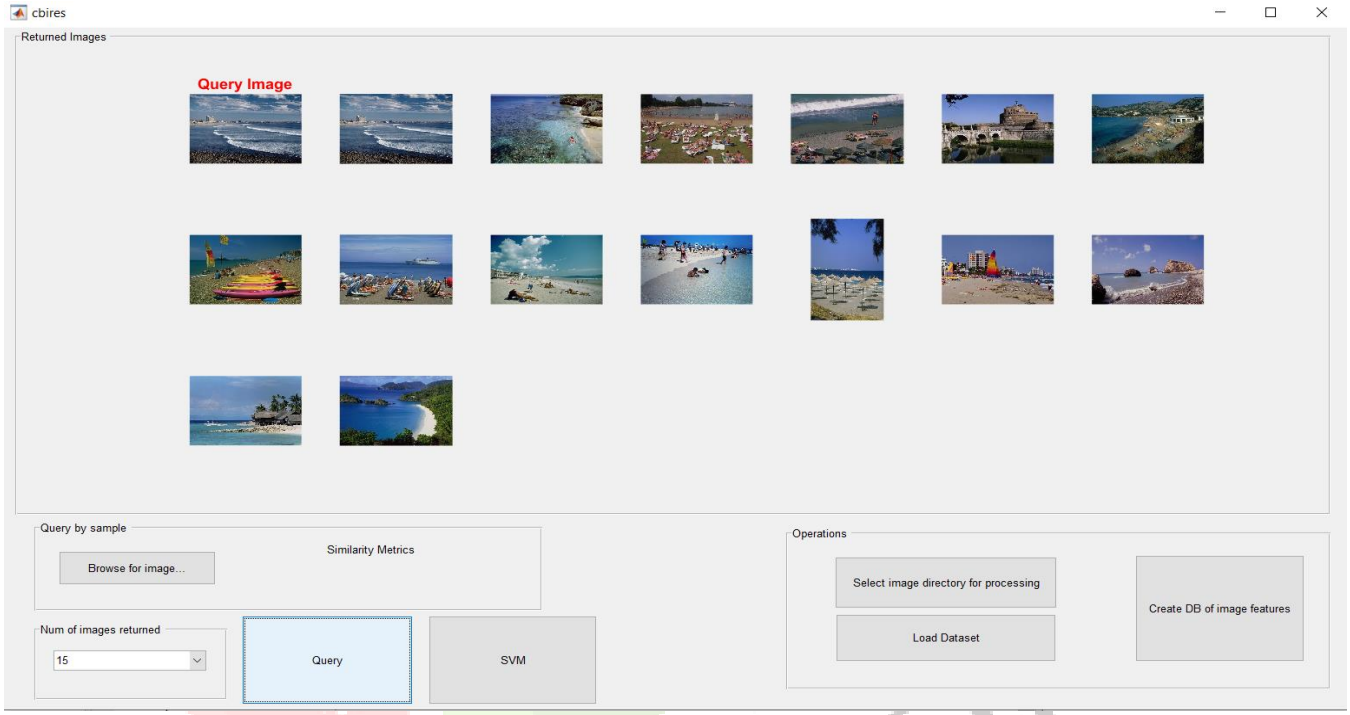

Figure 5. Retrieval Results of Beach Image

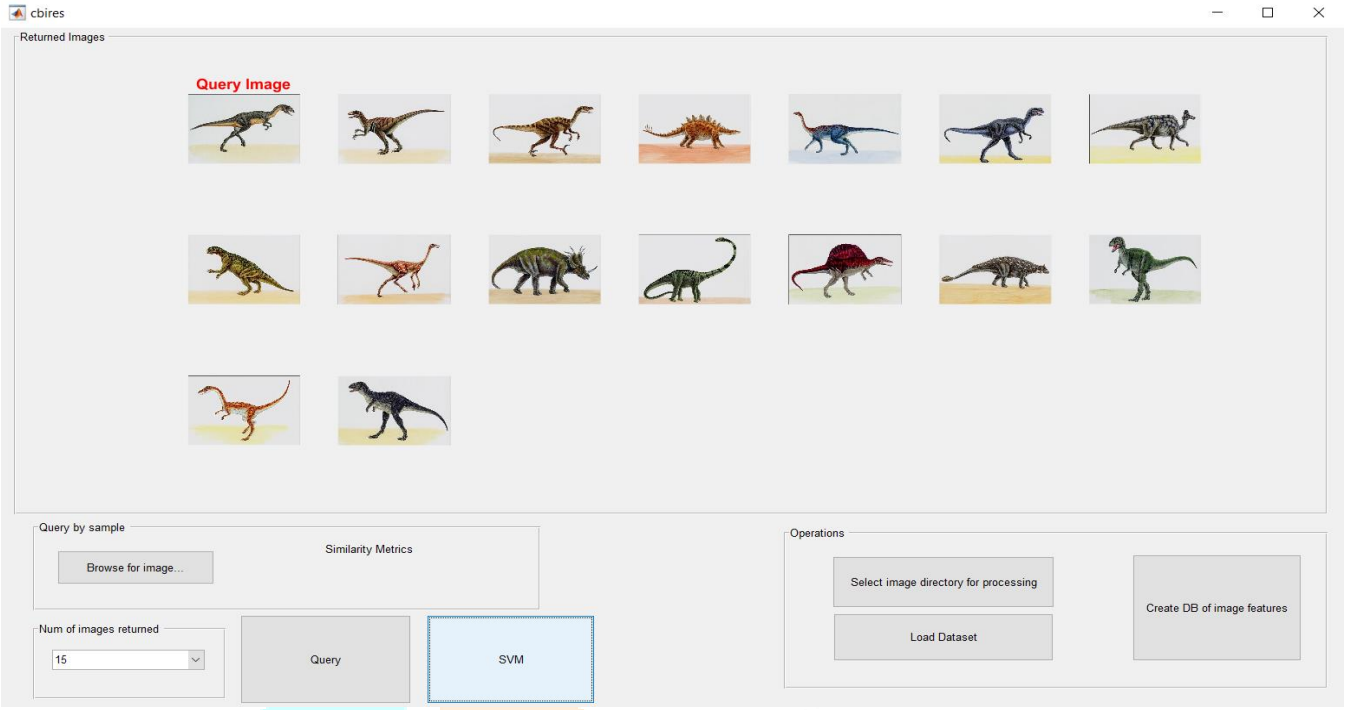

Figure 6. Retrieval Results of Dinosaur Image

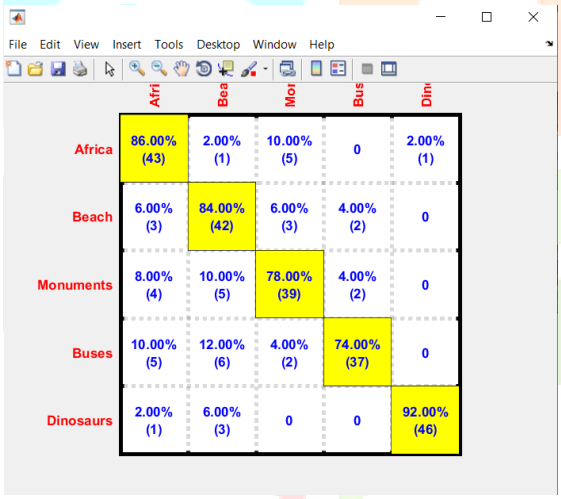

Fig.7. Confusion Metrics (Beach) with 84% Accuracy

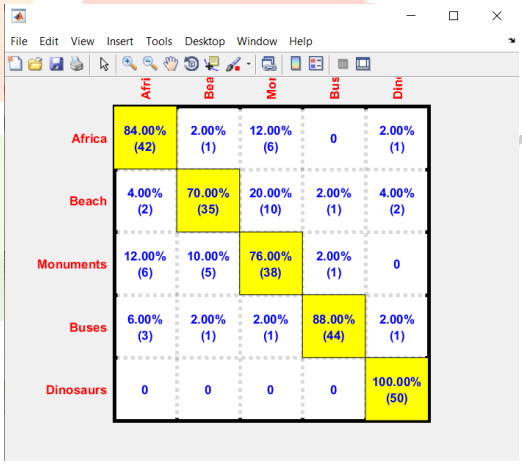

Fig.8. Confusion Metrics (Dinosaur) with 100% Accuracy

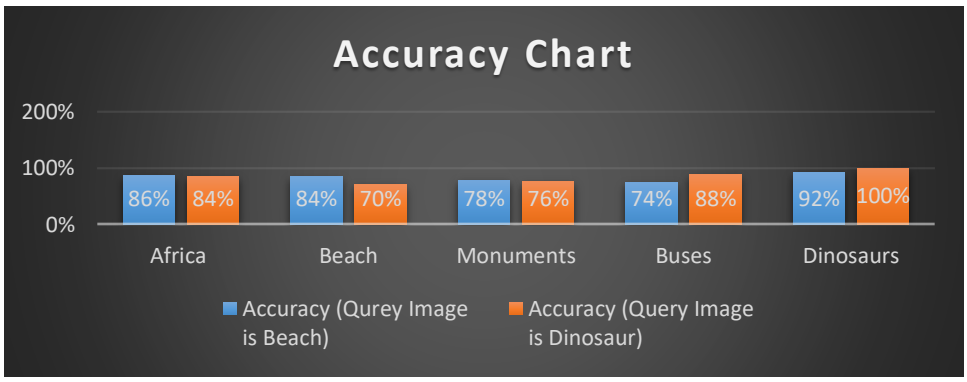

Figure 9. Accuracy Chart of Proposed Method

V. CONCLUSION

In this paper, a new SVM based image retrieval approach has been described which outperforms most premature techniques in terms of speed and accuracy. CBIR technique for web searching application has been compared in terms of accuracy, and a modified approach based on SVM was introduced. Accuracy of proposed method can be increased as compared to the accuracy of previous approaches. In previous scheme, maximum accuracy was 86.88% by combination of global and local features for CBIR with SVM but in proposed work the highest accuracy of 100% has been found. Due to this observation can be concluded that the CBIR for web searching application using SVM with combining all the visual features such as color, texture and shape is better method for image retrieval.

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