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Improved Approach for Content Based Image Retrieval (CBIR) System for Similarity Matching of Trademark and Its Sub-Images

[1]Mandeep Kaur, [2]Shaveta Rani, [3]Paramjeet Singh
[1] Student, Masters of Technology, [2, 3] Associate Professor,
[1, 2, 3] Department of CSE,GZS CCET, Bathinda, Punjab, India

Abstract: ***At present era, Trademark registration plays an important role in the economic development. A company's trademark plays vital role in expansion of its business too. Relevant image retrieval from a huge dimension dataset is quiet cumbersome but a significant task to survive in this world of images. In this research paper, a new method has been proposed to retrieve the trademark images on the basis of color, logo and text. Since color is a very important part of any image. It provides strong descriptor and also helps them to distinguish between two images. Moreover, the proposed scheme (HSV) has been finally compared with LXY algorithm and the result was quiet optimist as compare to LXY in terms of precision and recall. For this, special emphasis has been made on how similarity matching is performed on each of the technique like color histogram, color moments, indexes, features and various color descriptors.***

Keywords: Color Histogram, Image Retrieval, HSV, LXY, Trademark images.

I. INTRODUCTION

Automatic image retrieval based on some similarity either by color or shape or both on trademark images has gained a significant recognition in the world wide business development and research area because they are exclusively prepared signs or marks to recognize a particular product or brand and define not only the attractive features of products but also the position and status of companies. Trademark for any organization plays a significant and vital role in current market of developing world. A company's trademarks are the essential elements of its industrial property, similar trademark images arise doubtful cases in identification. The logos images are remarkable things in world's largest business and trade applications. A Trademark can be design of a small image, simple graphics, unique texture and combination of text and figures.

Content Based Image Retrieval (CBIR) has become an essential field for people to search and get information. CBIR system obtains the related images from the image dataset for the given input image, by comparing the feature of the input image and images in the dataset. The CBIR uses visual contents of an image such as color, texture, shape, faces etc., to show and index the image dataset. These features can be further divided as general features and domain-specific features .General features are color, texture, shape and domain specific features are human faces, fingerprints etc. [4].

In this present age, virtually all fields of people's life architecture, advertisement, crime prevention, journalism, hospitals, surveillance, fashion and graphic design, academics, engineering use different images for reliable and powerful services. A collection of number of images is called image database or dataset. Registration of trademark images and its evaluation for particularity is thus becoming a herculean task for registration offices.

The number of registered trademark images is growing rapidly. Several trademarks for several brands and company have been already designed and registered in trademark registration office.

So protecting a newly introduced trademark for any new or existing organization without inadvertent infringement of the copyright is really very fractious task.

In this paper work has been done on color. Color is the basic characteristics of the images through which we can identify an image. In image processing colors are used because they indicate a good feature descriptor that can be further used to identify and retrieve objects from any image. The eyes are very reactive to colors through which human can easily discriminate particular objects in different images from dataset.

Color feature provides influential information of images and work a very important role in image retrieval. Many techniques were used to depict color feature. These are color moment, color co-relation, color histogram, scalable color descriptor (SCD) and color structure descriptor (CSD).

For defining the features of color of an image, we have to select color space properly and use its characteristics in the retrieval [13]. In this paper color feature extraction techniques and their associated indexes are discussed. Moreover, the dissertation compares the effect of retrieval system for HSV and LXY system in CBIR for the requisite parameters like precision, recall and mean and found that the results in favor of proposed HSV as compare to LXY.

II. LITERATURE SURVEY

P. Gangadhara Reddy (2014) proposed a CBIR system based on an effective mixture of color and texture features. The author discussed the usage of HSV (hue – saturation – intensity) color space model for conducting research on content

based image retrieval system. The HSV model had been used as it must be quantified into non – equal intervals (discrete) which must then be constructed as a one dimensional feature vector representing the feature of color. Likewise, texture feature extraction was obtained by using Gray level co- occurrence matrix or Color co-occurrence matrix. Therefore the method presented was a kind of multi feature fusion method in which a normalized Euclidean distance measure had been used to identify similar content of images. As per the experiments and results, it had been shown that color + CCM retrieval mode had better performance and advantage as compared to only color or color + GLCM retrieval modes. The content based image retrieval system developed basically works on generic images and did not consider domain specific images. Therefore the queries based on which precision and recall values were calculated were also generic in nature [4].

T. Dharani, I. Laurence, Aroquiaraj(2014) Image Retrieval (CBIR) is a method which uses visual attributes of image to search user desired image from large image dataset according to the request of the user. MKNN is an enhancing method of KNN. The proposed KNN classification was called MKNN. MKNN contains two parts for processing, they are validity of the train samples and applying weighted KNN. The validity of each point is computed according to its neighbors. In our proposal, Modified K-Nearest Neighbor (MKNN) might be considered a kind of weighted KNN so that the query label was approximated by weighting the neighbors of the query. The process calculates the division of same labeled neighbors to the total number of neighbors. MKNN classification is based on authenticated neighbors who have more information in comparison with simple class labels. This paper also concentrated identifying the unlabeled images with help of MKNN algorithm. This system allowed provide label to unlabeled image as user input [12].

Nishant Singh Dubey, S. Ram Dixit, P. Gupta, J Prakash (2012) proposed a method for semantic retrieval of images by connecting low level features. Since, the users queries were specific and traditional text based which was not easily be handled. In the proposed work, the author tried to overcome this problem. In this paper, a two phase technique was considered to extract semantic information. And after the end, they retrieved the images by joining all the features which resulted in a dataset of images which were semantically more similar to the query/input image. Finally, they concluded from the experimental results that the considered approach matched those images which were very much alike with the input image semantically and was capable to increase the precision and recall values of the used image retrieval system [11].

Jasmeet Kaur and Seema (2012) presented a technique to give better results of image retrieval set on contextual information in Hindi dialects. In this paper the framework worked at semantic level using various labels represented by formal logics as fuzzy data sets. They developed a technique of latent correlation in such a way that the perspectives, expressions feelings about the color are mapped as human can understand. In this paper classifications based on domain feature of colors. The result showed the efficient and feasible retrieval in terms of time by comparison between CBIR and retrieval with a color Hindi dialect approach. Through the result analysis the average precision value lies around 65% and average recall value lies around 30% which was effective retrieval as per the experimental evaluation [7].

Gowsikhaa.D, Abirami and Baskaran.R (2012) had used the methodology to build image ontology using color, texture and shape which uses the concept of Image Ontology to retrieve the relevant images from an image dataset. In this research paper, classifications are based on the domain knowledge of extracted features of color, shape and texture. They also used the concepts of precision and recall for performance evaluation. But, they used these concepts for animal image ontology only which might be continued by adding more related classes like stripes, spots etc. [8].

III. DESIGN AND IMPLEMENTATION

The proposed research started with the objective of processing and refining image dataset that we are using a in the proposed framework and algorithm and in this process, following steps and processes evolved which lead to development of the research work.

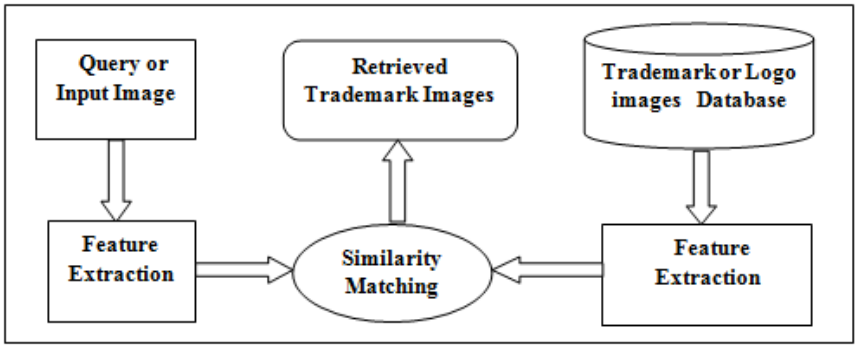

Fig 1 Basic block diagram for trademark or logo images retrieval system

To find the proposed objectives the proposed work mainly works upon two algorithms. One is proposed HSV algorithm and other is LXY algorithm. The dissertation compares s the effect of retrieval system for trademark images on the basis of color, text and logo with their associated features and on the basis of co-related indexes.

There are various process and implementation made to design our proposed method:

3.1 Collection of Dataset- Selecting highly relevant Image Instances to collect datasets:

As the work was done on domain specific area, it was important that only relevant images instance datasets were picked. In this phase we collect dataset from different aspects and varieties like various trademark or logo images etc.

3.2 Formation of GUI(Graphical User Interface)

In this stage, we have to develop a well-structured GUI (graphical user interface) to perform the simulation of CBIR for trademark or logo image. A GUI is a class of simulation that admits users to communicate with electronics devices or systems through graphical icons as against to text based interfaces.

3.3 Trademark Image Preprocessing

To compare various different sizes of images, we have to consider the speed of computer and the size should be limited within 256*256 pixels.

First, it's essential to select a proper color space to express a trademark image RGB and if needed converted to HSV (Hue, Saturation and Value) color space. HSV is very much closer to human eyes and more easily acceptable. So, RGB space is transformed to HSV space.

3.4 Feature Extraction and Implementation of proposed algorithm:

In the proposed algorithm we are using the comparison of HSV and LXY as a feature descriptor. In this we are using indexing of both algorithm and on the basis of index and their correlated features of retrieval the associated images retrieve for the requisite input. We are also using histogram and color descriptor as a feature descriptor. The feature extraction was made on the basis of color, logo and text of the input image. Bins approach is also used as a feature extraction in this phase.

3.5 Matching:

Finally the matching and retrieval of the images was done on the basis of Euclidean distance algorithm.

IV. RESULTS AND DISCUSSION

For results evaluation we use precision, recall and mean as parameters and found that there is higher rate of results in favor of HSV (proposed algorithm) as compare to LXY.

It has been derived from the two conventional parameters used for performance evaluation precision and recalls which are defined as follows:

$$\textbf{PRECISION} = \frac{\text{Relevant Retrieved Images}}{\text{All Retrieved Images}}$$

$$\textbf{RECALL} = \frac{\text{Relevant Retrieved Images}}{\text{All Relevant in Database}}$$

$$\textbf{MEAN} = \frac{\text{Sum of all relevant Values}}{\text{Total Number of Inputs}}$$

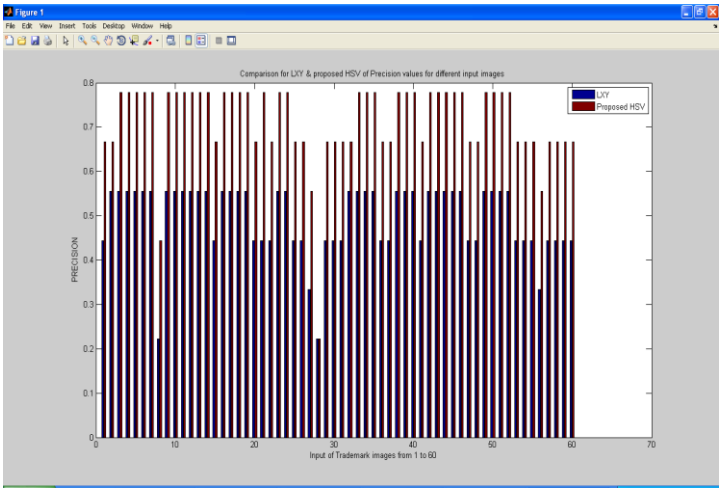

Fig 4.1 Comparison of Precision for LXY and proposed HSV

Fig 4.1 graph shows Precision on Y-axis and Input of Trademark images 1 to 60 on X-axis. It clearly depicts the comparison graph of LXY algorithm and proposed method on the basis of precision value in which precision value of LXY algorithm is quiet low as compare to proposed HSV.

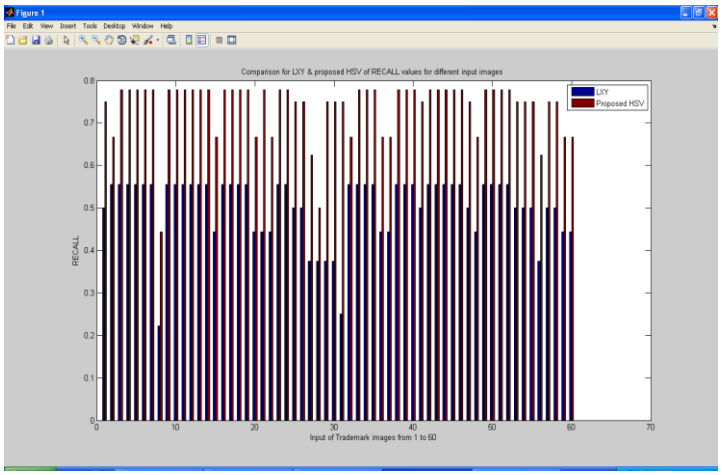

Fig 4.2 Comparison of Recall for LXY and proposed HSV

Fig 4.2 shows Recall on Y-axis and Input of Trademark images on X-axis. The above Fig 4.2 Recall value of LXY algorithm is also low as compare to propose HSI algorithm for all the relevant input images in the entire sixty datasets. The recall value calculated on the basis on number of favorable retrieved image with respect to all associated and similar images in the datasets.

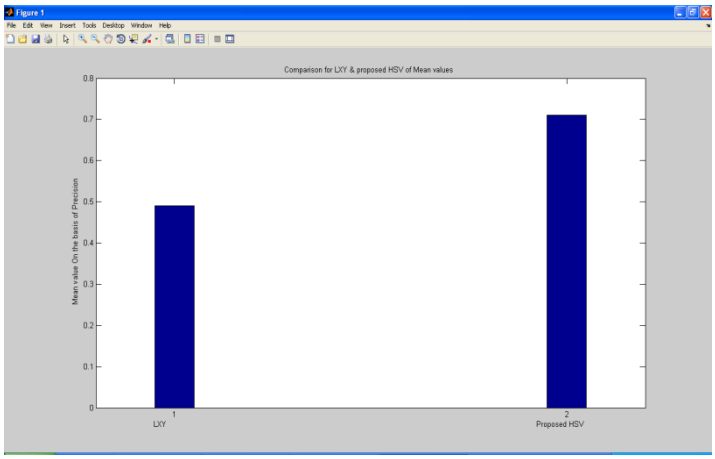

Fig 4.3 Comparison of Mean on the basis of Precision value

Fig 4.3 shows Mean value on the basis of Precision on Y-axis and comparison of LXY proposed HSV of mean values on X-axis. The mean value of HSV approach is quiet better and higher as compare to LXY approach which is quiet optimist and applicable in favor to the proposed approach.

IV. CONCLUSIONS AND FUTURE SCOPE

In this, we mainly focused towards the CBIR of Trademark Images on the basis of color, text and logo. The proposed work is exploring the bins approach for CBIR in different color spaces using LXY and HSI. The performance and comparison was made over each images stored in the set of data set of various Trademark images. Here, we have taken two metrics namely PRECISION and RECALL. The results clearly depicts that the value of PRECISION and RECALL for all the images stored in the set of dataset is quiet higher for proposed HSV(HSI) as compare to LXY approach. As we know that for better results point of view there should be high PRECISION and RECALL values for analyzing the higher bit rate of accuracy and performance for CBIR. The results of proposed work is quiet full fill the above line and founds that the result of proposed HSV is quiet better as compare to LXY algorithm. Moreover, the dissertation also depicts that the results for mean value on the basis of PRECISION and RECALL which is quiet optimist and scalable for proposed HSV as compare to the LXY approach. Overall, the results analysis and comparison is highly favorable for the proposed HSI algorithm

Furthermore, there is need to improve the results of image retrieval more to the present one. There is also need to increase the work more for different techniques and also there should be need to use some more parameters for results evaluation.

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