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Multi-layer multi-level color distribution – User feedback model with wavelet analysis for color image retrieval☆

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ABSTRACT

To avoid misclassification during retrieval,this paper proposes an efficient multi-layer multi-level color distribution (MLMLCD) approach to improve the image retrieval quality. Here, the MLMLCD Vector Generation stage applies the wavelet transform over the image layers and hence color distribution vectors are generated. In MLMLCD Image Retrieval stage, the similarity measurement of MLMLCD color distribution vector value is made between the proposed technique and the values from larger databases. Finally, the precise retrieval result is produced with user feedback and query model, which is iterated over several runs. The performance of the proposed technique is tested between two datasets namely: McGill and CalTech database. Here, the performance is tested in terms of retrieval efficiency, classification rate and time complexity. A higher retrieval efficiency (98.5%)with less false classification rate(3.4%) is achieved, when compared with conventional techniques and a significance improvement is noted.

1. Introduction

The large graphical database contains several categories of images. Each image has huge similarity to other few images. The images present in the database can be classified into few categories. As of the size of backend is higher, the features present in the similar images has little deviation. For example, the dog image present in the database contains dog feature but the size and color of the dog would be different. Also there will be little deviation of color in hair of dogs in few places. Such micro deviation in the feature would change the result of query. Now a days identifying similar color images from large database are challenges to the researchers. Retrieving related images from large database has been handled with many features like color, shape and texture. However, the color value of the image plays the vital role in all the cases.

Content-based image retrieval is an efficient method which automates retrieval of images with respect to its salient features [23]. The image retrieval has been performed in many ways using above mentioned features and for the classification there are number of algorithms has been used. The popular K-means algorithm computes the image similarity using the color values and edge similarity. Similarly there are number of algorithms has been used in earlier days. The efficiency of image retrieval is highly depending on the feature being considered.

The color distribution is the measure which is computed based on the number of pixels being affected with any particular color. There are number of colors possible for the image pixel, each colors contains unique color value. There may

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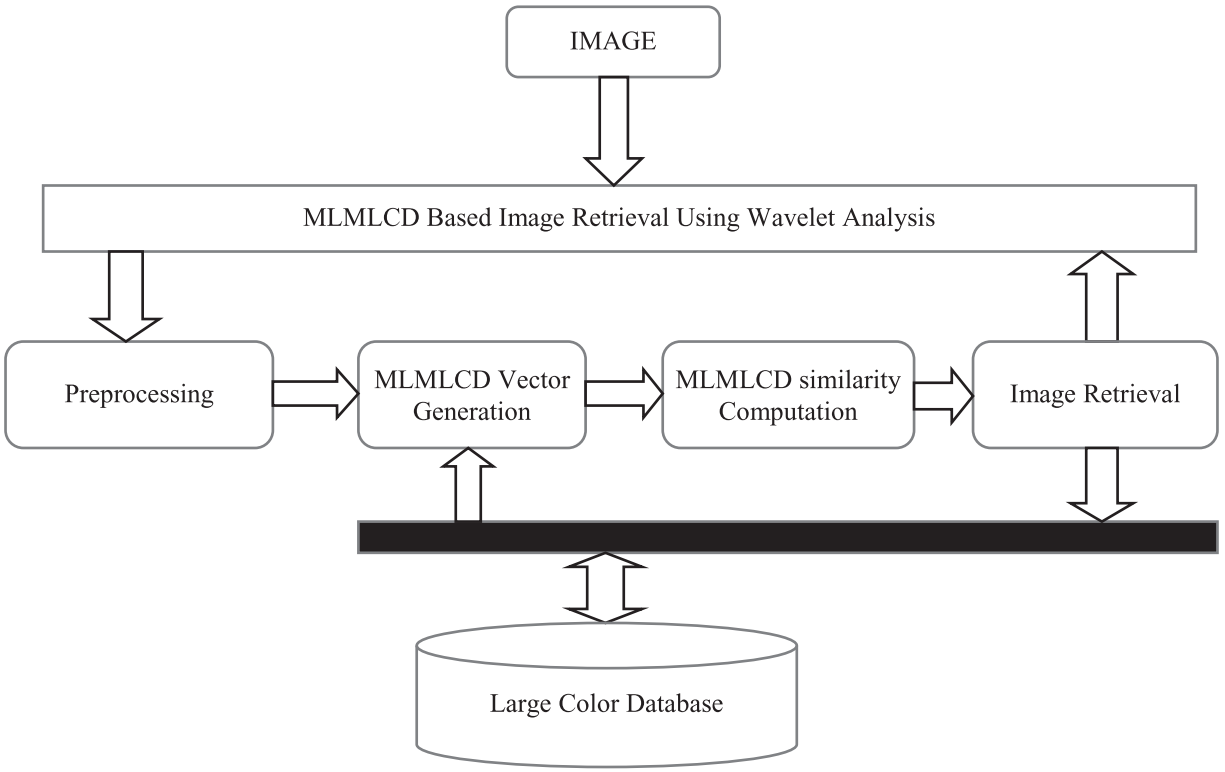

Fig. 1. Architecture of MLMLCD based image retrieval.

be N number of pixel with the same value. By counting the number of pixels affected for the value considered, the feature distribution of the color value can be computed. Each similar image has reasonable closure feature distribution than other images. The colors are basically classified from Red Green and Blue (RGB) consortium. The mixtures of RGB are giving numerous level color combinations. Each combination has unique color codes. Even though the color values are different, they affect only in the red layer not on the blue layer.

In this paper, the color histogram is used for the classification process and generates the feature vector based on the color values of pixels. The images would have any object and the color of the object also vary according to the type. The color histogram is computed by counting the number of color values present in the image for each distinct color values. Then the probability of distribution is computed to restore the pixel with new value [1]. This method concentrates on image layers with resemblance in the bottom layers than the top layer and computation of the color distribution resolves the problems associated with image retrieval process. For any image retrieval algorithm, the efficiency over time complexity is much important and wavelet transform is applied to improve the efficiency. The wavelet transform reduces the signals with less distortion and the images are transformed to different levels by varying the wavelet parameters [4]. The color distribution vector is generated over each wavelet transform output and produces three different distribution vectors for each level. The Multi-Layer Multi-Level Color Distribution (MLMLCD) vector is used in computing the similarity between the images. The proposed Multi-Layer Multi-Level Color Distribution (MLMLCD) method is evaluated over two database for computing its retrieval efficiency, false classification rate and time complexity.

In preprocessing stage, the method generates three level images for a single image from the selected database and the proposed method generates three different color distribution vectors. The entire phase has been split into number of stages namely preprocessing, MLMLCD Vector Generation, MLMLCD Image Retrieval. The different images are generated by applying wavelet transform (stage 1) and using the color distribution vector (stage 2). Hence, the methods computes the color distribution similarity value to perform image retrieval [7]. The architecture of MLMLCD using color image retrieval is shown in Fig. 1.

The outline of the paper is mentioned as follows: The Section 2 provides insights on conventional techniques used in Content Based Image Retrieval. Section 3 gives the proposed content based image retrieval with wavelet analysis. Section 4 evaluates the proposed work with conventional techniques. Finally, Section 5 concludes the paper with future work.

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