

Image Retrieval Using HSV-HDWT Hybrid Transformation Domain

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Abstract: With the development of the Internet, and the availability of image capturing devices such as digital cameras, image scanners, the size of digital image collection is increasing rapidly. Efficient image searching, browsing and retrieval tools are required by users from various domains, including remote sensing, fashion, crime prevention, publishing, medicine, architecture, etc. For this purpose, many general purpose image retrieval systems have been developed. In CBIR, images are indexed by their visual content. The choice of features plays an important role in image retrieval. Some of the features used are color, texture and shape. Combination of these features provides better performance than single feature. Here we are extracting color and texture features with the proposed method consists of HMMD (Hue Min Max Difference) color plane and HDWT (Hadamard Discrete Wavelet Transform) techniques. It is proved in research work that HMMD HDWT reduced the size of feature vectors, storage space and gives high performance than intensity-Haar, RGB-Haar and RGB-HDWT. Further, HSV color space model will be used to improve the feature extraction and improve the precision. At the end, results are presented to show the efficacy of the proposed method.

Keywords: CBIR, HSV, HDWT, RGB, Color Model

I. INTRODUCTION

At the first stage of CBIR, analysis primarily targeted on exploring numerous feature representations, hoping to seek out a “best” illustration for every feature. It's attention-grabbing to seem back toward the start and see that of the initial ideas have blossomed, that haven't, and that were created obsolete by the dynamic landscape of computing. Several programs and tools are developed to formulate and execute queries supported the visual or audio content and to assist browsing giant multimedia system repositories. Answers to several queries with relevancy speed, linguistics descriptors or objective image interpretations square measure still nonreciprocal. The work bestowed here offers a quick review of the analysis administrated during this field and additionally the planned techniques that may facilitate improve the system.

Content-based image retrieval has been developed to resolve the issues related to text-based image retrieval .The image retrieval relies on content of the image instead of keyword [1]. The content –based image retrieval works directly with image content instead of text annotations. The term "content" during this context would possibly discuss with colors, shapes, textures, or the other info which will be derived from the image itself. CBIR is fascinating as a result of searches that trust strictly on information square measure keen about annotation quality and completeness. The term "content-based image retrieval" looks to own originated in 1992 once it absolutely was utilized by T. Kato to explain experiments into automatic retrieval of pictures from a info, supported the colors and shapes gift. Initial CBIR systems were developed to go looking databases supported image color, texture, and form properties. Once these systems were developed, the requirement for easy interfaces became apparent. Therefore, efforts within the CBIR field began to embody humanistic style that attempted to satisfy the requirements of the user playacting the search. This usually suggests that inclusion of: question ways that will permit descriptive linguistics, queries that will involve user feedback, systems that will embody machine learning, and systems that will perceive user satisfaction levels.

There is an excellent use of content-based image retrieval in applications like fashion, graphic designers, diagnosis, geographical info, business enterprise and advertising, crime bar, etc [5]. Several national and regional newspaper publishers maintain their own libraries of images, or can use those offered from the news agency, Reuters and different agencies. Electronic ways of storage and access square measure showing, aboard developments in automatic ways of newspaper production, greatly up the speed and accuracy of the retrieval method. In hospitals, decision making method needs the medical man to go looking and review similar X-ray or scanned pictures of a patient before giving any resolution. In crime bar, police must make sure the face of a criminal by matching his image options with the photographs within the info. The foremost necessary application is that the net. Various industrial and experimental CBIR systems square measure currently offered, and plenty of net search engines square measure currently equipped with CBIR facilities, as for instance Alta aspect, Yahoo and Google [7]. Images square measure employed in design to record finished comes, together with interior and exterior shots of buildings in addition explicit options of the look. In design, images square measure employed in design to record interior and exterior shots of buildings, style options and to record finished comes. In teaching, visual content is incredibly useful in giving information to instructional business. Content of pictures is employed to represent and access the photographs in content-based image retrieval systems. A basic content-based image retrieval system is split into off-line feature extraction and on-line feature extraction [4]. Framework for content-based image retrieval is illustrated in Figure one.1.

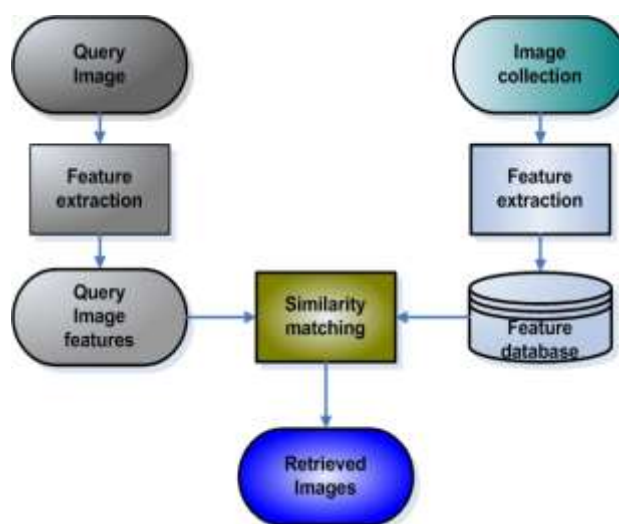


Fig 1: Framework for Content-Based Image Retrieval

II. RELATED WORK

Harshada Anand Khutwad, Prof.Mr.Ravindra JinaDatta Vaidya (2013): In “Content primarily based Image Retrieval” authors proposes a technique to use combination of color and texture options of the pictures to boost the retrieval leads to terms of accuracy. This paper describes color bar graph algorithmic program for color and Daubechies ripple algorithmic program for texture. The experiment is conducted in mat research lab setting. The results could also be improved if we tend to take into account form beside color and texture and that we may use some classification theme for higher retrieved results and performance.

.Julia Vogel, Bernt Schiele (2007): In “Semantic Modeling of Natural Scenes for Content-Based Image Retrieval” authors have given a procedure image illustration that reduces the linguistics gap between the image understanding of the humans and also the pc. Image regions area unit classified into one in all the 9 idea categories and sensible categorization performance has been obtained. Particularly, it's showed that the linguistics modeling results in significantly higher categorization performance compared to directly using low-level options.

Ritendra Datta, Jia Li, James Z. Wang (2005): In “Content-Based Image Retrieval - Approaches and Trends of the New Age” authors discuss contributions and challenges within the field of image retrieval. Some pointers also are given to style a sensible content-based image retrieval system.

Jun Yue, Zhenbo Li , Lu Liu , Zetian Fu (2010): In “Content-based image retrieval mistreatment color and texture united features” authors compared the characteristics of the world color bar graph, native color bar graph and texture options for CBIR. a lot of low-level options like form and spatial location options etc. are going to be accustomed create the system a lot of sturdy within the future. It conjointly describes the work on co-occurrence matrix primarily based texture feature extracting and scrutiny retrieval results with color-based CBIR.

S. Arivazhagan, L. Ganesan (2002): In “Texture classification mistreatment ripple transform” authors projected the feel classification mistreatment ripple applied mathematics options, ripple co-occurrence options, a combination of ripple applied mathematics options and co prevalence options of 1 level ripple remodeled pictures with totally different feature databases. The distinct ripple rework (DWT) is applied on a group of texture pictures and applied mathematics options like mean and variance area unit extracted from the approximation and detail regions of DWT rotten pictures, at totally different scales. The varied mixtures of the on top of applied mathematics options area unit applied for texture classification and a group of best feature vectors area unit chosen. so as to boost the success rate of classification, the co-occurrence matrix is calculated for original image, approximation and detail sub-bands of 1-level DWT rotten pictures and extra options area unit extracted. These further options area unit combined with the on top of chosen best ripple applied mathematics feature (WSF) sets and an in depth analysis is completed mistreatment 3 totally different feature databases. it's found that the success rate is improved a lot of by combining ripple applied mathematics and co-occurrence matrix options.

S. Arivazhagan, L. Ganesan, S. Padam Priyal (2006): In “Texture classification mistreatment physicist wavelets primarily based rotation invariant features” authors projected a brand new approach for rotation invariant texture classification mistreatment Gabor wavelets. Gabor wavelets area unit the mathematical model of visual animal tissue cells of class brain and mistreatment this, a picture may be rotten into multiple scales and multiple orientations. The Gabor operate has been recognized as a really useful gizmo in texture analysis, thanks to its best localization properties in each spatial and frequency domain and located widespread use in pc vision. Experimentation is conducted with 4032 revolved textures derived from all the 112 Brodatz texture pictures .In implementation, solely 112 textures at zero degree orientations area unit utilized in the coaching part whereas 4032 revolved textures derived from the on top of 112 textures area unit used for classification. Also, the comparative analysis with the recently projected rotation invariant circular Gabor filter methodology show that CGF strategies end in poor performance than the projected methodology.

M. Singha, K. Hemachandran, A. Paul (2012): In “Content-based image retrieval mistreatment the mixture of the quick ripple transformation and also the color bar graph” authors study a picture retrieval technique supported the mixture of Haar ripple transformation mistreatment lifting theme and also the color bar graph (CH) known as lifting wavelet-based color histogram. The

color feature is delineated by the CH that is translation and rotation invariant. The Haar ripple transformation is employed to extract the feature options and also the native characteristics of a picture, to extend the accuracy of the retrieval system. The lifting theme reduces the time interval to retrieve pictures. The experimental results indicate that the projected technique outperforms the opposite schemes, in terms of the common preciseness, the common recall and also the total average precision/recall.

Hassan Farsi, Sajad Mohamadzadeh (2013): In “Color and texture feature-based image retrieval by mistreatment Hadamard matrix in distinct ripple rework” the authors propose a brand new methodology supported combination of Hadamard matrix and distinct ripple transform (HDWT) in hue-min-max-difference and RGB color house. a median normalized rank and combination of preciseness and recall area unit thought of as metrics to judge and compare the projected methodology against totally different strategies. The obtained results show that the employment of HDWT provides higher performance compared with Haar distinct ripple rework, color layout descriptor, dominant color descriptor and ascendable color descriptor, city purpose and bar graph intersection.

III. METHODOLOGY

A content-based image retrieval system includes of 3 steps; feature extractor, compartmentalization and retrieval half. The feature extraction strategies rely upon form of the options or content of a picture.

(i) Collection of pictures: Corel information is employed for assortment of images. It contains one thousand totally different variable size pictures. Question image is one amongst the photographs taken from information.

(ii) Preprocessing: Before the extraction of feature vector, 1st pictures area unit resized to 256 X 256 so options area unit extracted from a picture. Image resampling reduces or will increase the quantity of pixels of the dataset.

(iii) Feature Extraction: we have a tendency to area unit operating with color and texture options of pictures during this thesis. Texture options area unit extracted by victimization Hadamard matrix with distinct wave remodel (HDWT) and color options area unit extracted by victimization HSV color house. Therefore, dataset and question feature vectors area unit created by victimization these techniques.

(iv) Similarity Measure: The relevant pictures are then retrieved by examination the feature vector of question with the feature vector dataset by victimization geometer distance because the ∂ similarity measure.

IV. RESULT

To evaluate the operating of HDWT methodology, the implementation has been tired MATLAB R2013a with the image dataset being one thousand image Corel dataset. The result for the HDWT victimization RGB color house model is bestowed Fig 2. The first image in Fig 2 is that the question image and remaining area unit the retrieved pictures from the information. Out of all the retrieved pictures, one will observe that the primary image retrieved is same because the question image. this can be obvious case wherever the question image is additionally gift within the information wherever the simplest match is with identical image.



Fig 2 Retrieved images using HDWT features

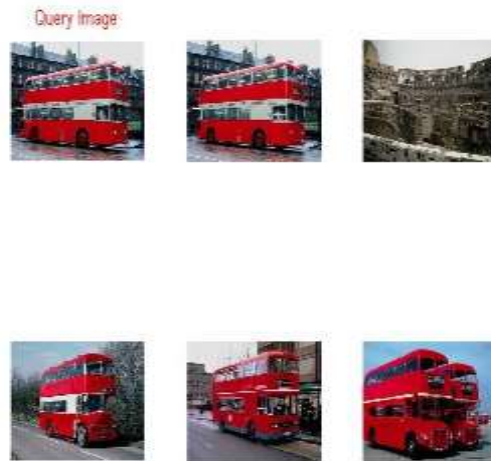


Fig. 3 Retrieved Images with one image being out of the class of the query image.



Fig. 4: Results for retrieved image of flower



Fig. 5: Results for dinosaur image query

Performance analysis of HSV-HDWT feature extraction is done on the basis of the performance metrics: precision, recall. These metrics when used tells us about the performance of the content based image retrieval. The metrics are explained in next section.

Performance Metrics

The following performance metrics are considered in analyzing the performance of content-based image retrieval

- (i) Precision: Precision is used for evaluation of most CBIR systems. Precision is the fraction of returned images that are relevant to the query image. If we denote T as the set of returned images and R as the set of all images relevant to the query image
- (ii) Recall: Recall is the fraction of returned relevant images with respect to the total number of relevant images in the dataset.

$$\text{Recall} = \frac{|T \cap R|}{|R|}$$

The numbers of relevant images are computed and the precision and recall in each number of retrieved images for all query images are obtained. We next consider the average of these precisions and recalls for each number of retrieved images as the precision and recall of each method for each number of retrieved images. The distance is computed between the feature vectors of the query image and the feature vectors stored in the dataset using Euclidian distance. Sort the images according to distances with the smallest distance first. The number of images returned is six in number fixed by the code.

The retrieved pictures in Fig. 3 show that one amongst the photographs isn't relevant to the specified or the question image. The performance metrics in terms of confusion matrix has been planned for the one thousand image Corel dataset that shows that there's a scope of improvement within the existing algorithmic program. The results show a brand new methodology is needed so as to enhance the relevance of the retrieved pictures. The projected work is meant for the development within the retrieval method on the grounds of each quantitative and qualitative information.

V. CONCLUSIONS

The obtained results showed using RGB color space and Hadamard transform in DWT that there could be improvement in the performance of image retrieval in the three datasets. Other than that, the HDWT method reduced the size of storage space and feature vectors and therefore reduced the computation time extremely in high level of HDWT and provided better performance. Although the algorithm provides an effective retrieval of images, the processing time for the complete process is high. Hence, the future work can be focused on decreasing the processing time for the feature extraction so that the complete process is fast enough for real time application.

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