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AN EFFICIENT APPROACH FOR CONTENT BASED RETRIEVAL USING MULTI WAVELET AND HSV COLOR SPACE

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Abstract- This paper presents an approach for image retrieval by using multiwavelet and hsv color space. The HSV stands for the Hue, Saturation and Value, provides the perception representation according with human visual feature. The multiwavelets offer simultaneous orthogonality, symmetry and short support. In this paper, we have tested 140 images with 5 different categories. the experimental results show the better results interms of retrieval accuracy and computation complexity. The performance of this approach is measured and results are shown. Euclidean Distance and Canberra Distance are used as similarity measure in the proposed CBIR system.

Keywords- *CBIR (Content Based Image Retrieval), distance and energy*

I. INTRODUCTION

With the rapid growth of digital image and video, content based image retrieval has become important research area to help people to search and retrieve useful information. High retrieval efficiency and less computational complexity are the desired characteristics of CBIR system.

A popular approach is querying by example and computing relevance based on visual similarity using low-level image features like color histograms, textures and shapes. Text-based image retrieval can be traced back to the 1970's; images were represented by textual descriptions and subsequently Retrieved using a text-based database management system [3]. Content-based image retrieval utilizes Representations of features that are automatically extracted from the images themselves. Most of the features of the query image, searches through the database for images with similar features, and displays relevant images to the user in order of similarity to the query [6][7][8][9].Image Retrieval aims to provide an effective and efficient tool for managing large image databases. With the ever growing volume of digital image generated, stored, accessed and analyzed.

The paper is organized as follows. Multi wavelet is presented in Section II. Section III describes the hsv colourspace. The feature extraction calculation is presented in Section IV. Section V describes the conclusion.

II. MULTIWAVELET

The wavelet transform transforms the image into a multi-scale representation with both spatial and frequency characteristics. Multiwavelets were defined using several wavelets with several scaling functions [7]. Multiwavelets have several advantages in comparison with scalar wavelet [8]. A scalar wavelet cannot possess all these Properties at the same time. On the other hand, a multiwavelet system can simultaneously provide perfect Representation while preserving length (Orthogonality), good performance at the boundaries (via linear phase symmetry), and a high order of approximation (vanishing moments) [9]. Thus multiwavelets offer the possibility of superior performance and high degree of freedom for image processing applications, Using the pyramid-structure wavelet transform, the texture image is decomposed into four sub images, as low-low, low-high, high-low and high-high sub-bands. The energy level of each sub-band is calculated.

This is first level decomposition. Using the low-low sub-band for further decomposition is done. Decomposition is done up to third level in this project. The reason for this type of decomposition is the assumption that the energy of an image is concentrated in the low- low band.

In this work, Haar is the simplest and most widely used, while Daubechies have fractal structures and are vital for current wavelet applications. So Daubechies wavelets are used here.

The procedure of wavelet transform as shown below

1) Input as Query image I as taken
2) Convert RGB to HSV
3) Apply pyramid structural wavelet to hue color
4) Calculate the features(color, texture and edge) values of the image
5) Similarity comparisons between input image and database by using Euclidean distance.
6) Sorting the distance values
7) Finally relevant images are retrieved with respect to corresponding query image I.
8) Repeat step 1 to 7 for another query image.

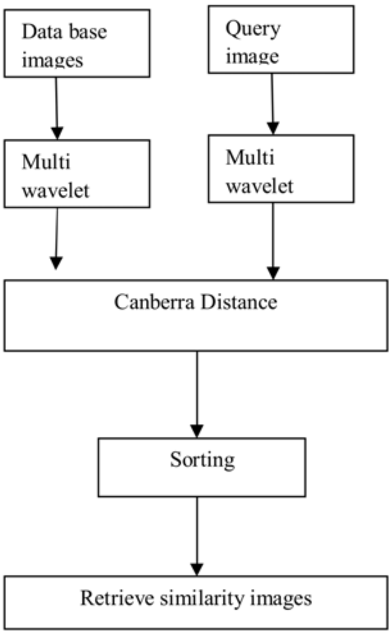

Fig.1.Flowchart of proposed algorithm

The experimental examples are shown in fig.2 and 3 using wavelet transform. The image retrieval accuracy is better than hsv color space.

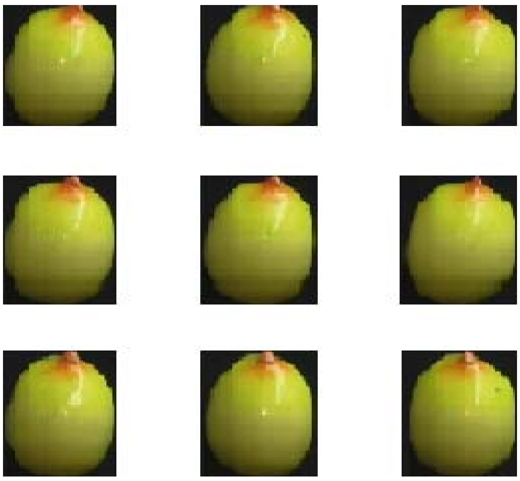

Fig.2.rotating mango coil using wavelet transform

Fig.3.rotating tamoto coil using wavelet transform

III. HSV COLOR SPACE

The HSV stands for the Hue, Saturation and Value, provides the perception representation according with human visual feature. The HSV model, defines a color space in terms of three constituent components: Hue, the color type Range from 0 to 360. Saturation the "vibrancy" of the color: Ranges from 0 to 100%, and occasionally is called the "purity". Value the brightness of the color: Ranges from 0 to 100%. To decrease the number of colors used in image retrieval, we quantize the number of colors into several bins. J.R. Smith [3] designs the scheme to quantize the color space into 166 colors. Li [5] design the non-uniform scheme to quantize into 72 colors. We propose the scheme to produce 15 non-uniform colors. The formula that transfers from RGB to HSV is defined as below:

$$H = \cos^{-1} \frac{\frac{1}{2}[(R-G)+(R-B)]}{\sqrt{(R-G)^2+(R-B)(G-B)}}$$

S=1-3/(R+G+B)(min(R,G,B))
V=1/3*(R+G+B)

The proposed scheme contains three phases. First of all we resize all images to reduce the size of images and processing time. Secondly we convert each pixel of resized image to quantized color code. Finally we compare the quantized color code between the query image and database image. The experimental results shown in fig 4 and 5 using hsv color space.

Fig.4.rotating mango coil using hsv color space

Fig.5.rotating tamoto coil using hsv color space

IV. FEATURE EXTRACTION

For the texture characteristic four descriptors are used that are: contrast, entropy, energy and inverse differential moment. We have used the Euclidian distance to measure the similarity between the Query image and database image. First apply the Pyramid structure wavelet to get the image into eight sub-images. Calculate the energy of all decomposed images at the same scale, using:

$$E = \frac{1}{MN}\sum_{i=1}^{m}\sum_{j=1}^{n}\left|X(i,j)\right|$$

Where M and N are the dimensions of the image, and X is the intensity of the pixel located at row i and column j in the image map. Using the above algorithm, the energy levels of the sub-bands is calculated, and further decomposition of the low-low sub-band image is also done This is repeated three times, to reach third level decomposition. These energy level values are stored to be an Canberra distance to measure the similarity of image for matching between a query image and image from database. We take Canberra distance between two p and q vector is shown below

$$d^{CAD}(\mathbf{p},\mathbf{q}) = \sum_{i=1}^{n}\frac{|p_i - q_i|}{|p_i| + |q_i|},$$

When matching processing is completed, results are sorted in ascending order and retrieval images are presented.

V. CONCLUSION

This paper attempts to evaluate the performance of the CBIR system on sample datasets of images using wavelet. Wavelet transform is the development of wavelet transform and construct wavelet with two scaling function. Wavelet transform has many relatively good properties such as symmetry, short support, orthogonality and high order vanishing moments. The system gives good results on the tests conducted. Further tests must be conducted on various and large databases to have a more accurate evaluation. The indexation technique is a crucial part in a CBIR system. To have a more powerful and efficient retrieval system for image and multimedia databases, content based queries must be combined with text and keyword predicates.

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