Color-Texture Features Based Image Retrieval Using Structure Wavelet

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Abstract

In this paper, content based image retrieval method is used, to retrieve the images from the database according to their similarity to the Query image. The aim of this project is to retrieve the images using Pyramid structure wavelet. Firstly, we calculate the Pyramid structure wavelet of all images in database.secondly,to calculate the energy and then distance between query and database images.

Keywords. *Retrieving Images, CBIR (Content Based Image Retrieval) system, distance and energy*

1. Introduction

Content-Based Image Retrieval (CBIR) is the process of retrieving images from a database on the basis of features that are extracted automatically from the images themselves [2]. A CBIR method typically converts an image into a feature vector representation and matches with the images in the database to find out the most similar images. In the last few years, several research groups have been investigating content based image retrieval. 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 current CBIR systems allow for querying-by-example, a technique wherein an image (or part of an image) is selected by the user as the query. The system extracts 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].

The paper is organized as follows. Flow chart of proposed method is presented in Section II. Section III describes the Pyramid structure wavelet. The texture feature calculation is presented in Section IV. Distance calculation are made in Section V. Results are shown in section VI. Section VII describes the conclusion.

2. Flowchart of Proposed Algorithm

The process of proposed algorithm 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 Euclidian 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.

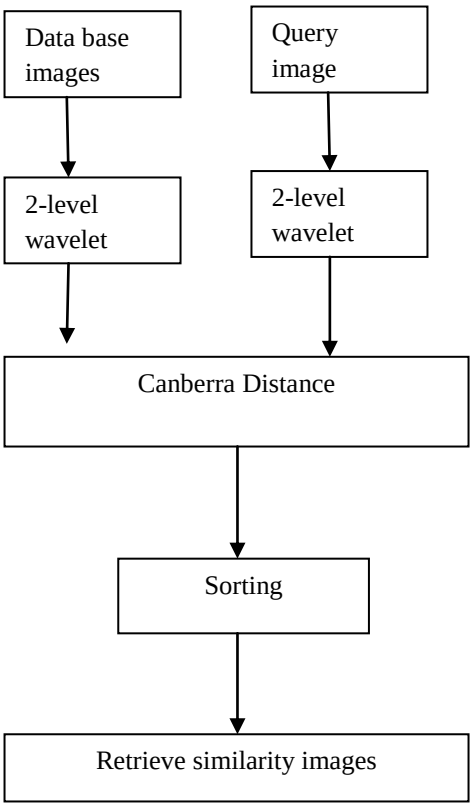

Figure.1.Flowchart of proposed algorithm

3. Pyramid Structure Wavelet Transform

The wavelet transform transforms the image into a multi-scale representation with both spatial and frequency characteristics. This allows for effective multi-scale image analysis with lower computational cost. 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.

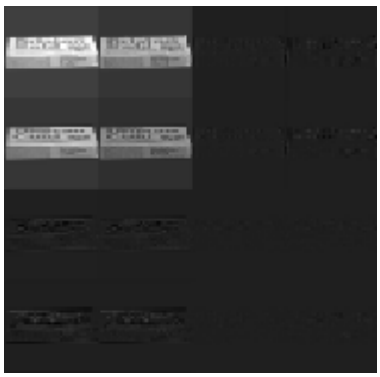

Figure.2. pyramid structure wavelet decomposition

4. Texture Feature Calculation

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 used in the Euclidean distance algorithm.

5. Distance Calculation

In this section, we take Canberra distance between two vectors p and q is shown below

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

6. Results

In the experiment various images are used in the MATLAB program. The results of four different test images *coil.png, tamoto.png, mango.png and Rolaids.png* are shown below.

Figure.3.rotating coil dristan cold

Figure.4.rotating coil Rolaids

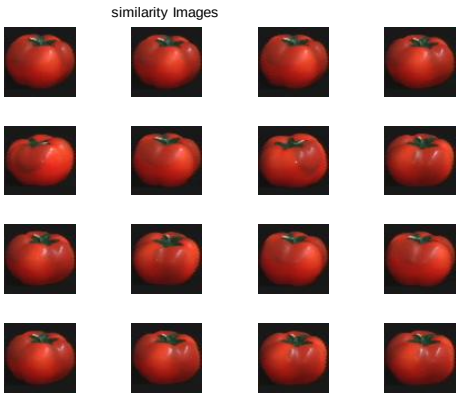

Figure.5.rotating coil tamoto

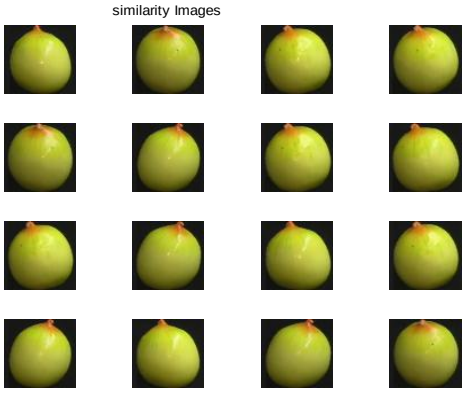

Figure.6.rotating coil mango

7. Conclusion

This paper attempts to evaluate the performance of the CBIR system on sample datasets of images using Pyramid structure wavelet. Pyramid structurewavelet transform is the development of wavelet transform and construct wavelet with two scaling function. Pyramid structure 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.

8. References

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