ENGINEERING IN ADVANCED RESEARCH SCIENCE AND TECHNOLOGY

ISSN 2350-0174
Vol.03, Issue.02
April-2023
Pages: 637-641

Content Based Image Retrieval Using Discrete Wavelet Transform And Edge Histogram Descriptor

Dr.Brahmaiah naik[1], K.Kavya[2], M.Kavitha[3], K.Rajasekhar reddy[4]. N.Karthikteja[5],M.Hitheesh[6]
[1] *Professor, Department of Electronics and Communication Engineering, Kallam Haranadhareddy Institute of Technology, Guntur, India*
[2,3,4,5]*Student, Department of Electronics and Communication Engineering, Kallam Haranadhareddy Institute of Technology, Guntur, India*

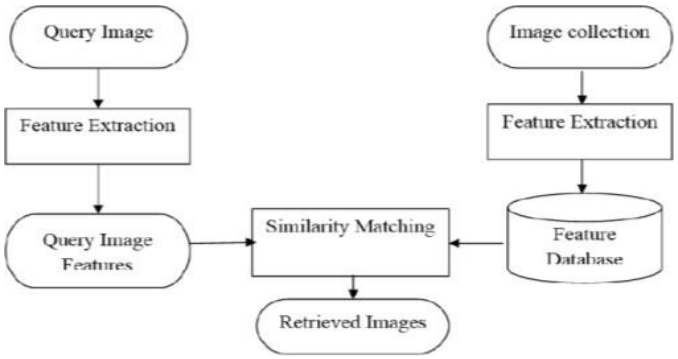
Abstract—This project describes an efficient algorithm for Content Based Image Retrieval (CBIR) based on Discrete Wavelet Transform (DWT). The proposed algorithm is explained for image retrieval based on shape and texture features. The combination of DWT and EHD techniques increases the performance of image retrieval system for shape and texture based search. The performance of various wavelets is also compared to find the suitability of particular wavelet function for image retrieval. The proposed algorithm is trained and tested for Wang image database. The results of retrieval are expressed in terms of Precision and Recall and compared with various other proposed schemes to show the superiority of our scheme.

Keywords—Wavelet Transform; Edge Histogram Descriptor; Feature Vector; Similarity Check; Precision; Recall;

1. Introduction

Images are more expressive than words, to express the words, images are used by most of the websites. With the help of simple searching for an image, image can easily be identified in a collection of images. There are two basic approaches used for the information retrieval: 1)text based image retrieval technique(TBIR). 2) Content based image retrieval technique(CBIR).

1. TEXTURE: It describes about the structural arrangement of the surface and its relationship to the surrounding environment. 2. PROPERTIES: Based on the orientation and distance between image pixels we obtain statistics that represents: Contrast Directionality Regularity Roughness. II. PROPOSED ALGORITHM The overall CBIR system is shown in figure 1. CBIR system extracts visual attributes (color, shape, texture and spatial speckle noise thus making it a challenging task for detection of information) of each image in the database and stores in a different database within the system called feature database. The users present query image to the system. The system automatically extract the visual attributes of the query image in the same mode as it does for each database image, and then identifies images in the database whose feature vectors match those of the query image, and sorts the best similar objects according to their similarity value. So, it mainly involves two processes first is Training process i.e. Feature extraction and the second is Testing process i.e. Feature matching process.



Block Diagram of CBIR

CBIR DESCRIPTION: 1. QUERY IMAGE: Query image is refers to the problem of finding for digital image in large databases.

2. FEATURE EXTRACTION: The first step in the process is

extracting image features to a distinguishable extent.The second step involves matching these features to yield a result that is similarly matching. 3. **IMAGE COLLECTION:** A huge number of collected images .simply nothing but as database. **4. QUERY IMAGE FEATURES:** It refers to the problem of finding objects that are relevant to a user query within image databases **5. FEATURE DATABASE:** A feature database is an organized collection of structured information or data. Typically stored electronically in a computer system. **6. SIMILARITY MATCHING:** Similarity matching tries to recognize similar individuals based on the information known about them . **7. RETRIEVED IMAGES**: An image retrieval system is a computer system used for browsing, searching and retrieving images from a large database of digital images. **8. FREQUENCY ANALYSIS** : Frequency Spectrum: Be basically the frequency components (spectral components) of that signal Show what frequencies exists in the signal Fourier Transform (FT) : One way to find the frequency content Tells how much of each frequency exists in a signal **SHORT TIME FOURIER TRANSFORM (STFT):** Dennis Gabor (1946) Used STFT. To analyze only a small section of the signal at a time -- a technique called Windowing the Signal. The Segment of Signal is Assumed Stationary.

$$STFT_x^{(\omega)}(t', f) = \int_t [x(t) \bullet \omega^*(t - t')] \bullet e^{-j2\pi ft} dt$$

$\omega(t)$: the window function

MULTI RESOLUTION ANALYSIS (MRA): Wavelet Transform An alternative approach to the short time Fourier transform to overcome the resolution problem Similar to STFT: signal is multiplied with a function Multi resolution Analysis Analyze the signal at different frequencies with different resolutions **WAVELET ANALYSIS:** Wavelet analysis represents the next logical step: a windowing technique with variable-sized regions. Wavelet analysis allows the use of long time intervals where we want more precise low frequency information, and shorter regions where we want high-frequency information

Fig 5. Wavelet Analysis

THE CONTINUOUS WAVELET TRANSFORM: Mathematically, the process of Fourier analysis is represented by the Fourier transform: which is the sum over all time of the signal f(t) multiplied by a complex exponential. (Recall that a complex exponential can be broken down into real and imaginary sinusoidal components.) The results of the transform are the Fourier coefficients F(w), which when multiplied by a sinusoid of frequency w yields the constituent sinusoidal components of the original signal. Graphically, the process looks like: Similarly, the continuous wavelet transform (CWT) is defined as the sum over all time of the signal multiplied by scaled, shifted versions of the wavelet function. **THE DISCRETE WAVELET TRANSFORM:** The Discrete Wavelet Transform (DWT), which is based on sub-band coding, is found to yield a fast computation of Wavelet Transform. It is easy to implement and reduces the computation time and resources required. In the case of DWT, a time-scale representation of the digital signal is obtained using digital filtering techniques. The signal to be analyzed is passed through filters with different cutoff frequencies at different scales. Edge Histogram Descriptor: Edge Histogram descriptor is a method describing texture. It is mostly used for image retrieval. This method classifies images on local edge distribution with the histogram-based descriptor. Image retrieval is a computer process used in a large database of digital images to browse and retrieve images The texture is a powerful low-level descriptor for image search and retrieval applications like colour. The distribution of edges is a good texture signature useful for image matching..

test images

Retrieval Results for query image 608.jpg from Wang database

Retrieval Results for query image 609.jpg from Wang database

Retrieval Results for query image 610.jpg from Wang database

Retrieval Results for query image 612.jpg from Wang database

In order to make a comparison on the retrieval performance due to selection of a particular wavelet, both precision and recall are calculated. A high precision and recall value represents a good performance for retrieval. The quantitative results and performance of different wavelets and EHD technique are tabulated in tables 1 to 6 for comparing the performance with different combinations.

CONCLUSION :

A content based image retrieval algorithm is presented mainly for texture and shape based features. Here color features are not considered just to show the efficiency of proposed scheme for texture and shape features. The strengths of wavelet transform is utilized to obtain better efficiency in image retrieval. The effectiveness of various wavelets is also investigated for the image retrieval.

REFERENCES: [1] S. Liapis, G. Tziritas, "Color and texture image retrieval using chromaticity histograms and wavelet frames," IEEE Transactions on Multimedia, Vol. 6, Oct. 2004. [2] A. Mumtaz, S. A. M. Gilani, T. Jameel, "A Novel Texture Image Retrieval System based on Dual Tree Complex Wavelet Transform and Support Vector Machines," IEEE 2nd International Conference on Emerging Technologies, 2006. [3] Kondekar V. H., Kolkure V. S., Kore S. N, "Image Retrieval Techniques based on Image Features: A State of Art approach for CBIR," (IJCSIS) International Journal of Computer Science and Information Security, Vol. 7, No. 1, 2010. [4] S. Soman, M. Ghorpade, V. Sonone and S. Chavan, "Content Based Image Retrieval using Advanced Color and Texture Features," International Conference in Computational Intelligence (ICCIA), 2011.