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Improve Image Retrieval using Modified Fuzzy color& texture Histogram

Dr. Abeer T .Al-Obaidy[1], Yasir Amer Jameel [2]
University of Technology, Computer science department

Abstract

The goal of Content based image retrieval (CBIR) is to design and development of effective and efficient CBIR system. There is a problem in retrieved images by using classical methods such as RGB Histogram, Perceptual HASH and Bhattacharyya such accuracy and number of relevant images that solving them.

This paper proposed a modified fuzzy color &texture Histogram (MFCTH) method to get more accurate image retrieval system and retrieve the best results. The basic task of this work is to find similar images (using their visual features) according to a query image within a large image database and improvement techniques that support effective searching and browsing tasks performed on a large image collection by using automatically derived image features. then uploading this effective system on **real cloud** to examine this system with high accuracy.

Keywords: Content based image retrieval, Cloud Computing , Feature extraction

1. Introduction

Recently, quite large groups of images and videos have incrementally developed. Corresponding to that development, content-based retrieving and querying the indexed groups are needed for accessing visual data. As an influential technology, content-based systems of retrieving must supply easy-to-index models of data, in addition to faster query executing means. For the sake of indexing and answering the queries that the users submit for seeking visual information, the *content* of the images and videos has to be retrieved.

The visual content, or generally content, of images and video frames might be sub-grouped as follows: spatial, semantic, and low-level. Due to the fact that video data has a time dimension, the spatio-temporal content of a video data is taken under consideration as well.

2.Related work

Singha and Hemachandran(2012), presented a novel approach for Content Based Image Retrieval by combining the color and texture features called Wavelet-Based Color Histogram Image Retrieval (WBCHIR). **Huneiti and Daoud(2015)**, suggested an approach of retrieving related content-based images with the use of color vector and texture vector. **Bose et, al. (2015),** proposed a new hybrid approach for CBIR in which the conventional approach was combined with a segmentation-based approach

3. Image Retrieval

Information **Retrieval** is the area of knowledge which is concerned with representing, storing, and accessing information items. Especially, in that case where the extracted information is a group of images, this area of knowledge is known as Image Retrieval. The beginning of Image Retrieval can be traced back to 1979 when a conference on Data-base Techniques for Pictorial Applications was held in Florence Khokher et al, (2012).

Image retrieval can be identified as an approach to browse, search and retrieve images from a large data-base of digital images. For the sake of overcoming the disadvantages of conventional approaches, content based image retrieval retrieves identical images depending on image characteristics like color, texture, and shape from large image data-base.

The Proposed method Fuzzy Color and Texture Histogram descriptor includes the texture information produced in the eight-bin histogram of the fuzzy system that uses the high frequency bands of the Haar wavelet transform. For color information, the descriptor uses the 24-bin color histogram produced by the 24-bin fuzzy-linking system. Overall, the final histogram includes 8 x 24 =192 regions. Each Image Block interacts successively with all the fuzzy systems in the exact manner demonstrated in CEDD production. Chatzichristofis (2008).

4. The Proposed System Design

The CBIR system is an application built on Windows Azure platform. Windows Azure is the operating system for the cloud by Microsoft Incorporation.

4.1 Description of the Proposed System Design

The main idea of this work is to build a content-based image retrieval system that supports querying by example to retrieve similar images from a database according to their features. Texture, color and shape features have been used to identify and describe the contents of the images.

The proposed GUI (graphical User interface) of CBIR system that designed shown in the Figure (1) consist of four main parts:

-**query image section** can be select the image and search. Search' is for comparison of same query image against multiple algorithms. Just click brows image 'Search'.

-**Selecting Method** can be select one of seven methods that each method subject to a special algorithm.

-**the Result area**, where visual similar images that queried would displayed here.

-**With or Without Cloud**, where give the user the ability of select implementation of program local or via connecting to cloud. The proposed CBIR system used two types of Algorithms, Binary Algorithms which are simple implementing and advance method which include Global Descriptors such as CEDD and FCTH . In addition four proposed modified Algorithms are implemented to improve CBIR System. Finally the proposed CBIR system uploaded on the cloud. Select AZURE cloud to uploading this CBIR system .

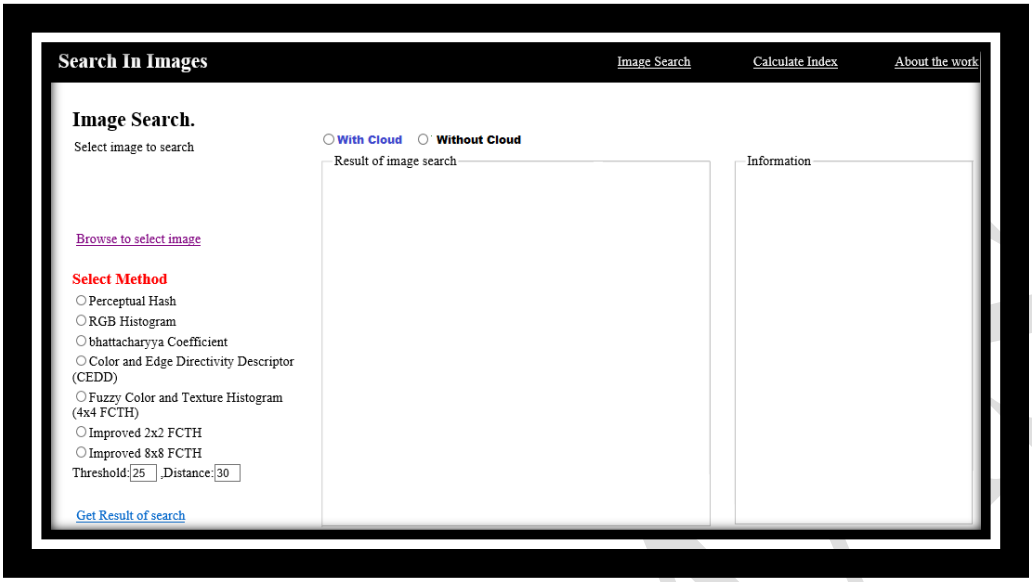

Figure 1 proposed User interface of CBIR system

4.2 Proposed Modified Fuzzy color and texture Histogram (MFCTH(2*2))

The increase of texture regions would definitely help in the improvement of the results and in the use of FCTH for semantics image retrieval. The proposed method increasing the texture region via decreasing the size of block to 2x2. The proposed algorithm is illustrated in Algorithm (1).

Algorithm (1) proposed Modified FCTH(MFCTH 2x2)

Input: 1000 RGB color image

Output: similar image

Step1: Color information

1.a RGB model is converted to HSV model

1.b 10-bin fuzzy filters

1.c 24-bin fuzzy filters

Step 2: texture information

2.a YIQ color space

2.b converted by the Haar Wavelet transformmation.

2.c segmentation the texture region to block size of **2×2**.

2.d apply texture fuzzy linking

Step 3: transforms the 24-bins histogram to 192-bins histogram

Step 4: Normalization of histogram

Step 5 : Quantization

Step 6: Compute Tanimoto distance between query image and image database

Step 7: Display nearest images for read image on designed user interface

End

4.3 Proposed Modified Fuzzy color and texture Histogram (MFCTH (8*8))

For more accuracy a second proposed segmentation of texture region into 8*8. In some images for example image (113) from beach class includes only two regions or two colors, therefore the M.FCTH 8*8 is the best method for implementing retrieval for such images and gives us better results than other methods. The proposed algorithm is illustrated in Algorithm (2).

Algorithm (2) proposed Modified FCTH(MFCTH 8x8)

Input: 1000 RGB

Output: similar image

Step1: Color information

1.a RGB model is converted to HSV model

1.b 10-bin fuzzy filters

1.c 24-bin fuzzy filters

Step 2: texture information

2.a YIQ color space

2.b converted using the Haar Wavelet transformation.

2.c segmentation the texture region to block size of **8×8**.

2.d apply texture fuzzy linking

Step 3: transforms the 24-bins histogram to 192-bins histogram

Step 4: Normalization of histogram

Step 5 : Quantization

Step 6: Compute Tanimoto distance between query image and image database

Step 7: Display nearest images for read image on designed user interface

End

5. Performance Evaluation

For assessing the efficiency of retrieval, the accuracy and recalling are utilized in a form of a statistic comparing parameters for the suggested image mining approaches. The common defining aspects of those 2 measurements are depicted by following formula. The degree of the accuracy of retrieving reached by a system is necessary for establishing its efficiency. In the case where the result is relevant and promising, it might be utilized as a standard in upcoming study works. In image mining that uses content based image retrieval, accuracy-recall is the most popular measure approach used for the evaluation of the precision of retrieval. This system is applied on real cloud (AZURE) that illustrated in (Table 1), (Table2) .

Table (1) shows the Time and number of retrieved images by using M.FCTH 2*2method .

Table (1)Time and number of retrieved images in M.FCTH 2*2 method

Type of image	No Of Image In DB	With Cloud			Without Cloud		
		total image retrieve	Relevant images	Retrieval time	Total image retrieved	Relevant images	Retrieval time
African	ZER	141	41	70ms	141	41	88ms
Beach	114	82	62	52ms	82	62	69ms

Building	**246**	**78**	**6**	**52ms**	**78**	**6**	**68ms**
Buses	**369**	**115**	**45**	**65ms**	**115**	**45**	**79ms**
Dinosaurs	**458**	**47**	**44**	**45ms**	**47**	**44**	**58ms**
Elephants	**575**	**33**	**12**	**67ms**	**33**	**12**	**83ms**
Flowers	**608**	**16**	**16**	**64ms**	**16**	**16**	**77ms**
Horses	**729**	**59**	**51**	**53ms**	**59**	**51**	**70**
Mountains	**860**	**146**	**37**	**67ms**	**146**	**37**	**84ms**
Food	**903**	**148**	**18**	**63ms**	**148**	**18**	**76ms**

Table (2) shows the Time and number of retrieved images by using M.FCTH 8*8 method**.** As it can be seen that this method gives better results in comparison with other methods.

Table(2)Time and number of retrieved images in M.FCTH 8*8 method

Type of image	**No Of Image In DB**	**With Cloud**			**Without Cloud**		
		Total image retrieved	**Relevant images**	**Retrieval time**	**Total image retrieved**	**Relevant images**	**Retrieval time**
African	**Zero**	**1**	**1**	**180ms**	**1**	**1**	**207ms**
Beach	**114**	**1**	**1**	**63ms**	**1**	**1**	**79ms**
Building	**246**	**7**	**3**	**63ms**	**7**	**3**	**80ms**
Buses	**369**	**1**	**1**	**62ms**	**1**	**1**	**78ms**
Dinosaur	**458**	**28**	**27**	**55ms**	**28**	**27**	**68ms**

Elephants	**575**	**2**	**2**	**64ms**	**2**	**2**	**83ms**
Flowers	**608**	**6**	**6**	**54ms**	**6**	**6**	**66ms**
Horses	**729**	**20**	**20**	**80ms**	**20**	**20**	**93ms**
Mountain	**860**	**1**	**1**	**64ms**	**1**	**1**	**84ms**
Food	**903**	**11**	**2**	**90ms**	**11**	**2**	**108ms**

6. Implementation and Experimental Results

For implementation of our CBIR system samples has been selected samples of each class(each class include 100 image) and examine this query image by every methods (CEDD ,FCTH ,Improved FCTH2*2and Improved FCTH8*8) and calculated total image retrieved and number of relevant images .in addition the time of retrieval also extracted. The results of retrieval using CEDD method are illustrated in Table 1. as can be seen the results of retrieval with and without cloud is the same but the retrieval time in retrieval with cloud is less than without cloud.

The efficiency of the different retrieval approaches is measured by choosing ten query images from every category of various semantics. For every one of the queries, an examining was held concerning the accuracy of the retrieval, depending on the usefulness of the image semantics. The semantic relevance is predetermined via manual trothing the query image and every retrieved image in the retrieval. The Precision values are shown in Table (3). These outputs clearly prove that the implementation of the FCTH approach has been improved by using the M.FCTH8*8 method.

As it can be seen that the value of average precision in FCTH method was 0.45 while in M.FCTH improved to 0.85.

Table 3 Precision of the Retrieval by different methods

Category	**CEDD**	**FCTH**	**M.FCTH 2*2**	**M.FCTH 8*8**	**No. of. Image In DB**
African People	**0.25**	**0.08**	**0.29**	**1**	**ZERO**

Beach	**0.33**	**0.16**	**0.24**	**1**	**114**
Building	**0.16**	**0.03**	**0.07**	**0.42**	**246**
Buses	**0.6**	**0.42**	**0.39**	**1**	**369**
Dinosaurs	**1**	**0.92**	**0.93**	**0.96**	**458**
Elephants	**0.38**	**0.57**	**0.36**	**1**	**575**
Flowers	**1**	**0.87**	**1**	**1**	**608**
Horses	**1**	**1**	**0.86**	**1**	**729**
Mountains	**0.33**	**0.41**	**0.25**	**1**	**860**
Food	**0.16**	**0.1**	**0.12**	**0.18**	**903**
Average precision	**0.52**	**0.45**	**0.45**	**0.85**	**------**

The precisions for each group based on the returned relevant images by using different methods are shown in charts of Figure 2. These precision values can be seen to increase significantly in groups such as African people and beach class and mountain images but increase slightly in some semantic classes such as groups of Buildings, Horses and Dinosaurs. This can be reasoned to the composition of colors that affected precision results.

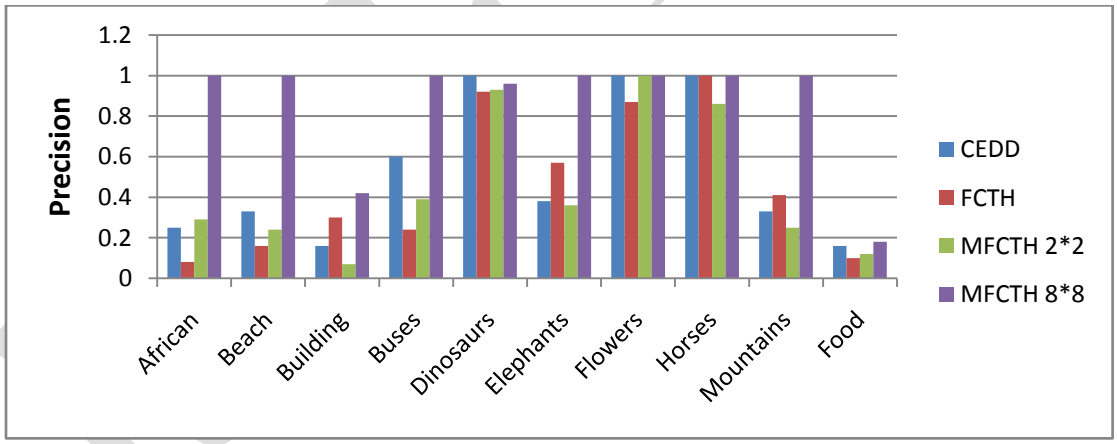

Figure 2 Comparison of Precision of different methods of retrieval

7. Conclusions

Through the proposed system and the results that have been reached at, the following conclusions were monitored:

1- The experimental results show that the proposed methods can contribute in accurate image retrieval through comparing them with classical methods and obtained more number of relevant images.

2- Propose four modifications of descriptors the first and second (MCEDD 2*2 & MCEDD 4*4) which lead to similar results but two other methods (MFCTH 2*2 & MFCTH 8*8) give different results with significant improvement.

3- The FCTH descriptor and its related (MFCTH 2*2 & MFCTH 8*8) descriptor produce more robust results when retrieving images with many texture areas.

4-Performance will be evaluated using Similarity measures like precision and recall. The outcome of the similarity measure is in very good agreement with expected results.

5-The cloud services provided by cloud architecture will handle all the unexpected traffic and it will simultaneously benefit with minimized cost.

8. References

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