International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-6 Issue-5, June 2017

Content Based Image Retrieval (CBIR) Using Color, Shape and Texture Features of Image

Suresh M. B, B Mohankumar Naik

Abstract: ***Content-based image retrieval (CBIR), as we see it today, is any technology that in principle helps organize digital picture archives by their visual content. The increased need of content based image retrieval technique can be found in a number of different domains The such as Agriculture, Data Mining, Research laboratories, Medical Field, Crime Prevention, Weather department , and Management of Earth Resources. Image retrieval based on different components has strong research scope. In this paper we present some technical details about the components used for the retrieval of images and algorithm are also defined for retrieval of images by using the components i.e. color, texture and shape information, and achieve higher retrieval efficiency using dominant color feature.***

Keywords: CBIR, Retrieval, color, texture, shape

I. INTRODUCTION

The content-based image retrieval system retrieves the stored images from the database by comparing the features of the query image against the images in the collection. The system first extracts and stores the features of the query image then it go through all images in the database and extract the features of each image. The results are the images that its features are most similar to the query image. Image Retrieval is a domain of increasing and crucial importance in the new information based society. Large and distributed collections of scientific artistic technical and commercial images are becoming a common ground thus requiring sophisticated and precise methods for users to perform similarity and semantic based queries. In conventional image databases, images are text-annotated and image retrieval is based on keyword searching. Some of the disadvantages of this approach are:

1. Keyword based image retrieval is not appropriate because there is no fixed set of words that describes the image content;
2. Keyword annotation is very subjective. To overcome the above disadvantages in text-based retrieval system, content based image retrieval (CBIR) was introduced in the early 1980s

In CBIR, images are indexed by their visual content, such as color, texture, shapes. From historical perspective, probably the first use of CBIR goes back to D. Kato in early nineties where he implemented what sounds to be the first automated image retrieval system using color and shape features. This motivated the intensive research carried out in many aspects of CBIR.CBIR system is equipped with database of images with different set of features. User has interface to add image in the image database and retrieve images from the database. A database stores all the images from which the image similar to the query instance is to be retrieved. When a query instance is entered in the input panel, the image feature for that image is derived and this is then compared with the all image features of the images stored in the database. The image whose feature matches closest to that of the query instance will be the output. The larger the image database slower is the retrieval process.

II. LITERATURE SURVEY

Some of the important literature which covers the more important CBIR System is discussed below.

i. They have used color attributes like the mean value, standard deviation, and image bitmap .They have also used texture features like the entropy based on the gray level co-occurrence matrix and the edge histogram. They compared this methods with others approaches and achieved better results.

ii. They have applied this method for content based image retrieval. The performances of the adapted wavelet filter bank over the no adapted wavelet filter bank are higher for every database.

iii. The main objective of the image mining is to remove the data loss and extracting the meaningful information to the human expected needs. The clustering-repeat gives good result when the number of examples of feedback is small.

iv. Generalized GMM are presented to help extract new image features. Compared with conventional norm-based distances (City-block or Euclidean), the Kullback divergence is more appropriate and efficient in the similarity measure and achieved a higher retrieval rate with the same level of computational complexity in a CBIR system.

v. K-means clustering and relevance feedback to re-rank the search result in order to remedy the rank inversion problem in content based image retrieval. Experimental results show that the re ranking algorithm achieves a more rational ranking of retrieval results and it is superior to Re ranking via partial Grouping method.

From the literature survey it is concluded that a wide variety of CBIR algorithms have been proposed indifferent papers.

Manuscript published on 30 June 2017.
***** Correspondence Author (s)
Suresh M B, Department of Computer Science & Engineering, Shri Jagdishprasad Jhabarmal Tibrewala University, Junjhunu (Rajasthan)-333001, India, E-mail: sureshresearch45@gmail.com
Dr. B Mohankumar Naik, Department Computer Science & Engineering, Shri Jagdishprasad Jhabarmal Tibrewala University, Junjhunu (Rajasthan)-333001, India, E-mail: mohan72003@gmail.com

The selection feature is one of the important aspects of Image Retrieval System to better capture user's intention. It will display the images from database which are the more interest to the user.

III. THE SYSTEM ARCHITECTURE

This section presents the components and the interaction necessary to offer a flexible and distributed functionality to the Image Retrieval system. The important consideration was that a user-friendly interface was needed for formulating complex queries and presenting data in a visual and straightforward way. Thus decided that a MATLAB 6.5 would be the easiest and in fact only solution satisfying our needs. The system is composed of three main blocks.

1. Feature extraction.
2. Program/Server that runs the queries.
3. Clients construct the queries. Feature extraction and construction of the index.

IV. PROPOSED WORK

The Image collection is obtained from several World Wide Web sites. The database of 700 images is being used. Images are divided into different categories and each category contains similar type of images. This will become useful when the program is being tested because when the user select a query image from one category in the database and the program returns the retrieved images, the user will know good is the program by comparing the number of retrieved images and the number of images in the same category as the query image .To reduce the number of calculations at run-time, every image in the database should be pre-computed.

The information needed to be pre-computed is Image feature, e.g. color, Texture and shape. Image database stores all the images from which the images similar to the query instance will be retrieved. The images will be stored in JPEG format. The larger the database, slower will be the retrieval process. The proposed system will produce the output as images which are relevant to the query Image. The proposed block diagram is given below in Fig.1

The following four steps are included in the system design:

i. Feature extraction and indexing of image database according to the chosen visual features, which form the perceptual feature space, e.g., color, shape, texture or any combination of the above.

ii. Feature extraction of query image (s).

iii. Matching the query image to the most similar images in the database according to some image-image similarity measure. This forms the search part of the CBIR

iv. User interface and feedback which governs the display of the outcomes, their ranking, the type of the user-interaction with possibility of refining the search through some automatic or manual preference (weighting) scheme, etc.

V. EXPERIMENTAL EVALUATION

The primitive features includes color, shape and texture features while the domain specific includes, for instance, recognition of face, signature, which form a sort of high level image description or meta-object.

A. Color

A content-based image retrieval system is presented that computes color similarity among images i.e. it supports querying with respect to color. Color is one of the most important features of objects in image. Each pixel in an image has a three-dimensional color vector and different color space approaches exist to represent color information. Color is the most extensively used visual content for image retrieval.

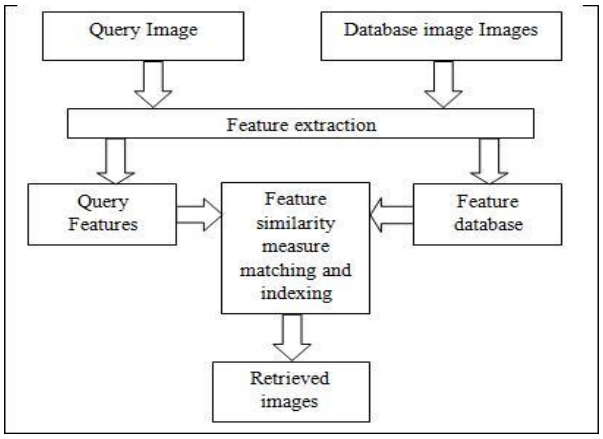

Fig.1: Proposed system Flow chart

Color has 3-D values that make it superior as compared with the gray scale values of images. gray scale images are the single dimensional images. Colors are defined on a selected color space Variety of color spaces include, RGB, LAB, LUV, HSV (HSL), YCrCb and the Hue min-max-difference (HMMD) Common color features or descriptors in CBIR systems include color space, color-covariance matrix, color histogram, color moments and color coherence vector, storing, filtering and retrieving audiovisual data.

MPEG-7 is a new multimedia standard, which has improved content-based retrieval by providing a rich set of standardized descriptors and description schemas for describing multimedia content. MPEG -7 has included dominant color, color structure, scalable color, and color layout as color features. The Color Structure Descriptor (CSD) represents an image by both the color distribution of the image or image region (similar to a color histogram) and the local spatial structure of the color. The extra spatial information makes the descriptor sensitive to certain image features to which an ordinary color histogram is blind. CSD used a 8 × 8 structure to scan the total image. This descriptor counts the number of times a particular color is contained within the structuring element while the image or image region is scanned by this structuring element. It has used hmmd color space.

B. Shape

Shape is also an important low-level feature in image retrieval system; since an object, in most case, can form by a set of shape (e.g. a car is consisted of a few rectangles and a few circles), most similar objects have a high correlation in the set of shapes

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)

Shape features of objects or regions have been used in many content-based image retrieval systems. When images are segmented into regions or objects then with color and texture shape features are described.

Since the effective segmentation of the images is difficult, so that shape features have limited use for image retrieval. It is used in applications where objects or regions are readily available. The state -of-art methods for shape description can be categorized into either boundary based rectangular shapes, triangular or polygonal shapes, finite element models, and Fourier -based shape descriptor or region-based methods (statistical moments) . A good shape representation feature for an object should be invariant to translation, rotation and scaling. For the purpose of image retrieval, a number of features characteristic of object shape, which is usually independent of size or orientation, are computed for every object of image database. Shape attributes techniques can be represented in two distinct categories:

i. Measurement-based methods ranging from simple, primitive measures such as area and circularity to the more sophisticated measures of various moment invariants;

ii. Transformation-based methods ranging from functional transformations such as Fourier descriptors to structural transformations such as chain codes and curvature scale space feature vectors.

C. Texture

Texture is a feature that is quite difficult to describe, and subjected to the difference of human perception, and it is hard to extract by segmentation, because segmentation unable to extract the whole texture but the texture element. Texture is another important property of images. It refers to the visual patterns that have properties of homogeneity or arrangement that do not result from the presence of only a single color or intensity. Various texture representations have been investigated in pattern recognition and computer vision. Two classes of texture representation methods can be distinguished: structural and statistical. Structural methods deal with the arrangement of image primitives, for instance, presence of parallel or regularly spaced objects.

A variety of techniques has been used for measuring texture similarity; the best-established rely on comparing values of what are known as second-order statistics calculated from query and stored images. Essentially, these calculate the relative brightness of selected pairs of pixels from each image. From these we calculate degree of contrast, coarseness, directionality and randomness, directionality and regularity, or periodicity. As that of color queries Texture queries can be formulated by selecting examples of desired textures from a palette, or providing the required query image. The system then retrieves images having the texture most similar in value with the query.

VI. ALGORITHM FOR IMAGE RETRIEVAL

For retrieving the images the components considered are color, shape. The detailed steps are given below.

1) Query is given from the user.
2) CSD & texture features are extracted calculated and these are stored in a matrix. This is called as Feature Vector.
3) Feature vector is also formed for the images present in the database.
4)Calculate Euclidian Distance between the feature vector of query image and database images.
5) Sorted the distance in ascending order and Top K images are displayed on the screen.

When we have used color, edge & texture features we have got better result.

A Image Retrieval Using Gray Histogram

Histogram represents the distribution of intensity of the color in the image. The image retrieval consists of the following stages.

1. Query image is given from the user.
2. Color Image is converted to gray image. Histogram of the image is calculated

1: Gray Histogram of the database images are calculated.
2: Euclidean Distance is calculated by the
3: Sorted the distance in ascending order and Top K images are displayed on the screen

$$D = \sqrt{\sum_{i=1}^{n} (X_i - Y_i)^2}$$

B. Image Retrieval Using Color Mean:

The mean of pixel colors states the principal color of the image. The mean μ is given by as follows.

$$\mu = 1/N \sum_{i=1}^{N} X_i$$

Xi indicates i^{th} pixel of image. The steps for Image Retrieval are given below.

1. Query is given from the user.
2. Color Mean of the image is calculated.
3. Color Mean of the database images are calculated.
4. Euclidean Distance is calculated.
5. Sorted the distance in ascending order and Top K images are displayed on the screen.

When the mean is used the result is little bit improved. But to get better result we have to combine both the features.

VII. CONCLUSION

Users needing to retrieve images from a collection come from a variety of domains, including crime prevention, medicine, architecture, fashion and publishing. Remarkably little has yet been published on the way such users search for and use images, though attempts are being made to categorize users' behavior in the hope that this will enable their needs to be better met in the future. So in our paper we present an efficient way of image retrieval based on the combination of color, texture and shape.

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)

REFERENCES

1. Chih-Chin Lai, Member, IEEE, and Ying-Chuan Chen," A User-Oriented Image Retrieval System Based on Interactive Genetic Algorithm", IEEE transactions on instrumentation and measurement, vol. 60, no. 10, october 2011.
2. Content Based Image Retrieval by Baby Manjusha P. Department of Computer Science and Technology Cochin University KOCHI-682022, 2010
3. Beginners to Content Based Image Retrieval by Swapnalini Pattanaik, D.G.Bhalke in the International Journal of Scientific Research Engineering &Technology (IJSRET) Volume 1 Issue2 pp 040-044 May 2012
4. Efficient Global and Region Content Based Image Retrieval by Ibrahim S. I. Abuhaiba, Ruba A. A. Salamah in
5. the I.J. Image, Graphics and Signal Processing, 2012, 5, 38-46 Published Online June 2012 in MECS (http://www.mecs-press.org/) DOI: 10.5815/ijigsp.2012.05.05.
6. Content-Based Image Retrieval using Color Moment and Gabor Texture Feature by S. Mangijao Singh , K. Hemachandran Department of Computer Science, Assam University, Silchar, Assam, India in the IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 5, No 1, September 2012 ISSN (Online): 1694-0814
7. A.Kannan, Dr.V.Mohan, Dr.N.Anbazhagan "Image Clustering and Retrieval using Image Mining Techniques" 2010 IEEE Conference
8. Sharadh Ramaswamy and Kenneth Rose, Fellow, IEEE "Towards Optimal Indexing for Relevance Feedback in Large Image Databases" IEEE transaction on Image Processing. December 2009.
9. B. S. Manjunath, Member, IEEE, Jens-Rainer Ohm, Member, IEEE, Vinod V. Vasudevan, Member, IEEE, and Akio Yamada," Color and Texture Descriptors" IEEE Transactions on circuits and systems for video technology, vol.11,no6,June2001

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)