Content based Image Retrieval

Ayushi Tewari
IMS Engineering College
Bachelor of Technology
Computer Science

Uzma Nikhat
IMS Engineering College
Bachelor of Technology
Computer Science

Sweta Malik
IMS Engineering College
Bachelor of Technology
Computer Science

ABSTRACT
In Digital Image Processing there are many fields out of which Image retrieval is one of the most important area. There are many image search tools such as Google and Yahoo that provides keywords for each image. So it is important to type the keyword to get the desired image that is difficult and not satisfactory. In content based image retrieval system we extract the visual content of an image such as texture , color, shape , special layout to represent the image.. The main purposeof content based image retrieval is to extract all those images having similar features to that of query image from the database of images. To bridge the semantic gap thatexists between the representation of an image by low-level features (namely, colour, shape, texture) and its high-level semantic content as perceived by humans. This technology can be used in several application such as crime prevention , digital libraries , face detection , image fusion and many more.

Keywords
Image retrieval, k-mean, Canny edge,SBIR,CBIR

1. INTRODUCTION
An Image retrieval is defined as a method of browsing, searching and retrieving images from a large database of digital images. Image retrieval has been a very active research area since the 1970s. Some research about image retrieval technology has begun that focuses only on the text-based ImageRetrieval (TBIR) which utilize some method of adding keywords, or descriptions to the images so that retrieval can be performed over the annotation words. In 1990s,content-based image retrieval (CBIR) has begun. To overcome from limitations of traditional methods, CBIR retrieves similar images based upon image features such as color, texture, and shape from large image database.

CBIR is used to reduce the semantic gap between low-level features and high-level user semantics.

Image Retrieval The advent of the World Wide Web (WWW) and the development of highly economical devices for capturing, storing and transmitting images have led to the creation of huge image libraries. Thus, we are faced with the inevitable problem of having to retrieve useful information from these collections, both efficiently and effectively. This has led to a renewed interest in image retrieval and its practical applications.

Text Based Retrieval Traditional image retrieval employed text as the primary means by which to represent and retrieve images from databases. Images were stored along with string attributes – keywords prepared by an annotator that reflected in a relatively broad manner the content of the image. Although text-based image retrieval took advantage of already well-established information retrieval algorithms and mechanisms, it disadvantages as an effective tool to retrieve images became readily apparent..

Color Based Retrieval
Since color is a low-level image feature that does not appear to classify images distinctly, few CBIR systems exist that utilize only color as the image retrieval feature. Yet color does have its advantages for image retrieval. It provides multiple measurements at a single pixel of the image, enabling categorization to be done without the need for complex spatial decision-making. Color content is also independent of view and resolution and is easy to extract from an image and to manipulate.

Content Based Retrieval

Initial research in the retrieval of images based on their inherent features has been reported. Content-based image retrieval utilizes representations of features that are automatically extracted from the images themselves

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 feature of the query image, searches the database for images with similar features, and exhibits relevant images to the user in order of similarity to the query. Content-based image retrieval systems attempt to exploit the visual information inherent in images, thus providing a more realistic perceptual representation of an image. In this context, content includes among other features, perceptual properties such as texture, color, shape, and spatial relationships. Many CBIR systems have been developed that compare, analyze and retrieve images based on one or more of these features. Some systems have achieved various degrees of success by combining both content-based and text-based retrieval. In all cases, however, there has been no definitive conclusion as to what features provide the best retrieval .

2. CBIR COMPONENTS

2.1 Query image
This is the image inputted by the user. This image undergoes feature extraction. Finally similarity matching is used to retrieve similar images from the feature databa

2.2 Image Database
This consists of all the images present in the database. Each image is subjected to the feature extraction process. This information is then stored in a feature database.

2.3 Feature Extraction
Feature extraction is the process of computing numerical or alphanumerical representation of some attribute of digital images to derive the image contents. A feature is directly related to the visual characteristics of the image..

2.4 Similarity Matching
Matching images directly, that is comparing the values of the pixels of the image directly is quite often used in object recognition. Different methods have been proposed to do this and a selection of these methods is presented here and can be

used in the image retrieval system. Euclidean Distance Probably the most common approach to compare images directly is the Euclidean distance. Euclidean distance is a geometrical concept which takes intoconsideration the co-ordinate values of the pixel points between which the distance is to be found . To be able to compare images using a Euclidean distance, the images have to be of the same size which can be achieved easily with scaling algorithms. The Euclidean distance has been used successfully e.g. in optical character recognition and has been extended by different methods.

3. VISUAL FEATURES

3.1 Texture

Texture is an essential feature of an image when querying image databases. It depends on human visual perception. The two most commonly used features are Tamura and Gabor. In Tamura the authors propose six texture features corresponding to human visual perception: coarseness, contrast, directionality, line-likeness, regularity, and roughness. They make experiments to test the significance of the feature and found the first three features to be very important. Gabor filters are a well known technique for texture analysis which was used for different works earlier. In this work we use the approach where the HSV color space (hue, saturation, value) is used. It has been proposed that Gabor filters can be used to model the responses of the human visual system.

3.2 Color

Color feature in content based image retrieval uses variouscolor spaces such as RGB, XYZ, YIQ, L*a*b*, U*V*W*,YUV and HSV. The HSV color space gives the best colorhistogram feature, among the different color spaces .HSV color space the color is presented in terms of three

components: Hue (H), Saturation (S) and Value (V) and the HSV color space is based on cylinder coordinates. L*a*b* color space, L* stands for luminance, a* represents relative greenness-redness and b* represents relative blueness-yellowness. It achieve device independence

3.3 Shape

Shape from an image is quite a powerful representation as it characterizes the geometry of the object. The representation of a shape should be invariant to scale, translation and rotation. The shape feature can be divided into two categories i.e. Contour based and regions based . Region based includes simple geometric attributes that can be obtained by measuring properties of points belonging to the region. The properties includes area, aspect ratio etc. Typically boundary-based representations include two major steps. First, a 1D function is constructed from a 2D shape boundary parameterizing the contour. Then the constructed 1D function is used to extract a feature vector describing the shape of the object. The contour based representation has descriptors such as Fourier descriptors and CSS (Curvature Scale Space) descriptors.

4. PROPOSED SCHEMES

There are basically four methods for image retrieval, based on either the color feature or on the texture feature of the image.

4.1 Image Retrieval System Based on Color Feature

Humans expresses the color s in proportion of pixels which can be used in computation of similarity of color feature using histogram method**.**This schemes are very useful in getting information.

4.2 Image Retrieval System Based on Color and Texture Feature:

Usually both color and texture feature are used for extracting any information from the query image given by user. Finding image using color and texture both reduces the search result more closer to the appropriate result. Now a days Wavelets are used for the Texture feature schemes .

4.3 Image Retrieval System Based fuzzy partition of color space:

This approach can contribute in designing of automated image retrieval systemsIn this method is achieved by partitioning the HSV color space into dominant color bins and by using a specific fuzzy similarity measure.

We can use color model for color image retrieval purposes that characterizes color with one dimension instead of three. Therefore, HSV color space is preferred.

4.4 Image Retrieval System Based curvelet transform

Basically, curvelet transform extends the ridgelet transform to multiple scale analysis. Curvelet transform is generally based on wrapping of Fourier samples takes a 2-D image as input in the form of a Cartesian array f[m, n] such that $0 \le m < M$, $0 \le n < N$ and generates a number of curvelet coefficients indexed by a scale j , an orientation l and two spatial location parameters (k , k2) as output. Statistical operations are applied to these coefficients to form the curvelet texture descriptor.Discrete curvelet coefficients can be defined by following equation:

$$C^D(j,l,k_1,k_2) = \sum f[m,n]\, \phi^D_{j,l,k_1,k_2}[m,n]$$

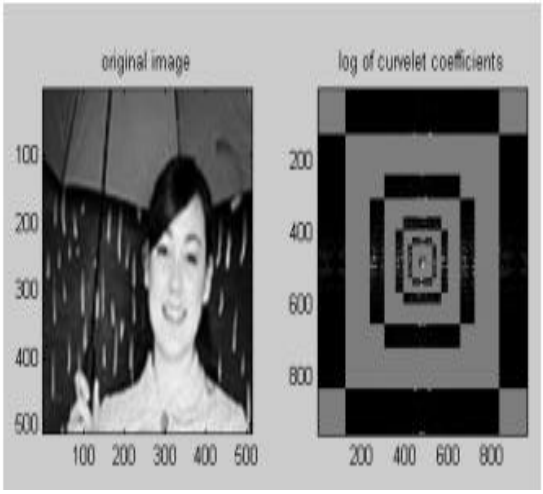

Fig:1CurveletCofficient of Image

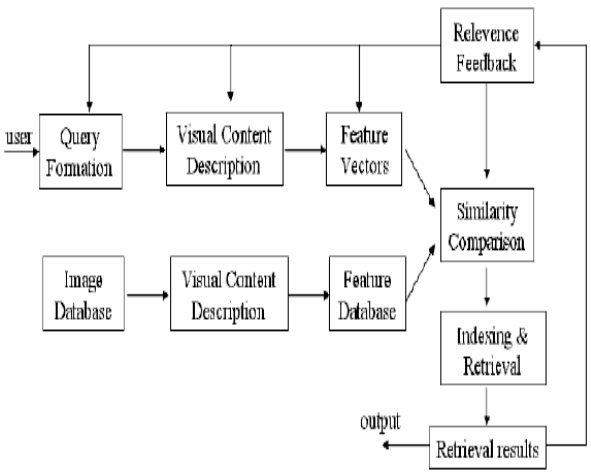

Fig 2: Content based Image Retrieval

5. THEORETICAL MODEL OF PROJECT RESEARCH DIRECTIVES

5.1 Canny Edge Detection Algorithm

Image edges form boundaries of objects. Hence edge detection is a fundamental tool in image processing .after applying edge detector you an image , it gives the boundaries of objects which help of object identification .edge detection significantly reduce the amount of data and filters out less useless information ,while it preserve significant data in the image. The algorithm runs in 5 separate steps:

1. Smoothing: Blurring of the image to remove noise.
2. Finding gradients: The edges should be marked where the curve of the image has large magnitudes. Non-maximum suppression:
3. Only local actual path should be marked as edges.
4. Double thresholding: Potential edges are determined by thresholding.
5. Edge tracking by hysteresis: Only Seen the actual boundary.

5.2 The K- meanAlgorithm:

The K-mean algorithm of portioning based on the mean value of the subset of the object in the cluster.

Method:

1. Initialize the center of the clusters some value
2. Attribute the closest cluster to each data point
3. Set the position of each cluster to the mean of all data pointsbelonging to that cluster
4. Repeat steps 2-3 until convergence

S NO.	Author	Methodology	Advantages	Disadvantages
1	▪ Sagarmay Deb ▪ Yanchun Zhang	In this paper basically two main approaches have been focused . They are : 1.Multimedia system 2.Content based image retrieval Initially there were two approaches to Content based image retrieval and also two main categories of features . The basic one is concerned with extraction of boundary of image. While the second one defines the query image at different levels of details and there is basically a vast gap existing among the low level and high level semantics.	Mainly in this Paper two problems have been solved :- 1-The first deals with the segmentation of image , dividing the image into various segment based on similarities of some kind of feature like texture , color , shape , edges etc. 2-It also reduces vast gap existing between low level features and high level semantics	This approach needs further modification to as it has issues that are still needs to be resolved.
2	▪ Young Deok Chun ▪ Nam Chul Kim ▪ Ick Hoon Jang	In this paper the author proposed a content-based image retrieval method nothing but a combination of two basic feature of image 1.Multiresolution color 2.Texture feautre	It demonstrates more excellent retrieval accuracy for queries and target images of various resolutions.	In this system it is difficult to achieve such image segmentation for natural images; the use of shape features in image retrieval has been limited to special applications.

3	▪ Savvas A. Chatzichristofis ▪ Yiannis S. Boutalis ▪ Mathias Lux	the author proposed an image retrieval suite called img (Rummager) which brings into effect a number of new as well as state of the art descriptors. This paper basically explains the execution of image search based on query image which could be XML-based index file or directly from folder containing image file	It can execute a hybrid search of images which combines keyword info as well as visual similarity	In this system it is difficult to achieve such image segmentation for natural images; the use of shape features in image retrieval has been limited to special applications
4	▪ B.Szanto ▪ P.Pozsegovics ▪ Z.Vamossy ▪ Sz.Sergyan	the author proposed in a typical CBIR, features related to visual content such as appearance, pigmentation, and character are first extracted from a query image, the similarity between the set of features of the query image and that of each target image in a DB is then computed, and target images are next retrieved which are most similar to the query image.	It has alarge probability to get desired result	This system lacks of perfectness in some exceptional conditions but that can be easily overcome by using some extra algorithms.

6. REFERENCES

[1] Remco C. Veltkamp and MirelaTanase ,Content Based Image Retrieval Systems: A Survey ,International Journal of Engineering Science and Technology, Vol. 20, No. 5, pp. 1-62, 2002.

[2] Dr. H.B.Kekre, Sudeep D. Thepade and AkshayMaloo ,Image Retrieval using Fractional Coefficients of Transformed Image using DCT and Walsh Transform , International Journal of Engineering Science and Technology. Vol. 2, No. 4, pp. 362-371, 2010.

[3] Gaurav Jaswal Amit Kaul, Content Based Image Retrieval, National Conference on Computing, Communication and Control, A Literature Review, National Institute of Technology, Hamirpur-177001, Himachal Pradesh (India).

[4] Sketch4Match – Content-based Image Retrieval System Using Sketches, B.Szanto, P.Pozsegovics, Z.Vamossy, Sz.Sergyan, january 2011

[5] A content based image retrieval system for marine life images Ahsan Raza Sheikh, Lye. M.H., SarinaMansor, M. F. Ahmad Fauzi, FatahiyahMohdAnuar,AUGUST 2011

[6] Human Motion Retrieval from Hand-Drawn Sketch,Min-Wen Chao, Chao-Hung Lin, Member, IEEE, Jackie Assa, and Tong-Yee Lee, Senior Member, IEEE,MAY 2012 7. A Sketch-based 3D Model Retrieval System, Ke Ding and Yunhui Liu, Fellow, IEEE, NOVEMBER 2012

[7] SwapnaliniPattanaik, Prof. D. G. Bhalke ,Beginners to Content Based Image Retrieval ,InternationalJournal of Scientific Research Engineering Technology (IJSRET),Volume 1 Issue2 pp 040-044 May 2012