 ISSN : 0976-8491 (Online) | ISSN : 2229-4333 (Print)

Scalable and Robust Searching of Content Based Image Retrieval System

[1]D.Shiva Shanker, [2]T.Srikanth
[1,2]Dept. of CSE, Grandhi Varalakshmi Venkatarao Institute of Technology

Abstract
One key challenge in Content-Based Image Retrieval (CBIR) is to develop a fast solution for indexing high-dimensional image contents, which is crucial to building large-scale CBIR systems. This paper aims to introduce the problems and challenges concerned with the design and the creation of CBIR systems, which is based on a free hand sketch (Sketch based image retrieval – SBIR). With the help of the existing methods, describe a possible solution how to design and implement a task specific descriptor, which can handle the informational gap between a sketch and a colored image, making an opportunity for the efficient search hereby. The used descriptor is constructed after such special sequence of preprocessing steps that the transformed full color image and the sketch can be compared. We have studied EHD, HOG and SIFT. Experimental results on two sample databases showed good results. Overall, the results show that the sketch based system allows users an intuitive access to search-tools.

Keyword
Content Based Images Retrieval, Image Retrieval

I. Introduction
Multimedia data including images and videos have been dramatically increased in our life due to the popularity of digital devices and personal computers. Huge volumes of media data bring a lot of critical challenges of retrieving contents from large-scale multimedia databases effectively. In recent years, multimedia information retrieval has attracted more and more attention in research community. One of the most popular and fundamental research topics is Content-Based Image Retrieval (CBIR) [1]. Although CBIR has been extensively studied in both academia and industry for many years, there are still a number of challenging issues, which do not have very effective solutions until now. These issues are often related to some long-standing challenges among several interdisciplinary research areas, including database, computer vision, information retrieval, and machine learning

In general, a CBIR system at least consists of four modules: data acquisition and processing, feature representation, data indexing, query and feedback processing. Among them, an efficient data indexing solution is critical to making CBIR systems scalable to large-scale real-world applications. Although data indexing techniques have been well studied in database community, traditional indexing solutions are still not efficient enough for indexing image contents, which are often represented in high dimensional feature spaces. How to develop an efficient high dimensional data indexing solution is challenging and significant for building large-scale CBIR systems

Research and development issues in CBIR cover a range of topics, many shared with mainstream image processing and information retrieval. Some of the most important are:

- Understanding image users' needs and information-seeking behavior
- Identification of suitable ways of describing image content
- Extracting such features from raw images
- Providing compact storage for large image databases
- Matching query and stored images in a way that reflects human similarity judgements
- Efficiently accessing stored images by content
- Providing usable human interfaces to CBIR systems

Key research issues in video retrieval include:

- Automatic shot and scene detection
- Ways of combining video, text and sound for retrieval
- Effective presentation of search output for the user.

II. Related Works
Several reviews of the literature on image retrieval have been published, from a variety of different viewpoints. Enser [1995] reviews methods for providing subject access to pictorial data, developing a four-category framework to classify different approaches. He discusses the strengths and limitations both of conventional methods based on linguistic cues for both indexing and search, and experimental systems using visual cues for one or both of these. His conclusions are that, while there are serious limitations in current text-based techniques for subject access to image data, significant research advances will be needed before visually-based methods are adequate for this task. He also notes, as does Cawkell [1993] in an earlier study, that more dialogue between researchers into image analysis and information retrieval is needed.

Aigrain et al [1996] discuss the main principles of automatic image similarity matching for database retrieval, emphasizing the difficulty of expressing this in terms of automatically generated features. They review a selection of current techniques for both still image retrieval and video data management, including video parsing, shot detection, keyframe extraction and video skimming. They conclude that the field is expanding rapidly, but that many major research challenges remain, including the difficulty of expressing semantic information in terms of primitive image features, and the need for significantly improved user interfaces. CBIR techniques are likely to be of most use in restricted subject domains, and where synergies with other types of data (particularly text and speech) can be exploited.

Eakins [1996] proposes a framework for image retrieval (outlined in section 2.3 above), classifying image queries into a series of levels, and discussing the extent to which advances in technology are likely to meet users' needs at each level. His conclusion is that automatic CBIR techniques can already address many of users' requirements at level 1, and will be capable of making a significant contribution at level 2 if current research ideas can be successfully exploited. They are however most unlikely to make any impact at level 3 in the foreseeable future.

Idris and Panchanathan [1997a] provide an in-depth review of CBIR technology, explaining the principles behind techniques for colour, texture, shape and spatial indexing and retrieval in some detail. They also discuss the issues involved in video segmentation, motion detection and retrieval techniques for compressed images. They identify a number of key unanswered research questions, including the development of more robust and compact image content features, more accurate modelling of human perceptions of image similarity, the identification of more efficient physical

storage and indexing techniques, and the development of methods of recognizing objects within images. De Marsicoi et al [1997] also review current CBIR technology, providing a useful feature-by-feature comparison of 20 experimental and commercial systems.
In addition to these reviews of the literature, a survey of "non-text information retrieval" was carried out in 1995 on behalf of the European Commission by staff from GMD (Gesellschaft für Mathematik und Datenverarbeitung), Darmstadt and Université Joseph Fourier de Grenoble [Berrut et al, 1995]. This reviewed current indexing practice in a number of European image, video and sound archives, surveyed the current research literature, and assessed the likely future impact of recent research and development on electronic publishing. The survey found that all current operational image archives used text-based indexing methods, which were perceived to have a number of shortcomings. In particular, indexing vocabularies were not felt to be adequate for non-text material. Despite this, users seemed generally satisfied with existing systems. The report concluded that standard information retrieval techniques were appropriate for managing collections of non-text data, though the adoption of intelligent text retrieval techniques such as the inference-based methods developed in the INQUERY project [Turtle and Croft, 1991] could be beneficial.

III. Existing System

In earlier days, image retrieving from large image database can be done by following ways. We will discuss briefly about the image retrieving of various steps

- Automatic Image Annotation and Retrieval using Cross Media Relevance Models
- Concept Based Query Expansion
- Query System Bridging The Semantic Gap For Large Image Databases
- Ontology-Based Query Expansion Widget for information Retrieval
- Detecting image purpose in World-Wide Web documents

IV. Proposed System

This paper aims to introduce the problems and challenges concerned with design and creation of CBIR systems, which is based on free hand sketch. Make convenient to retrieve data or images based on sketches so that even illiterates, who do not know to write text can also make use of system effectively. Introducing this system into search engines makes corporate world and even other users bit more efficient in retrieval of data effectively.
The goal of this paper is to develop a SBIR search engine, which with free hand sketch content can be retrieved. The most important task is to bridge the gap between the free hand sketch and the picture.

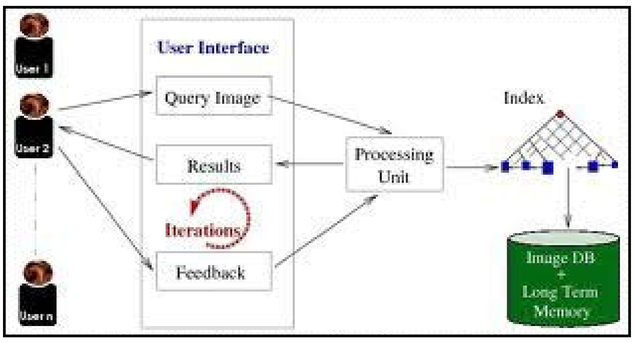

Fig. 1: CBIR Architecture

A. Global Structure and Subsystems

The content-based retrieval as a process can be divided into two main phases. The first is the database construction phase, in which the data of preprocessed images is stored in the form of feature vectors – this is the off-line part of the program. This part carries out the computation intensive tasks, which has to be done before the program actual use. The other phase is the retrieval process, which is the on-line unit of the program.

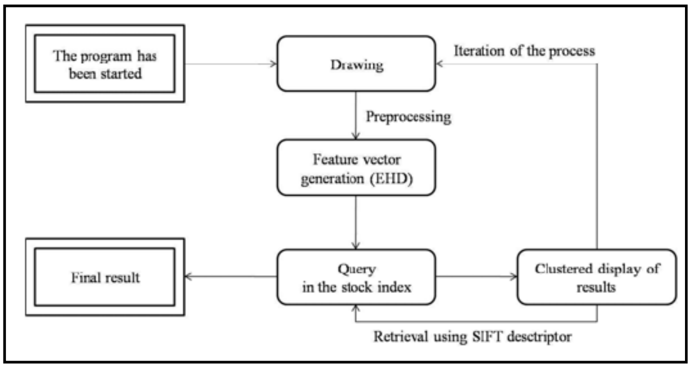

Fig. 2: The Data Flow Modal of the System from the User's Point of View

First the user draws a sketch or loads an image. When the drawing has been finished or the appropriate representative has been loaded, the retrieval process is started. The retrieved image first is preprocessed. After that the feature vector is generated, then using the retrieval subsystem a search is executed in the previously indexed database. As a result of searching a result set is raised, which appears in the user interface on a systematic form. Based on the result set we can again retrieve using another descriptor with different nature. This represents one using loop.

B. The Preprocessing Subsystem

The system was designed for databases containing relatively simple images, but even in such cases large differences can occur among images infile size or resolution. In addition, some images may be noisier, the extent and direction of illumination may vary (see fig. 3), and so the feature vectors cannot be effectively compared. In order to avoid it, a multistep preprocessing mechanism precedes the generation of descriptors.The input of the preprocessing subsystem is one image, and the output is the respective processed result set.

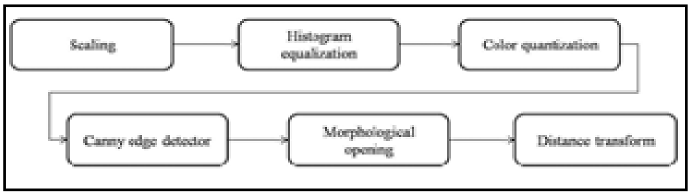

Fig. 3: Processing System

The main problem during preprocessing of the color images of real situations is that the background containing several textures and changes generate unnecessary and variable-length edges. As a possible solution texture filters were analyzed, for example the entropy calculation based filter. It gives very valuable results, if a textured object of little color stands in a homogenous background.
Therefore, the classification of the image pixel intensities minimizes the number of the displayed colors. If only some intensity values represent the images, then according to our

 ISSN : 0976-8491 (Online) | ISSN : 2229-4333 (Print)

experience, the color based classification of result images can also be easily implemented. As an approximate method the uniform and minimum variance quantization [19] were used. After the transformation step edges are detected, of which the smaller ones are filtered by morphological opening filter.

C. The Feature Vector Preparation Subsystem

In this subsystem the descriptor vectors representing the content of images are made. Basically three different methods were used, namely the Edge Histogram Descriptor (EHD) [4], the Histogram of Oriented Gradients (HOG) [2] and the Scale Invariant Feature Transform (SIFT)

The system works with databases containing simple images. But even in such cases, problems can occur, which must be handled. If the description method does not provide perfect error handling, that is expected to be robust to the image rotation, scaling and translation. Our task is to increase this safety.

Another problem was encountered during the development and testing. Since own hand-drawn images are retrieved, an information gap arises between retrieved sketch and color images of database. While an image is rich of information, in contrast at a binary edge image only implicit content and explicit location of pixels can be known.

D. The Retrieval Subsystem

As the feature vectors are ready, the retrieval can start. For the retrieval the distance based search was used with Minkowski distance [13], and the classfication-based retrieval [14].

1. Database

The collection of logically related data is known as database. It is used to store, retrieve and data manipulations.

The storage module provides images, information and the associated feature vectors are uploaded to the database. The file name, size and format of the image are attached. The information related to the preparation is gathered, as the maker's name, creation date, image title, the brand and type of recording unit. In addition, we may need more information of color depth, resolution, image dimension, vertical and horizontal resolution, possibly the origin of the image, so we take care of their storage. For storage the large images are reduced. The data is stored in a global, not scattered place in the hard disk.

The retrieval results are obtained by usage of query module

Advantages

- Make convenient to retrieve data or images based on sketches so that even illiterates , who do not know to write text can also make use of system effectively.
- Introducing this system into search engines makes corporate world and even other users bit more efficient in retrieval of data effectively.

IV. Tests and Results

A. Used Test Databases

The system was tested with more than one sample database to obtain a more extensive description of its positive and negative properties. The Microsoft Research Cambridge Object Recognition Image Database was used, which contains 209 realistic objects. All objects have been taken from 14 different orientations with 450×450 resolution. The images are stored in TIF format .

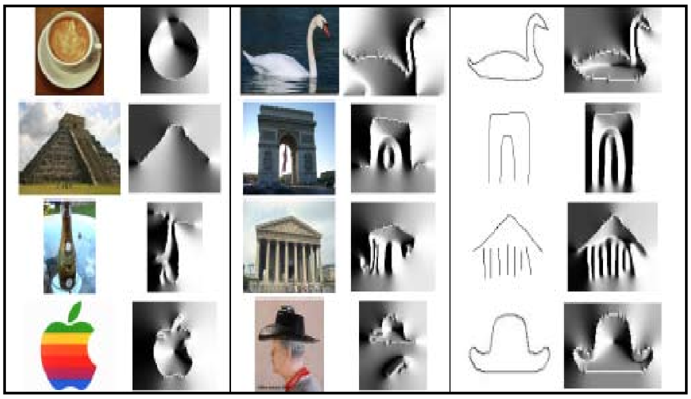

Fig. 4: Some Sample Images of the Microsoft Research Cambridge Object Recognition Image Database

Another test database was the Flickr 160. This database was used before for measuring of a dictionary-based retrieval system [8]. 160 pieces of general-themed pictures have sorted from the photo sharing website called Flickr. The images can be classified into 5 classes based on their shape. A lot of images contain the same building and moments. The database is accompanied by examples, which is based on the retrieval. Since the test result are documented and the retrieved sketches are also available, so the two systems can be compared with each other. Some images of Flickr 160 database.

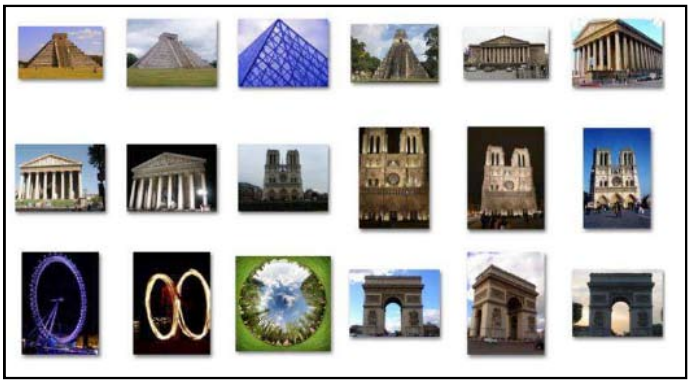

Fig. 5: Some Sample Images of Flickr 160 Database

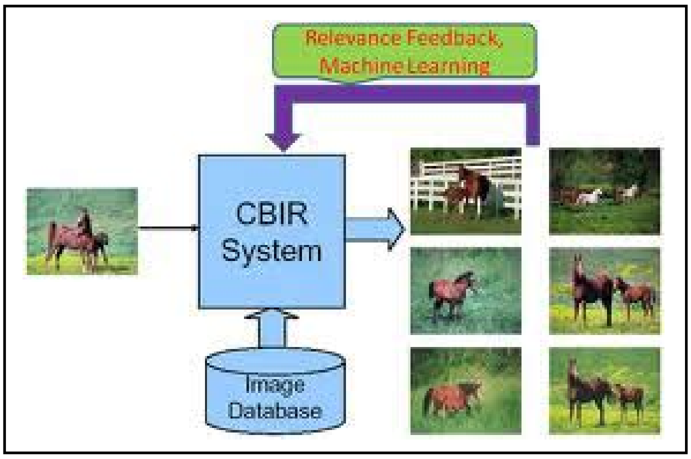

Fig. 6: CBIR System

V. Conclusion

This paper aims to introduce the problems and challenges concerned with design and creation of CBIR systems, which is based on free hand sketch. Make convenient to retrieve data or images based on sketches so that even illiterates, who do not know to write text can also make use of system effectively. Two main aspects were taken into account. The retrieval process has to be highly interactive. The robustness of the method is essential in some degree of noise, which might also be in case of simple images. Based on the test results with many databases HOG is better in many cases than EHD.

References

[1] D. Comaniciu, P. Meer,"Robust analysis of feature spaces: color image segmentation", IEEE Conference on Computer Vision and Pattern Recognition, pp. 750–755, June 1997.

[2] N. Dalal, B. Triggs,"Histograms of oriented gradients for human detection", IEEE Conference on Computer Vision and Pattern Recognition, pp. 886–893, July 2005.

[3] T. Deselaers, D. Keysers, H. Ney,"Features for image retrieval: An experimental comparison", Information Retrieval, Vol. 11, pp. 77–107,December 2007.

[4] M. Eitz, K. Hildebrand, T. Boubekeur, M. Alexa,"An evaluation of descriptors for large-scale image retrieval from sketched feature lines", Computers and Graphics, Vol. 34, pp. 482–498, October 2010.

[5] R. Fabbri, L.D.F. Costa, J.C. Torelli, O.M. Bruno,"2D Euclidean distance transform algorithms: a comparative survey", ACM Computing Surveys, Vol. 44, pp. 1–44, February 2008.

[6] M. Flickner, H. Sawhney, W. Niblack, J. Ashley, Q. Hiang, B. Dom, M. Gorkani, J. Hafner, D. Lee, D. Petkovic, D. Steele, P. Yanker,"Query by image and video content: The QBIC system", IEEE Computer, Vol. 28, pp. 23–32, 2002.

[7] R. Hu, M. Barnard, J. Collomosse,"Gradient_eld descriptor for sketch based image retrieval and localization", International Conference on Image Processing, pp. 1–4, 2010.

[8] A.K. Jain, J.E. Lee, R. Jin,"Sketch to photo matching: A feature-basedapproach", Proc. SPIE, Biometric Technology for Human Identi_cation VII, Vol. 7667, pp. 766702–766702, 2010

[9] A.K. Jain, J.E. Lee, R. Jin, N. Gregg,"Graf_ti-ID: matching retrieval of graffiti images", ACM MM, MiFor'09, pp. 1–6, 2009.

[10] A.K. Jain, J.E. Lee, R. Jin, N. Gregg,"Content based image retrieval: an application to tattoo images", IEEE International Conference on Image Processing, pp. 2745–2748, November 2009.

Shiva Shanker Donga received his B.TECH degree in CSE from Swarnandhra College of Engginering and Technology Narsapur West Godavari District, in 2011, the M.Tech. Degree in CSE from Grandhi Varalakshmi Venkatarao Institute of Technology Bhimavaram, in 2013. At present, he is engaged in "Scalable and Robust Searching of Content Based Image Retrieval System".

T.Srikanth received the M.Tech degree from Acharya Nagarjuna University, Guntur in 2010. Currently he is working as Associate Professor in Grandhi Varalakshmi Venkatarao Institute of Technology Bhimavaram, Andhra Pradesh, India. He has five years of experience in teaching and one years of experience in software industry. His research interests include object oriented programming, image processing, cloud computing and parallel programming.