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A Survey: On Content Based Image Retrieval

Vivek Jain*, Neha Sahu**
*Asst.Professor, Computer Science Department, SRCEM, Banmore (M.P.), India
**Research Scholar, Computer Science Department, SRCEM, Banmore (M.P.), India

ABSTRACT

Content based Image Retrieval is the task of retrieve the images from the large collection of database on the basis of their own visual content. CBIR is used for automatic indexing and retrieval of images depending upon contents of images known as features. This paper provides the survey of technical achievements in the research area of image retrieval. In this paper, a survey is done on the different methods of content based image retrieval for the classification of texture and color. For the classification of the extracted features we have used SVM. Classification using cascaded SVM is also used here for solving large-scale pattern classification problems. Cascaded SVM has advantages over conventional SVM.

Keywords-CBIR, Feature Extraction, Texture and Pattern Classification.

I. INTRODUCTION

Invention of the digital camera has given the common man the privilege to capture his world in pictures, and suitably share them with others. One can today generate volumes of images with content as diverse as family get-togethers and national park visits. It is very important to efficiently store and retrieve images for different application. For this purpose, many general purpose image retrieval systems have been developed. They are Text based and content based.

The idea of text-based approach was originated at 1970s. In this approach the images are manually annotated by text descriptors, which are then used by DataBase Management System (DBMS) to perform image retrieval. The difficulties faced by text basedretrieval became more and more severe. Thus, the searches for solutions inimage retrieval problem are becoming widely recognized and increased active areafor research and development. There are many problems andweaknesses exist in conventional imagedatabase search based on keywords or text descriptions, which are manuallyassigned to the images. These problems include the following [1]:

(i)Consume much time and labour to annotate keywords or text descriptions to an image.
(ii)The semantic views are normally different for each user.
(iii)Previous methods did not take the image contents into account.
(iv)It lacks the capacity to utilize the human intuition and emotion in retrieval images and leads to an inconsistency of keywords agreements.

A new mechanism which is Content-Based Image Retrieval (CBIR) was proposed in the early 1990.

CBIR, the term 'content' in this context might refer to color, shapes, textures, spatial layout or any other information that can be derived from the image itself. For the "Content-based" means that the search will analyse the actual contents either the color, shapes or texture of the images. Besides, “image retrieval” means that searching and browsing aims at retrieving images from a large database of digital images. In other sentence to describe CBIR, we can say that content-based image retrieval is an application of computer vision which used visual contents to search images from large scale image databases according to users’ requirement and intuitive.

CBIR operates on a totally different principle from keyword indexing and aimed at efficient retrieval of relevant image databases based on automatically derived imagery features. CBIR is still an emerging science. As image compression, digital image processing, and image feature extraction techniques come to be more developed, CBIR preserves a steady pace of development in the research field. Moreover, the progress of powerful processing power and faster and cheaper memories contribute deeply to CBIR development. This progress promises a vast range of future applications using CBIR. CBIR is used for automatic indexing and retrieval of images depending upon contents of images known as features.

II. APPLICATIONS

1) The advantage of such systems ranges from simple users searching a particular image on the web
2) Various types of professionals like police force for picture recognition in crime prevention.
3) Geographical information and remote sensing systems
4) Medicine Diagnosis
5) Architectural & Engineering Design
6) Fashion & Publishing
7) Home Entertainment
8) Retail Catalogues

III. CBIR: AN OVERVIEW

Figure1 shows a description of a standard image retrieval system.

1.1 Collection of Database:A database containing number of mages with any one of the formats bmp, jpg and tiff is essential.
1.2 Query: The user provides a sample image or sketched figure as the query for the system.
1.3 Feature Extraction:

A Single feature can represent only part of the image property. So, multiple features are used to augment the image retrieval process. In computer vision society, a feature is defined as a function of one or more measurements each of which specifies some quantifiable property of an object, and is computed such that it enumerates some significant characteristics of the object.

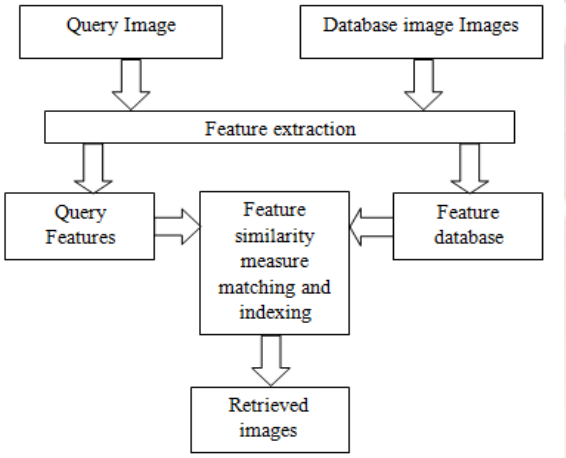

Fig 1: CBIR

General Features: Application independent features such as color, texture, and shape.
Domain-Specific Features: Application dependent features such as human faces, fingerprints, and conceptual features. These features are regularly a synthesis of low-level features for a specific domain [9].

3.3.1Color*:* Color represents one of the most widely used visual features in CBIR systems. First a color space is accustomed represent color images. Normally, the grey level intensity is represented as the sum of red, green and blue grey level intensities. Swain and Ballard proposed histogram intersection, an L1 metric as the similarity measure for color histogram. In image retrieval a histogram is employed to represent the distribution of color in image. The number of bins of histogram determines the color quantization. Thus, the histogram shows the number of pixels whose grey level fails within the range indicated by corresponding bin. The evaluation between query image and image in database is accomplished through the use of some metric which determines the distance or similarity between the two histograms. Besides the color histogram several other colors feature representation like color moments and color sets have been applied.

To overwhelmed the quantization effects as in the color histogram, proposed color moments approach the mathematical foundation of this approach is that any color distribution can be characterized by its moments.
To facilitate the fast search over large scale image collection, Smith and Chang proposed color sets as an approximation of color histogram. A color set is defined as a selection of color from the quantized color space.

3.3.2 Texture: Texture is another important feature of images. It rises to the visual patterns that have feature of homogeneity or arrangement that do not result from the presence of only a single color or intensity. It contains important information about the structural arrangement of surfaces and their relationship to the surrounding environment [3].Various texture representation has been investigated in both pattern recognition and computer dream. In the early 1990s, Haralick et al. proposed the co-occurrence matrix depiction of texture feature. This approach explored the grey level spatial dependence of structure. Tamura developed computational approximation to the visual texture properties found to be important in psychology studies. The six visual texture features were stiffness, contrast, directionality, line likeness, regularity and roughness. One major distinction between Tamura texture representation and the co- occurrence matrix is that all the texture properties in Tamura Representation are visually meaningful, whereas some of texture features used in co-occurrence matrix may not be.

Classes of Texture Representation Method

Structural methods: It includes morphological operator and adjacency graph; describe texture by identifying structural primitives and their placement instructions. They deal with the organization of image primitives, presence of parallel or regularly spaced objects [7].

Statistical methods:It includes the popular co-occurrence matrix, Fourier power spectra, Shift invariant principal component analysis (SPCA), and Tamura feature, Multi-resolution filtering technique such as Gabor and wavelet transform, characterize the texture by statistical distribution of the image intensity [7].

3.3.3 *Shape:* In image retrieval, depending on the applications, some need the shape representation to be invariant to translation, rotation and scaling, whiles others do not.

In general, shape representation can be distributed into two categories:
Boundary based which uses only the outer boundary of the shape.
Region-based which uses the entire shape regions.

The most successful demonstrative for these two categories is Fourier descriptor and Moment invariants [7].

IV. METHODS

Hideyuki Tamura, Shunji Mori And Takashi Yamasaki [4], proposed texture feature corresponding to visual perception. It is useful for optimum feature selection and texture analyser design. Similarity measurements using these features were attempted. We approximated in computational form six basic textural features, namely, stiffness, contrast, directionality, linelikeness, regularity, and roughness. In evaluation with psychological measurements for human subjects, the computational measures gave good correspondences in rank correlation of 16 typical texture patterns. Similarity measurements using these features were attempted. The discrepancies between human vision and computerized techniques that we encountered in this study indicate fundamental problems in digital analysis of textures. Some of them could be overcome by analyzing their causes and using more sophisticated techniques.

W.Y. Ma, B. S. Manjunath [5], compares the different Wavelet transform based texture features for content based search and retrieval. Here four types of wavelet transform have been introduced. Orthogonal, biorthogonal, Tree structure and Gabor wavelet transform. And result shows Gabor performs best.

Simon tong and Edward Chang [2], proposed an effective relevance feedback strategy based on support vector machine active learning. Support vector machines (SVMs) have become a popular tool of machine learning. They have strong theoretical foundation and excellent empirical success. They have been applies to task such as handwritten digit recognition, object recognition, and text classification. The algorithm selects the most informative image to query a user and quickly learns a boundary that separates the image to satisfy the user's query concepts from the rest of dataset.

Yi-Min Wen1,and Bao-Liang Lu1 [6], Proposed an algorithm for Support Vector Machines (SVM) thatcan be parallelized efficiently and scales to very large problems withhundreds of thousands of training vectors. In its place of analyzing thewhole training set in one optimization step, the data are fragmented intosubsets and optimized separately with multiple SVMs. The partialoutcomes are combined and filtered again in a 'Cascade' of SVMs, tillthe global optimum is reached. The Cascade SVM can be spread over multiple processors with minimal communication overhead and needs far less memory, since the kernel matrices are much smaller than for a regular SVM. Our method not only speeds up training but also reduces the number of support vectors.

V. CLASSIFICATION BASED RETRIEVAL

A number of image features based on color and texture attributes have been reported. Although quantifying their discrimination ability to classification problem has not been so easy. So In this module, Image Classification is done on features extracted from images. Classification is done by using SVM and Cascaded SVM [2] [3]. Results based on the proposed approach are found encouraging in terms of color image classification accuracy. This involves matching these features to yield a result that is visually similar. The commonly used similarity measure method is the Distance method. There are different distances available such as Euclidean distance, City Block Distance, Canberra Distance.

VI. RETRIEVAL

The System saves and presents a sequence of images ranked in decreasing order of similarity or with the minimum distances is returned to the user.

To evaluate the efficiency of the proposed system precision and recall rates are to be calculated where,

$$\text{Precision} = \frac{\text{IR}}{\text{IT}} \qquad (1)$$

IR=No Of Relevance Images Retrieved
IT=Total Number of Images Retrieved on the screen

$$\text{Recall} = \frac{\text{IR}}{\text{IRB}} \qquad (2)$$

IR=No Of Relevance Images Retrieved
IRB=Total Number of relevant Images in the database

VII. THE EXISTING IMAGE RETRIEVAL SYSTEMS

There is several various type of existing content-based image retrieval systems had been done in past few years. A survey to content-based image retrieval system had been done by Remco C. Veltkamp and Mirela Tanase. The survey provides an overview of the functionality of temporary image retrieval systems in terms of technical aspects which are 15 querying, relevance feedback, features, matching measures, indexing data structures, and result presentation. The example of CBIR system that involves in that survey such as ADL (Alexandria Digital Library), CBVQ (Content-Based Visual Query), FIR (Formula Image Retrieval), MARS (Multimedia Analysis and Retrieval System), QBIC (Query By Image Content), WISE (Wavelet Image Search Engine) and others[9].

VIII. CONCLUSION

The Purpose of this survey is to provide

an overview of the functionality of Content Based Image Retrieval. Most of the system use color and texture features. Few systems use shape feature and still less use layout feature. CBIR methods have been used extensively in various areas to improve the performance of system and achieve better results in different applications. CBIR using cascaded SVM integrates various features perfectly in CBIR and reflects the user's subjective requirements. The experiments achieve good performance and demonstrate the efficiency and robustness of system.

REFERENCES

[1] Swapnalini Pattanaik, Prof.D.G.Bhalke, "Beginners to Content Based Image Retrieval", International Journal of Scientific Research Engineering &Technology (IJSRET) Volume 1 Issue2 pp. 040-044 May 2012.

[2] Nishchal K Verma, Saurabh Agrawal, Pradip Sircar "Content Based Color Image Classification using SVM", Eighth International Conference on Information Technology: New Generations 2011.

[3] R. M. Haralick, K. Shanmugam, and I. Dinstein, Texture features for image classification, IEEE Trans. OnSys. Man. and Cyb. SMC-3(6), 1973.

[4] H. Tamura, S. Mori, and T. Yamawaki, "Texture features corresponding to visual perception," IEEETrans. On Systems, Man, and Cybernetics, vol. Smc-8, No. 6, June 1978.

[5] W.Y. Ma, B. S. Manjunath, "Comparison of wavelet transform features for texture Image Annotation" , IEEE Trans 1995.

[6] Yi-Min Wen1, 2 and Bao-Liang Lu1, "A Cascade Method for Reducing Training Timeand the Number of Support Vectors", 2004.

[7] Dr. Fuhui Long, Dr. Hongjiang Zhang and Prof. David Dagan Feng, "Fundamentals of Content Based Image Retrieval".

[8] "SVMs and Kernel Functions", Algorithms in Bioinformatics II, SoSe'07, ABIT, D. Huson, June 27, 2007.

[9] Yong Rui and Thomas S. Huang, and Shih-Fu Chan, "Image Retrieval: Current Techniques, Promising Directions, and Open Issues",Journal of Visual Communication and Image Representation 10, 39–62 (1999).