Volume 4, Issue 7, July 2014 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

A Review on Content Based Image Retrieval using SVM

Sumiti Bansal
Department of Computer Science and Engineering
BFCET Bathinda, India

Er. Rishamjot Kaur
Department of Information and Technology
BFCET Bathinda, India

Abstract: ***Content based image retrieval has most important research area in last few years. Image retrieval is technique of finding out most important features of image. Main task of content based image retrieval (CBIR) is to get perfect and fast result. To get better results, relevance feedback techniques were incorporated into CBIR such that more precise results can be obtained by taking user's feedback into account. Conventional content –based image retrieval schemes may suffer from some problems in practical application. First, user would like to complete their search in single attempt on the web. Secondly large time consumptions in these such search problems. Third ordinary users may add noisy examples into the query. In this paper, we present a review on content based image retrieval using various techniques such as support vector machine (SVM) that should combine all relevance or irrelevance features such as color, texture, shape, size. SVM is used to find out the optimal result and give fast result as compared to others. In this paper we discuss working of support vector machine (SVM) and explain other proposed techniques for image retrieval.***

Keywords: ***CBIR (Content Based Image Retrieval), feature extraction, SVM (Support vector Machine), image retrieval, image classification.***

I. INTRODUCTION

Now days, CBIR (Content based image retrieval) is a hotspot of digital image processing techniques due to exponential increase of size of so multimedia files in recent years because of the substantial increase of affordable memory storage on one hand and the wide spread of World Wide Web (www) on the other hand, the need for the efficient tool to retrieve the images from the large data base becomes crucial. The growing demands for image retrieval in multimedia field such as crime prevention, Fashion and graphic design and traffic control has pushed application developers to search ways to manage and retrieve images more efficiently. Content-based image retrieval (CBIR), also known as query by image content (QBIC) and content- based visual information retrieval (CBVIR) is the application of computer vision to the image retrieval problem, that is, the problem of searching the digital images in large database. Content- based" means that the search will analyze the actual contents of the image. The term [CBIR] describes the process of retrieving desired images from a large collection on the basis of features (such as colour, texture and shape) that can be automatically extracted from the images themselves.

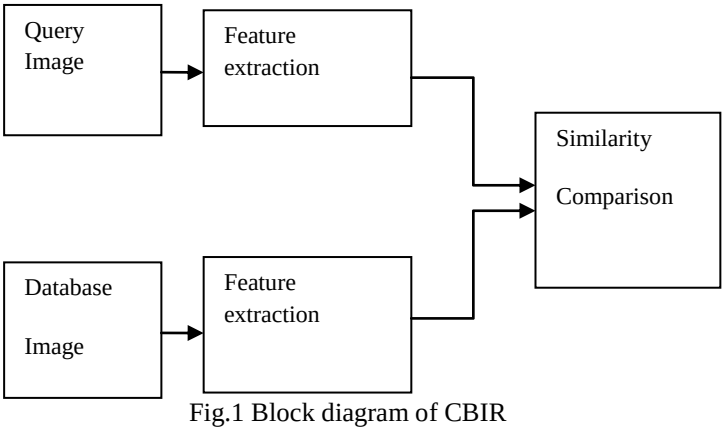

Fig.1 Block diagram of CBIR

II. APPLICATIONS OF IMAGE RETRIEVAL SYSTEMS

- The advantages of such systems range from simple users searching a particular image on the web.
- Various types of professionals like police force for picture recognition in crime prevention.
- Medicine diagnosis
- Architectural and engineering design
- Fashion and publishing
- Geographical information and remote sensing systems
- Home entertainment

III. SUPPORT VECTOR MACHINE (SVM): AN OVERVIEW

SVM was first proposed by Vapnik and it gives higher better performance in classification of image than other data classification algorithm. It is mainly used in real world problem like voice recognition, tone recognition, text categories, image classification, object detection, handwritten digital recognition, and data classification. Image classification is the process of collecting similar type of images in a single set. Manual browsing the database to search for identical images would be not practical because there is a large amount of database and it would be increased day by day. To improve the result of classification extract related features, because we also want good accuracy. Previous image retrieval system should consists some problems because users want to complete their search in a single step such as on web, time consuming problems and also some noise should be added to the resulting image.

Previously working with neural networks for supervised and unsupervised learning. They show good results when used for such type of applications. Multilayer perception uses feed forward and recurrent networks. MLP shows multiple inputs and outputs for universal approximation of continuous nonlinear function.

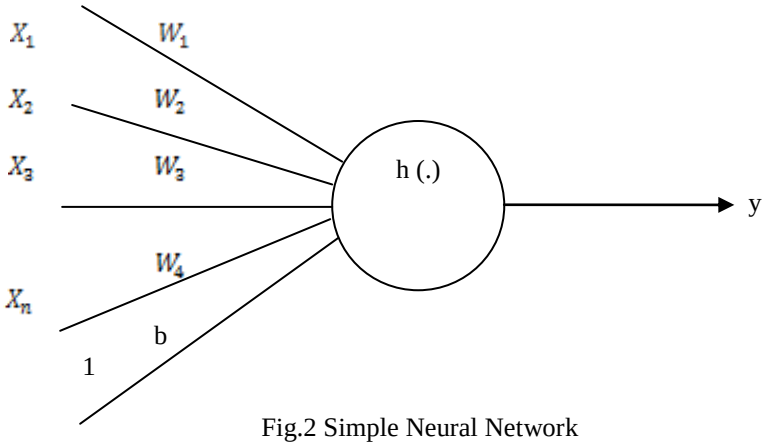

Fig.2 Simple Neural Network

Described some issues noticed:

- Local minima
- Finding how many neurons might be needed for a task ?
- If NN solution come together this may not give result in a unique solution

Now we give the data about X and Y axis and check how many hyper planes are there. For checking which solution is correct is a difficult task. To overcome this type of problem SVM should be used.

A) Mathematically description of SVM (Support Vector Machine)

There are several cases in this approach which are given below .

1) Optimal separating hyper planes: A brief description of SVM algorithm is given as follows. Consider a given set of points in the form of training data which separate two classes of pattern based on given training set:

S= {(x1, y1), (x2, y2), (x3, y3) ... (xi, yi)}

Where xi is a p-dimension real vectors, yi= {-1, +1} and n is a number of sample.

According to Vapnik's formula

y_i=<w.x>+ b …….. (1)

$= \Sigma\, w_i . x_i + b$

Where w is a p-dim vector and b is constant or scalar. By adding a scalar value b it increases the margin between hyperplanes and in the absence of b hyperplanes is forced to pass through the origin. So in SVM we always use parallel hyperplanes which maintain distance between them. Parallel hyperplanes can be described by equation :

w. x_i + b = 1 for y_i = 1

w. x_i+ b = -1 for y_i = -1

2) Linearly Separable: we can select these hyper planes so that there are no points between them and then make an effort to maximize their distance. As we know in feature space there are number of hyper planes but choose the one for which the distance to the closest point is maximal is called optimal separating hyper planes . Since the distance to the closest point is 1. After subtracting the two distances we get the summed distance from separating hyper planes to the nearest points.

Maximum Margin = M= 2/ w

The quantity 2/w is called the margin and it is used for measure the generalization ability: the larger the margin, the better the find generalization error .

3) Linearly non-separable case: When the data is not linearly seperatable we introduce a new variable called as slack variable denoted by ε_i. If

We take variable ($\varepsilon_1, \varepsilon_2 \ldots\ldots \varepsilon_n$) where $\varepsilon_i >= 0$ such that Yi (w.xi+ b)>=1-ε_i,

i=1 …….N

4) Nonlinear support vector machines: In the non- linear case, we mapped the data into other space with the help of some nonlinear mapping function. This mapping function is called kernel function and space is called Euclidean distance.

IV. FEATURE EXTRACTION

Feature extraction is the basis of content based image retrieval. Typically two types of visual feature in CBIR:

- Primitive features which include color, texture and shape.
- Domain specific which are application specific and may include, for example human faces and finger prints.

Primitive features are those which can be used for searching like color, shape, texture and feature which are used for particular domain and have knowledge about them. For example, we are searching for face of girl which belongs to human category, so here domain is human. Another one is we are searching for elephant which belong to animal category. These features are domain specific.

A) COLOR

Color is one of the most reliable visual features that are also easier to apply in image retrieval systems. Color is independent of image size and orientation, because, it is robust to background complication.

First a color space is used to represent color images. Typically, RGB space where the gray level intensity is represented as the sum of red, green and blue gray level intensities . Swain and Ballard proposed histogram intersection, an L1 metric as the similarity measure for color histogram. Color histogram is the most common method for extracting the color features of colored images. Color histograms are widely used for CBIR systems in the image retrieval area.

B) TEXTURE

Texture is that innate property of all surfaces that describes visual patters, and that contain important information about the structural arrangement of the surface including clouds, trees, bricks, hair, and fabric and its relationship to the surrounding environment. Various texture representation have been investigated in both pattern recognition and computer vision.

C) SHAPE

Shape is the characteristic surface configuration that outlines an object giving it a definite distinctive form. In image retrieval, depending on the applications, some require the shape representation to be invariant to translation, rotation and scaling, whiles others do not. In general shape representation can be divided into two categories:

1) Boundary based which uses only the outer boundary of the shape.

2) Region-based which uses the entire shape regions.

V. PREVIOUS TECHNIQUES

A) Content-Based Image Retrieval by Mining User Navigation Patterns

As elaborated above, the critical issue of RF can be chiefly summarized thus: how to achieve effective and efficient image retrieval. To deal with this issue, we describe how our proposed approach NPRF integrates the discovered navigation patterns and three RF techniques to achieve efficient and effective exploration of images.

B) Content-Based Image Retrieval using Color Moment and Gabor texture feature

The novel method of color moment (based on division of the image into 3 equal non overlapping horizontal regions) + Gabor texture features gives better results compared to the color moment (based on whole image) + Gabor texture features and others using only single feature.

C) *Histogram Refinement for Content-Based Image Retrieval*

Color histograms are frequently used to compare images. Examples of their use in multimedia applications include scene break detection and querying a database of images. Color histograms are popular because they are trivial to compute, and tend to be robust against small changes in camera viewpoint.

VI. CONCLUSION

We addressed a new issue that image retrieval using unclean positive examples. In the proposed scheme Feature aggregation was formulated as a binary classification problem and solved by support vector machine (SVM) in a feature dissimilarity space. This paper reviewed the main components of a content based image retrieval system, including image feature representation while highlighting the past and current technical achievement Open research issues are identified and future research directions are suggested .In retrieval system to achieve fast retrieval speed and make the retrieval system scalable to large size image collection, an effective multidimensional technique is required and an indispensable part of whole system.

REFERNCES

[1] K. Ashok Kumar & Y.V.Bhaskar Reddy, "Content Based Image Retrieval Using SVM Algorithm", Dept of ECE, V.R.S &Y.R.N college of Engg & Tech., Chirala, Andhra Pradesh Dept of ECE, Q.I.S college of Engg &Tech., Ongole, Andhra Pradesh

[2] E-mail:ashok.kavuru@gmail.com, yvbreddy06@yahoo.com

[3] Sonali Jain, "A Machine Learning Approach: SVM for Image Classification in CBIR", Department of Computer Science, MITM, RGPV, Indore

[4] Ja-Hwung Su, Wei-Jyun Huang, Philip S. Yu, "Efficient Relevance Feedback for Content-Based Image Retrieval by Mining User Navigation Patterns " IEEE, and Vincent S. Tseng, Member, Vol. 23, No. 3, March 2011

[5] Gaurav Jaswal (student), Amit Kaul, "Content Based Image Retrieval'' – A Literature Review National Institute of Technology, Hamirpur-177001, Himachal Pradesh(India)2009

[6] Durgesh Nirapure , "Review paper on Content Based Image Retrieval using HSV color model'' Department of computer science engineering IES College of technology Bhopal India, Shraddha Pandit ISSN: 2321-693X

[7] S. Mangijao Singh , K. Hemachandran, "Content Based Image Retrieval using Color Moment and Gabor based images using colour movement and Gabor Based Image Retrieval using Color Moment and Gabor Texture Feature texture" Department of Computer Science, Assam University, Silchar, Assam, India, Vol. 9, Issue 5, No 1, September 2012

[8] Yong Rui and Thomas S. Huang, " Image Retrieval: Current Techniques" Promising Directions, and Open Issues January 7, 1999

[9] Martin Solli , "Content Based Image Retrieval Fonts and Color Emotions" Copyright c ° 2009 Department of Science and Technology Campus Norrk¨oping, Link¨oping University SE-601 74 Norrk¨oping, Sweden

[10] Ritendra Datta Jia Li James Z. Wang, "Content-Based Image Retrieval - Approaches and Trends of the New Age

[11] Amanbir Sandhu , Aarti Kochhar, "Content Based Image Retrieval using Texture, Color and Shape for Image Analysis" International Journal of Computers & Technology Volume 3, No. 1, AUG, 2012

[12] [11] Ritendra Datta Jia Li James Z. Wang , "Content-Based Image Retrieval - Approaches and Trends of the New Age" The Pennsylvania State University, University Park, PA 16802, USA

[13] Katherine A. Heller ,Zoubin Ghahramani , "A Simple Bayesian Framework for Content-Based Image Retrieval'' Gatsby Computational Neuroscience Unit University College London heller@gatsby.ucl.ac.uk, Department of Engineering Cambridge University zoubin@eng.cam.ac.uk

[14] Greg Pass, Ramin Zabih, "Histogram Refinement for Content-Based Image Retrieval" Computer Science Department Cornell University

[15] Mahesh Maurya, Chitvan Oza, Alok Shah,Sadiya Patel, "A Review on Content Based Image Retrieval" MPSTME,SVKM's NMIMS (Deemed-to be University), Vile Parle West, Mumbai 56

