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A Survey on Content Based Image Retrieval using Classification Technique

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ABSTRACT

From the last several years, the volume of digitized images has been rapidly increased. Day-to-day, huge volume of images is going to be initiated. These digital images are going to be stored in a database. This database is called image database. After the storage it is also necessary to search and retrieve these stored images proficiently. This has risen to the need of a well organized Image Retrieval system. This paper introduces image classification technique for Image Retrieval System.

Keywords : Content Based Image Retrieval, Feature Extraction, Classification technique

I. INTRODUCTION

The era of information technology has given the raise to the wide usage of images in all the major areas of human beings like education, crime prevention, hospitals, government, commerce, architecture, engineering, surveillance etc. These different areas use a huge amount of images. This huge amount of images is termed as image database. The image database is one of the system in which image data are stored. Various areas have different image databases for storing their relevant images.

The storage in the image database is no more feasible if the stored images cannot be retrieved for the future use. So an efficient Image Retrieval system is needed to achieve this task. Now-a-days Content Based Image Retrieval systems are used for browsing, searching and retrieving images efficiently. This retrieval is based on the visual features of an image such as color, texture and shape.

Majority of the CBIR systems work in the way: Load query image, extracts feature vector from the query image, extracts feature vector from each image available in the database and the set of these feature vectors is organized. Figure 1 represents the block diagram of a basic CBIR.

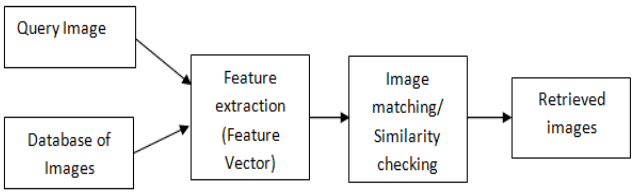

Figure 1 : Block Diagram of CBIR

1. Feature Extraction

Feature extraction is the most important task of Content Based Image Retrieval process. Here

different image attributes like color, texture, shape are discussed for feature extraction.

1.1 Color feature

Color is the widely used visual feature in Content Based Image Retrieval due to ease of use and computation speed. Each and every color is represented by combining the three features red (R), green (g) and blue (B). Color information can be extracted using different color descriptors like color histogram, color moments, color correlograms, MPEG-7 color descriptors. In digital images, color are represented in different color spaces like RGB, HSV, YIQ, CMY, YCbCr, CIElab etc.

1.2 Texture feature

Texture represents natural properties of the surfaces that describe visual patterns. Texture features are also widely used in CBIR applications. Texture has important information related to structural arrangement of clouds, bricks, leaves etc. Wavelet transformation, Gabor filter, Tamura features are some of the texture descriptors.

1.3 Shape feature

The shape feature of an object is also used in many of the Content Based Image Retrieval Systems. Shape representation techniques are characterized as either region-based (Statistical moments) or boundary-based (polygonal approximation, Fourier-based shape descriptors).

2. Image Classification Method

Image classification is the main domain where the deep neural networks perform the important task. Classification is a machine learning technique used to reduce semantic gap between the low-level image features and high level user perception. Image classification is a two step process consisting of training and testing phases [1]. In training phase the samples of each class are trained and establish model description for each class. In testing phase the model is used to classify and index images that are not labeled. Table 1 [2] describes different classification techniques.

Classification techniques	Benefits	Assumptions and/or limitations
Neural network	• Can be used for classification or regression • Able to represent Boolean functions (AND, OR, NOT) • Tolerant of noisy inputs • Instances can be classified by more than one output	• Difficult to understand the structure of an algorithm • Too many attributes can result in overfitting • Optimal network structure can only be determined by experimentation
Support vector machine	• Models nonlinear class boundaries • Overfitting is unlikely to occur • Computational complexity reduced to a quadratic optimization problem • Easy to control the complexity of decision rule and frequency of error	• Training is slow compared to Bayes and decision trees • Difficult to determine optimal parameters when training data is not linearly separable • Difficult to understand the structure of an algorithm
Fuzzy logic	• Different stochastic	• Prior knowledge is

	relationships can be identified to describe properties	very important to get good results • Precise solutions are not obtained if the direction of decision is not clear
Genetic algorithm	• Can be used in feature classification and feature selection • Primarily used in optimization • Always finds a "good" solution (not always the best solution) • Can handle large, complex, nondifferentiable and multimodal spaces • Efficient search method for a complex problem space • Good at refining irrelevant and noisy features selected for classification	• Computation or development of the scoring function is nontrivial • Not the most efficient method to find some optima, rather than global • Complications involved in the representation of training/output data

Table 1 : Different classification techniques

II. RELATED WORK

Sultan Aljahdali, Aasif Ansari has proposed method for feature based image retrieval process and it is applied with Gabor filter texture feature extraction technique [3]. They have experimented this method with Support Vector Machine Supervised Classification technique and without using it. Their result shows that great improvement in result by using SVM classification technique. But they have considered only texture feature which will not give best result for all type of images [3].

D. Jeyabharathi and Dr.A. Suruliandi have compared various feature extraction technique with different classification technique [4]. They have explored PCA, LDA and ICA for feature extraction techniques. On the basis of that features SVM and nearest neighbour classifier are compared. Their experiment result is evaluated based on reorganization rate and F score. Based on result they have concluded that PCA with SVM gives accurate result than nearest neighbour technique [4].

Literature survey on various techniques to classify labelled and unlabelled images is available in [5].Like Svm, D-Em, RF, Active Learning, Transductive Learning techniques are explain. And they have given some recommendation for choosing fuzzy set theory or Rough set theory according to our application [5].

Apostolos Marakakis, Nikolaos Galatsanos, Aristidis Likas have proposed relevance feedback approach with SVM classification .They have used two feature selections method to train the database according to feedback given by user and for reducing the database dimensionality[6].

III. CONCLUSION

In this paper, we have compared different image classification techniques along with their benefits and limitations involved in each technique. This survey can further be helpful in developing a Content Based Image Retrieval System that will be helpful in reducing the search time and semantic gap.

IV. REFERENCES

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