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Integrated Multiple Features for Tumor Image Retrieval Using Classifier and Feedback Methods.

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Abstract

The content based image retrieval method greatly assists in retrieving medical images close to the query image from a large database basing on their visual features. This paper presents an effective approach in which the region of the object is extracted with the help of multiple features ignoring the background of the object by employing edge following segmentation method followed by extracting texture and shape characteristics of the images. The former is extracted with the help of Steerable filter at different orientations and radial Chebyshev moments are used for extracting the later. Initially the images similar to the query image are extracted from a large group of medical images. Then the search is by accelerating the retrieval process with the help of Support Vector Machine (SVM) classifier. The performance of the retrieval system is enhanced by adapting the subjective feedback method. The experimental results show that the proposed region based multiple features and integrated with classifier and subjective feedback method yields better results than classical retrieval systems.

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Keywords:Content based image retrieval; Multiple features;SVM Classifier;Relevance feedback.

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1. Introduction

The technological advancement in medical field has recently been at faster phase. It has resulted in a huge database of medical images that help the medical experts in diagnostic process of several diseases [1]. Out of the many serious diseases tumor is more serious whose occurrence is high and fatal since it has an invasive and infiltrative nature in the narrow intracranial cavity. Tumors are cancerous lumps in the parts of the body. To study the details of various organic tumours in question, we need to analyze the medical images of similar tumor in the past and use them to study the present case. Content-based image retrieval (CBIR) approaches were invented in the last decade, to support the computer aided diagnostic (CAD) process [2]. CBIR is an extremely successful tool in facilitating the retrieval of the required medical images so that the physician can take an appropriate decision in the diagnosis of diseases. Feature extraction plays an imperative role in enhancing the performance of the retrieval system. Generally medical images are represented in gray scale rather than the color, due to their nature. Single feature may not help in describing the full content of the image, therefore we adapt multiple features [3].

Texture is an inherent surface property of an object in which it gives the relationship to the neighbouring location. In addition it also describes the structural understanding of a region. A variety of texture explanation methods are projected in the literature [4]. Among these methods, Gabor filter has gained an appreciable attention due to their capacity to illustrate features at various orientations [5].

Shape features provide useful information for recognizing the objects. Fundamentally there are two types of shape feature extraction methods defined in literature, one is boundary-based and another is region-based method. The earlier one describes the boundary information of an object and frequently used shape representation methods include Fourier descriptors, Polygonal approximation and Curvature scale space (CSS) analysis**.** The later one extracts the entire region content. Among the region based descriptors moments play a significant role and are very popular. They exploit both boundary and interior content of the image [6].

As the quantity of images increases in the data base the computation time increases proportionally. Integration of classifier with the CBMIR reduces the computation cost and searching space in which the classifier categorizes the database images with labels [7].

The semantic space between the low level perception and high level concept can be filled by introducing Relevance Feedback (RFB) method. RFB is a query refinement technique that captures the user needs through the given feedback learning method. Various relevance feedback techniques have been discussed in literature [8]. User interaction with the retrieval system greatly improves the retrieval results.

This paper presents a novel and more effective approach for extracting content information about region of the object. In the proposed method the region of the object is extracted based on intensity and texture gradient. We extend the framework to extract the content by means of Steerable filter at various orientations for extracting texture features and radial Chebyshev moments for shape features extraction. Finally similar medical images are retrieved by matching the region features with the database images. This frame work increases the performance of the retrieval system by incorporating the Support Vector Machine (SVM) classifier [9] and subjective feedback learning method. For a given query, the medical image retrieval system returns preliminary results based on ED as a similarity metric computed between the global features of the given query image and particular class data base images in which the entire database images are pre classified by SVM. If the user is not happy with the retrieved output, interaction can be done with the system by modifying the query image by adapting the feedback mechanism. This feedback information selects a set of better images from the portioned database in the next iteration and returns superior results.

The rest of this paper is structured as follows. **Section 2** focuses on the Proposed CBMIR system. **Section 3** focuses on features extraction algorithm. **Section 4** explains the SVM classifier **Section 5** describes the feedback technique **Section 6** gives experimental results with feedback approach. **Section 7** concludes the paper.

2. Proposed CBMIR System Architecture.

The fundamental framework of a typical conceptual content-based retrieval system is illustrated and discussed in figure (1).Initially the retrieval system classified the database images according to the modality using SVM