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Region and Location Based Indexing and Retrieval of MR-T2 Brain Tumor Images

Krishna A N[a], Dr. B G Prasad[b]

[a]Associate Professor, Department of Computer Science and Engineering, S J B Institute of Technology, Bangalore-560 060, India. Contact: ankrishna12742004@yahoo.co.in

[b]Professor and Head, Department of Computer Science and Engineering, B N M Institute of Technology, Bangalore-560 070, India. Contact: drbgprasad@gmail.com

In this paper, region based and location based retrieval systems have been implemented for retrieval of MR-T2 axial 2-D brain images. This is done by extracting and characterizing the tumor portion of 2-D brain slices by use of a suitable threshold computed over the entire image. Indexing and retrieval is then performed by computing texture features based on gray-tone spatial-dependence matrix of segmented regions. A Hash structure is used to index all images. A combined index is adopted to point to all similar images in terms of the texture features. At query time, only those images that are in the same hash bucket as those of the queried image are compared for similarity, thus reducing the search space and time.

Keywords : Content Based Retrieval, Indexing, Segmentation, Texture.

1. INTRODUCTION

In medical field, a large number of diverse radiological and pathological images in digital format are generated everyday in hospitals and medical centers with sophisticated image acquisition devices and digital scanners. Medical images are generally complex in nature and are used for diagnosis, therapy, research and education. Support of prior image references is critical to radiologists or physicians current examination of images. To support their prior image reference needs, the generated images need to be processed and organized so that efficient retrieval of similar images for a current examination image is achieved.

Content-Based Image Retrieval (CBIR) has been initially proposed to overcome the problem caused by the subjectivity of a users perception in Text-Based Image Retrieval (TBIR). CBIR is more challenging in medical domain due to the complex nature of images. In medical domain, visual features between normal and pathological images may have only subtle differences; these may not be captured by traditional feature extraction such as color, texture or shape based on entire images. The main reason is that, important features in biomedical images are often local features of pathological regions or lesions, rather than global features of entire image. Generating local features is much more complex than global features; however, it can describe fine details of the images and allow efficient retrieval of relevant images based on local object properties. To extract regional or local features, segmentation is very important in medical imaging and generally treated as a pre-processing step.

Manual segmentation is a very time-consuming task and not feasible in real-time needs. Moreover, results from manual operations are not repeatable and suffer from intra-observer and inter-observer variability. In the past few decades, researchers have proposed many effective algorithms to perform automated segmentation. The successful implementation of modern mathematical and physical techniques, such as Bayesians analysis, template matching and deformable models, greatly enhances the accuracy of segmentation results. Com-

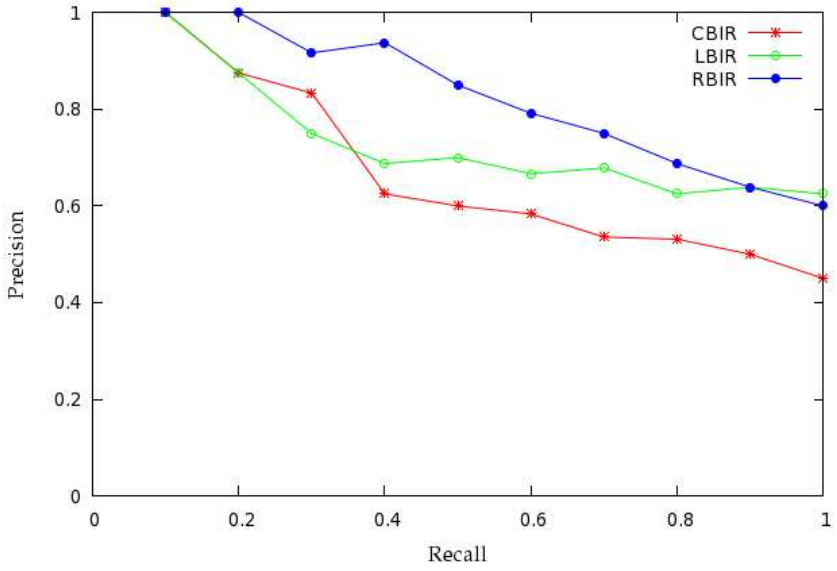

Figure 3. Precision Recall Graph for Top 10 Retrievals

index images. The retrieved images are sorted using Euclidean distance measure in the decreasing order of similarity against the query image. The performance of both the systems have been measured using standard precision versus recall graphs. Region-based indexing and retrieval gives significantly better results of 81.7 percent precision as compared to location-based indexing and retrieval which gives 72.74 percent precision. This is because, in most of the cases the tumor is located in the central position. The results are also compared with CBIR which gives 65.33 percent precision.

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Krishna A N is currently Associate professor, Department of Computer Science and Engineering, S J B Institute of Technology, Bangalore. He obtained his Bachelors and Masters degree in Computer Science and Engineering from University Visvesvaraya College of Engineering. He has publications in International Conferences and Journals. His research interests includes Image Processing, Pattern Recognition and Content Based Image Retrieval.

Dr. B G Prasad is currently Professor and Head, Department of Computer Science and Engineering, B N M Institute of Technology, Bangalore. He obtained his Bachelors degree in Computer Science and Engineering from P E S College of Engineering, Mandya, Masters degree and Ph.D in Computer Science and Engineering from IIT Delhi. He has publications in many Refereed Journals and Conferences. His research interests include Operating Systems, Content Based Image Retrieval and Computer Networks.