

Chapter 11

Medical Image Mining Using Fuzzy Connectedness Image Segmentation: Efficient Retrieval of Patients' Stored Images

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ABSTRACT

This chapter presents novel approach fuzzy connectedness image segmentation with geometric moments (FCISGM) for digital imaging and communications in medicine (DICOM) image mining. As most of the medical imaging data is exchanged in DICOM format, this chapter focuses on the various methodologies available for DICOM image feature extraction and mining. The comparison of existing medical image mining approaches with the proposed FCISGM approach is provided in this chapter. After carrying out exhaustive results it has been found that proposed FCISGM method gives more precise results and requires minimum number of computations compare to other medical image mining approaches resulting in improved relevant outcomes.

INTRODUCTION

The medical image databases are growing day by day. There are various modalities of medical images such as Angiograms, Positron Emission Tomography (PET), Ultrasound, X-Ray, etc. Physician compares previous and current medical images associated with patients to provide right treatment. Medical Imaging is playing a leading role in modern diagnosis. Efficient image mining tools are needed to retrieve the relevant images from large growing medical image databases. Such tools must provide more precise

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retrieval results with less computational complexity. Various researches are carried out in recent past years for efficient medical image mining. Some recent research papers included various methodologies for medical image mining or retrieval. This chapter contains the comparison of image mining techniques with the new proposed method Fuzzy Connectedness Image Segmentation with Geometric Moment (FCISGM). The proposed method provides superior results and comparatively better results than the various image retrieval techniques such as Web base Medical Image Retrieval (IR) in Oracle (Bhagat et al., 2013; Bhagat et al., 2014; Dimitrovski et al., 2009), Pattern Similarity based Medical IR (Iakovidis et al., 2009), Indexing for Relevance Feedback (FB) in IR (Ramaswamy et al., 2009), Entropy Based IR (Zhang et al., 2008), Similarity Based Online Feature Selection (Jiang et al., 2004), Entropy Based Feature Selection and Localized CBIR (Chang et al., 2009). The comparison of these systems is provided in section overview of existing image mining systems. This chapter addresses various problems in DICOM medical image mining.

This chapter contains the overall description of basic fuzzy connectedness image segmentation theory, new proposed FCISGM approach developed for DICOM image mining, shape analysis, application of proposed FCISGM approach for shape analysis, feature extraction using proposed approach, DICOM medical image mining using proposed FCISGM approach. Chapter presents the description of various image modalities in DICOM format, such as, Angiogram, PET, Ultrasound, X-ray etc. The comparison of existing methodologies with proposed methodology for medical image feature extraction and medical image mining is provided in this chapter. The comparison is carried out on the basis of time required for feature extraction, number of images retrieved, precision and recall. The chapter also provides the future research directions in medical image mining. For more details please refer our earlier publications (Bhagat et al., 2011; Bhagat et al., 2012; Bhagat et al., 2013; Bhagat et al., 2014). This chapter is guide to the researchers in the medical image mining domain.

BACKGROUND

The overview of some image retrieval or mining systems such as medical image retrieval system in oracle (Dimitrovski et al., 2009), medical image mining using pattern similarity scheme based on PANDA (Iakovidis et al., 2009) framework, etc. is provided in this section. This section describes the content based medical image mining and the need for content based medical image mining.

Overview of Existing Image Mining Systems

Query by image contents (QBIC), Virage, Photobook, Chabot, VisualSeek, SurfImage and Netra (Colin et al., 2005; Rui et al., 1999) these are several popular content based image retrieval systems. All these systems can't be useful for retrieving medical images. These systems uses some simple feature extraction methods which may provide unwanted results and are not that much precise. In content based image retrieval systems the queries, used to retrieve images, can be classified as primitive, logical and abstract (Colin et al., 2005). Primitive query is based on features, such as color, shape and texture, extracted from images. Logical query employs the identities of the objects in the image. Sketch-based and linguistic queries in which the user describes objects or regions in the desired spatial positions and ascribes attributes, such as class label, size, color, and shape properties, to them can also be considered as logical

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