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ABSTRACT

Magnetic resonance spectroscopic imaging (MRSI) integrates both spectroscopic and imaging methods to produce spatially localized spectra from within the sample or patient. Although MRSI is a relatively new imaging technology for clinical applications and relevant databases still do not exist, the rapid advances made in the field of NMR and the associated scanning technologies, the increased frequency in which oncological diseases appear may soon lead to the creation of large databases of such images at least in main medical centers. Therefore, the need for indexing and retrieval of MRSI images might soon emerge. This paper proposes the application of a new method for content based MRSI medical image retrieval. The description of MRSI images relies on a new Descriptor which includes global image features, capturing both brightness and texture characteristics at the same time, based on an evaluation of MRS spectrum per voxel. Image information is extracted using a set of fuzzy approaches. Experiments demonstrate the feasibility of the proposed technique using synthetic images.

KEY WORDS
CBMIR, MRSI Image Retrieval, Fuzzy Methods, NMR Medical Images

1. Introduction

Magnetic Resonance Spectroscopic Imaging (MRSI) has the capability to examine multiple adjacent voxels, covering a large volume in a single scanner measurement. MRSI provides the representation of metabolite information as spectral maps [1] or metabolite images and allows direct visual evaluation of the distribution of metabolites in both normal and abnormal tissues.

Nowadays, digitized medical images are becoming more frequently used. This leads to the creation of large image databases, resulting in the need to find an efficient method for the indexing and retrieval of these images. Although MRSI is a relatively recent field in medical imaging the need for MRSI image databases indexing emerges fast.

The process of automatic indexing and retrieval of medical images based on their content is known by the term Content-Based Medical Image Retrieval (CBMIR) [2]. Content-based Image Retrieval (CBIR) is any technology that in principle helps to organize digital image archives by their visual content. By this definition, anything ranging from an image similarity function to a robust image annotation engine falls under the purview of CBIR [3].

Several medical image indexing and retrieval techniques have been proposed in the literature. Chu et al presented an image retrieval system dedicated to brain MRI which indexes images mainly on the shape of the ventricular region [4]. Korn et al proposed a system for the fast and effective retrieval of tumor shapes in mammogram X-rays [5]. Comaniciu et al described a system that aims to help physicians in the diagnosis of lymphoproliferative disorders of blood [6]. Glatard et al introduced a Texture Based Medical Image Indexing and Retrieval for Cardiac Images [7].

Most of the CBMIRs are based on visual example. The user defines an image as input (query image), and, based on certain global or local feature vectors (FV), the system brings up similar images. These sorts of feature vectors are used to describe the content of the image and that is why they must be appropriately selected on occasion. The visual content of the images is mapped in to a new space called the feature space. The feature vectors (*descriptors*) that are chosen have to be discriminative and sufficient for the description of the objects [8].

Although all the above methods have been applied to pixel based medical, imaging including MRI, we herein attempt to define a new CBMIR descriptor suitable for