Chapter III
Review on Texture Feature Extraction and Description Methods in Content-Based Medical Image Retrieval

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ABSTRACT

Texture feature extraction and description is one of the important research contents in content-based medical image retrieval. The chapter first proposes a framework of content-based medical image retrieval system. It then analyzes the important texture feature extraction and description methods further, such as the co-occurrence matrix, perceptual texture features, Gabor wavelet, and so forth. Moreover, the chapter analyzes the improved methods for these methods and demonstrates their application in content-based medical image retrieval.

1. INTRODUCTION

Content-based medical image retrieval has been one of the most vivid research areas in the medical field over the last 10 years. With the development of computer technology and medical imaging technology,

amount of medical images increase exponentially. Text-based medical image retrieval hasn't met the needs of medical image retrieval, management, and maintenance. So it is urgent to develop an efficient technology for medical image retrieval (Liu *et al*, 2007). Under the circumstance, content-based medical image retrieval has received a wide concern. Now it isn't only used for medical image retrieval, management and maintenance, but also used to assist physicians in diagnosis and treatment of diseases (Müller *et al*, 2004; Lau and Ozawa, 2004; Tourassi and Floyd, 2004; Ogawa *et al*, 1998).

Now there are many conceptual frameworks of content-based medical image retrieval system (Smeulders *et al*, 2000; Wei *et al*, 2005; Zhang *et al*, 2007). A simple framework (See Figure 1) is used to demonstrate the problems which are studied in the chapter. The framework consists of feature extraction, feature selection, feature description, dimension reduction, indexing, relevance feedback, and similarity measure. Feature extraction is usually thought to be a transformation for a medical image from high dimension feature space description to low dimension feature space description. Feature selection is used to select some of most discriminative features from a group of features to reduce feature space dimension. A group of representative features from a medical image are used to describe the content of the medical image in feature description. Feature description emphasizes how to organize the features effectively to describe the content in the medical image. In dimension reduction, transformations are used to reduce feature space, which decreases computation complexity in medical image retrieval. Indexing is used to speed up retrieval process. Relevance feedback is introduced into medical image retrieval by the participation of users in which retrieval patterns are submitted many times with interactivity to improve precision of retrieval system. Similarity measure is used to measure similarity between medical images. To improve both efficiency and effectiveness of a retrieval system, a typical content-based medical image retrieval system is divided into offline processing and online retrieval. Feature extraction, feature selection, feature description, dimension reduction and indexing for each image in a medical image database are performed by offline (See dashed frame in Figure 1). But feature extraction, feature selection, feature description, dimension reduction and indexing for a query image are performed by online. In addition, relevance feedback, similarity measure and result

Figure 1. Conceptual framework of content-based medical image retrieval