SPECIAL ISSUE PAPER

A novel medical image compression using Ripplet transform

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Abstract In spite of great advancements in multimedia data storage and communication technologies, compression of medical data remains challenging. This paper presents a novel compression method for the compression of medical images. The proposed method uses Ripplet transform to represent singularities along arbitrarily shaped curves and Set Partitioning in Hierarchical Trees encoder to encode the significant coefficients. The main objective of the proposed method is to provide high quality compressed images by representing images at different scales and directions and to achieve high compression ratio. Experimental results obtained on a set of medical images demonstrate that besides providing multiresolution and high directionality, the proposed method attains high Peak Signal to Noise Ratio and significant compression ratio as compared with conventional and state-of-art compression methods.

Keywords Medical image compression · Ripplet transform · SPIHT · Multiresolution · Telemedicine

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1 Introduction

With the great development in the field of medical imaging, analysis and compression of medical images are the major challenges in healthcare services. In telemedicine, medical images generated from medical centers with efficient image acquisition devices such as Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Ultrasound (US), Electrocardiogram (ECG) and Positron Emission Tomography (PET) need to be transmitted conveniently over the network for perusal by another medical expert. These huge amounts of data cause a high storage cost [1] and heavy increase of network traffic during transmission [2]. Therefore, compression of medical images is essential in order to reduce the storage and bandwidth requirements [3, 4]. Apart from preserving vital information in the medical images, high compression ratio and the ability to decode the compressed images at various qualities are the major concerns in medical image compression [5].

Many advanced image compression methods have been proposed in response to the increasing demands for medical images. Among the proposed methods, much interest has been focused on resolving 2D singularities and attaining the desirable characteristics such as high Peak Signal to Noise Ratio (PSNR), and little work has been done on efficient representation of images at different scales and different directions. Grounded on this motivation, this paper proposes a compression method for medical images which provides hierarchical representation of images by representing singularities along arbitrarily shaped curves. This method employs a recently introduced family of transforms termed as Ripplet transform [6]. The Ripplet transform has been proposed as an alternative to wavelet transform to represent images at different scales and