Abstract

Carotid artery disease is a condition in which the carotid arteries become narrowed or blocked. When the arteries become narrowed, the condition is called carotid stenosis. The carotid arteries provide the main blood supply to the brain. Carotid artery disease occurs when sticky, fatty substances called plaque build-up in the inner lining of the arteries. The plaque may slowly block or narrow the carotid artery or cause a clot (thrombus) to form more suddenly. Clots can lead to stroke. Imaging techniques have long been used for assessing and treating cardiac and carotid disease. B-mode ultrasound imaging or intravascular ultrasound (IVUS) has emerged, and it is widely used for visualizing carotid plaques and assessing plaque characteristics that are related to the onset of neurological symptoms. In Medical diagnosis operations such as feature extraction and object recognition will play the key role. These tasks will become difficult if the images are corrupted with noises. So the development of effective algorithms for noise removal became an important research area in present days. Developing Image denoising algorithms is a difficult task since fine details in a medical image embedding diagnostic information should not be destroyed during noise removal. The ultrasound imaging suffers from
Speckle Reduction in Carotid Artery Images using Dual Tree Complex Wavelet Transform

Speckle noise. Many of the wavelet based denoising algorithms use DWT (Discrete Wavelet Transform) in the decomposition stage which is suffering from shift variance and lack of directionality. To overcome this in this paper we are using the denoising method which uses dual tree complex wavelet transform to decompose the image and we performed the shrinkage operation to eliminate the noise from the noisy image. In the shrinkage step we used semi-soft thresholding operator along with traditional hard and soft thresholding operators and verified the suitability of dual tree complex wavelet transform for the denoising of ultrasound images. The results proved that the denoised image using DTCWT (Dual Tree Complex Wavelet Transform) have a better balance between smoothness and accuracy than the DWT and less redundant than UDWT (Undecimated Wavelet Transform). We used the SSIM (Structural similarity index measure) along with PSNR to assess the quality of denoised images. [1],[2],[3]

References


Index Terms

Computer Science  Image Processing

Keywords

Carotid artery , DiscreteWavelet Transform, UndecimatedWavelet Transform, Dual Tree
Complex Wavelet Transform