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Medical Image Denoising by Using Wavelet Transform

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Abstract
The project deals with the use of wavelet transform for signal and image de-noising employing a selected method of thresholding of appropriate decomposition coefficients. The proposed technique is based upon the analysis of wavelet transform and it includes description of global modification of its values. The whole method is verified for simulated signals and applied for processing of biomedical signals representing EEG signals and MR images corrupted by additional random noise.

Image denoising is an important pre-processing step in medical image analysis. The basic intent of image denoising is to reconstruct the original image from its noisy observation as accurately as possible, while preserving important detail features such as edges and textures in the denoised image. In medical imaging, for the precise analysis of diseases denoising of medical images like X-RAY, CT (Computed Tomography), MRI (Magnetic Resonance Imaging), PET (Positron Emission Tomography) and SPECT (Single Photon Emission Computed Tomography) is essential since a small lose of a particular area in case of medical images may results in immense disaster similar to death.

Keywords: MATLAB, Image Denoising, Image Processing, Wavelet Transform, Thresholding

Introduction

Now a days medical image enhancement technologies have great impact in innovative medical equipment's were put into use in the medical sector. Improved medical images are recycled by surgeons to help diagnosis and understanding of diseases because medical image qualities are often affected by noise and other data acquisition devices, lightning conditions, etc.

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Related Works

Before going implement the proposed work, in the part of related works, the following research papers have been referred considering their contents.

Idan ram et.al [1] has proposed: "Image Processing using Smooth Ordering of its Patches". In this paper authors extracts all the patches with overlaps and order them in such a way that they are chained in the shortest possible path. The obtained ordering is applied to the corrupted image implies a permutation of the image pixels. This method enables us to obtain good recovery of clean image by applying relatively simple 1Dimensional smoothening Operator (such as filtering or interpolation) to the recorded set of pixels.

Suhaila Sari et.al [2] has proposed: "Development of Denoising Method for Digital Image in Low Light Condition". In this paper authors develops a denoising method through hybridization of bilateral filters and wavelet thresholding for digital images. The major drawback of this approach was that it is not suitable to remove impulsive noise.

Lingli Huang et.al [3] has proposed: "Improved Non-Local Means Algorithm For Image Denoising". Image denoising technology is one of the forelands in the field of computer graphic and computer Vision. Nonlocal means method is one of the great performing methods which arouse tremendous research. In this paper, Author's proposed an improved weighted non-local means algorithm for image denoising. The non-local means denoising method replaces each pixel by the weighted average of pixels with the surrounding neighborhoods. The proposed method evaluates on testing images with various levels noise. Experimental results show that the algorithm improves the denoising performance.

Haijuan Hu et.al [4] has proposed "Removing Mixture of Gaussian and Impulse Noise by Patch Based Weighted Means". Author firstly Establish a law of large numbers and a convergence theorem in distribution to show the rate of convergence of the non-local means filter for removing Gaussian noise. After that introduce the notion of degree of similarity to measure the role of similarity for the non-local