Assessment of Noise Removal Methods in Image- A Survey

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Abstract

Modern digital technology has created its attainable to control multi-dimensional signals with systems that vary from easy digital circuits to advanced parallel computers. We are going to concentrate on the basic ideas of image process. Image understanding needs AN approach that differs essentially from the theme of this book. Further, are going to prohibit ourselves to two–dimensional (2D) image process though most of the ideas and techniques that are to be represented will be extended simply to 3 or a lot of dimensions. Several of the prevailing image-based NPR techniques area unit supposed to serve inventive functions, that is, to elicit AN aesthetic response from the viewer; a number of most relevant article to our work mentioned here.

Keywords: NPR, Wavelet, ANN

1. INTRODUCTION

The objective of image improvement is to change its options in keeping with the wants of process area, whereas considering the on top of mentioned things. It's clear that improvement techniques square measure terribly relevant to the sector wherever the processed image to be used, as a result of this many techniques square measure out there for improvement of image relying upon the utilization (like human perceptions, medical imagination or terribly advanced measuring device systems). Another drawback with improvement techniques is that the majority of the strategy needed a properly de-noised image otherwise the noise generated artifacts might additionally get increased thus de-noising is typically a necessary and the initial step to be taken before the picture information is analyzed. It's necessary to use AN economical de-noising technique to complete such information corruption as a result of the characteristics of noise. Image de-noising still remains a challenge for researchers as a result of nature of noise. This paper describes methodologies for noise reduction (or de-noising) giving a plan to soft computing rule to seek out the reliable estimate of the noise pattern in given degraded image. It's tough to style one mathematical model for all sorts of noise instead a soft computing based mostly recording equipment model might be a way higher resolution for noise model. This paper additionally considers data based mostly process depth for every a part of image that not solely reduces the time interval however additionally protects the knowledge loss.

2. IMAGE ENHANCEMENT

The aim of image enhancement is to improve the interpretability or perception of information in images for human viewers, or to provide 'better' input for other automated image processing techniques. Image enhancement techniques can be divided into two broad categories: Spatial domain methods, which operate directly on pixels and Frequency domain methods, which operate on the Fourier transform of an image. Unfortunately, there is no general theory for determining what `good' image enhancement is when it comes to human perception. If it looks good, it is good! However, when image enhancement techniques are used as pre-processing tools for other image processing techniques, then quantitative measures can determine which techniques are most appropriate.

The value of a pixel with coordinates (x,y) in the enhanced image $\hat{F}$ is the result of performing some operation on the pixels in the neighborhood of (x,y) in the input image, F. Neighborhoods can be any shape, but usually they are rectangular. The simplest form of operation is when the operator T only acts on a 1X1 pixel neighborhood in the input image, that is F(x,y) only depends on the value of F at (x,y). This is a grey scale transformation or mapping. The simplest case is thresholding where the intensity profile is replaced by a step function, active at a chosen threshold value. In this case any pixel with a grey level below the threshold in the input image gets mapped to 0 in the output image. Other pixels are mapped to 255.Other grey scale transformations are outlined. [7]

3 NEURAL NETWORK

An artificial neural network (ANN), usually called neural network (NN), is a mathematical model or computational model that is inspired by the structure and/or functional aspects of biological neural networks. A neural network consists of an interconnected group of artificial neurons, and it processes information using a connectionist approach to computation. In most cases an ANN is an adaptive system that changes its structure based on external or internal information that flows through the network during the learning phase. Modern neural networks are non-linear statistical data modeling tools. They are usually used to model complex relationships between inputs and outputs or to find patterns in data.

Computational neurobiologists have constructed very elaborate computer models of neurons in order to run detailed simulations of particular circuits in the brain. As Computer Scientists, we are more interested in the general properties of neural networks, independent of how they are actually "implemented" in the brain. This means that we can use much simpler, abstract "neurons", which (hopefully) capture the essence of neural computation even if they leave out much of the details of how biological neurons work. People have implemented model neurons in hardware as electronic circuits, often integrated on VLSI chips. Remember though that computers run much faster than brains - we can therefore run fairly large networks of simple model neurons as software simulations in reasonable time. This has obvious advantages over having to use special "neural" computer hardware.

Our basic computational element (model neuron) is often called a node or unit. It receives input from some other units, or perhaps from an external source. Each input has an associated weight w, which can be modified so as to model synaptic learning. In principle, back prop provides a way to train networks with any number of hidden units arranged in any number of layers. (There are clear practical limits, which we will discuss later.)

In fact, the network does not have to be organized in layers - any pattern of connectivity that permits a partial ordering of the nodes from input to output is allowed. In other words, there must be a way to order the units such that all connections go from "earlier" (closer to the input) to "later" ones (closer to the output). This is equivalent to stating that their connection pattern must not contain any cycles. Networks that respect this constraint are called feed forward networks; their connection pattern forms a directed acyclic graph or dag.

4 IMAGE- BASED STYLIZATION AND ABSTRACTION SYSTEM

Previous work varies in the use of scene geometry, video-based vs. static input, and the focus on perceptual task performance and evaluation. Among the earliest work on image-based NPR was that of Saito and Takahashi [1990] who performed image processing operations on data buffers derived from geometric properties of 3D scenes. Our own work differs in that we operate on raw images, without requiring underlying geometry. To derive limited geometric information from images, Raskar et al. [2004] computed ordinal depth from pictures taken with purpose-built multi-flash hardware. This allowed them to separate texture edges from depth edges and performs effective texture removal and other stylization effects. Our own framework does not model global effects such as repeated texture, but also requires no specialized hardware and does not face the technical difficulties of multi-flash for video.

Several video stylization systems have been proposed, mainly to help artists with labor-intensive procedures [Wang et al. 2004; Collomosse et al. 2005].

5 NOISE REDUCTION VIA ADAPTIVE MULTI-SCALE PRODUCTS THRESHOLDING

This work presents a wavelet-based multi-scale products thresholding scheme for noise suppression of magnetic resonance images. A Canny edge detector-like dyadic wavelet transform is employed. This results in the significant features in images evolving with high magnitude across wavelet scales, while noise decays rapidly. To exploit the wavelet inter-scale dependencies, authors multiply the adjacent wavelet sub-bands to enhance edge structures while weakening noise.

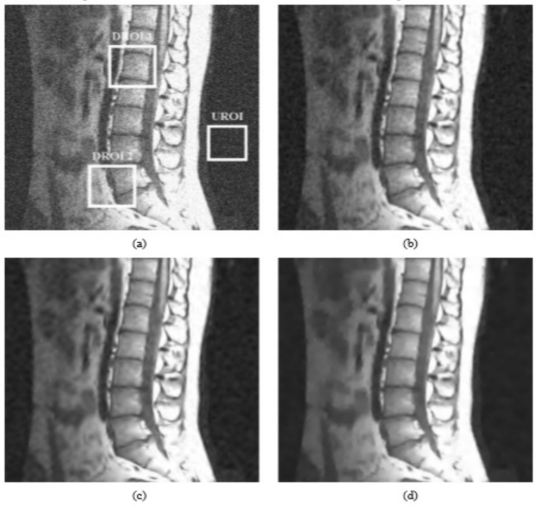


Fig. 1. The discrete decomposition algorithms of (a) 1-D DWT and (b) 2-D DWT.

In the multi-scale products, edges can be effectively distinguished from noise. Thereafter, an adaptive threshold is calculated and imposed on the products, instead of on the wavelet coefficients, to identify important features [1].

6 A VERSATILE WAVELET DOMAIN NOISE FILTRATION TECHNIQUE FOR NOISE REMOVAL

This research propose a robust wavelet domain method for noise filtering in medical images. The proposed method adapts itself to various types of image noise as well as to the preference of the medical expert; a single parameter can be used to balance the preservation of (expert-dependent) relevant details against the degree of noise reduction. The algorithm exploits generally valid knowledge about the correlation of significant image features across the resolution scales to perform a preliminary coefficient classification. This preliminary coefficient classification is used to empirically estimate the statistical distributions of the coefficients that represent useful image features on the one hand and mainly noise on the other. The adaptation to the spatial context in the image is achieved by using a wavelet domain indicator of the local spatial activity. The proposed method is of low complexity, both in its implementation and execution time [5].

7 A NOISE FILTERING IN WAVELET PROVINCE

In mathematics, a wavelet series is a representation of a square-integrals (real- or complex-valued) function by a certain orthonormal series generated by a wavelet. Nowadays, wavelet transformation is one of the most popular candidates of the time-frequency-transformations. The discrete wavelet transform [9–11] translates the image content into an approximation sub-band and a set of detail sub-bands at different orientations and resolution scales. Typically, the band-pass content at each scale is divided into three orientation sub-bands characterized by horizontal, vertical and diagonal directions. The approximation sub-band consists of the so-called scaling coefficients and the detail sub-bands are composed of the wavelet coefficients. Here we consider a non-decimated wavelet transform [10] where the number of the wavelet coefficients is equal at each scale.

Fig. 1 shows a non-decimated wavelet decomposition of an ultrasound image. In the detail sub-bands HLi, LHi and HHi, the brightest color represents large positive values of the wavelet coefficients and the dark color corresponds to the negative coefficient values with largest magnitudes. Several properties of the wavelet transform, which make this representation attractive for denoising, are easily recognized in Fig. 1:

- Multi-resolution - image details of different sizes are analysed at the appropriate resolution scales.
- Sparsity - the majority of the wavelet coefficients are small in magnitude.
- Edge detection - large wavelet coefficients coincide with image edges.
- Edge clustering - the “edge” coefficients within each sub-band tend to form spatially connected clusters.
- Edge evolution across scales - the coefficients that represent image edges tend to persist across the scales.

Wavelets have been used for denoising in many medical imaging applications [12–20]. A general procedure is:

i. Calculate the discrete wavelet transform;

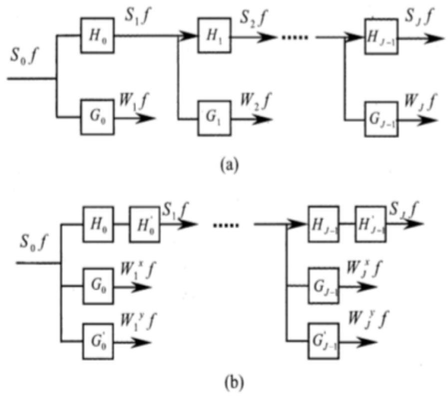
ii. Remove noise from the wavelet coefficients and

iii. Reconstruct a denoised signal or image by applying the inverse wavelet transform**.**

The scaling coefficients are typically not modified except for some special imaging modalities like MRI that we address later. The noise-free component of a given wavelet coefficient is typically estimated by wavelet shrinkage [21] the idea of which is to heavily suppress those coefficients that represent noise and to retain the coefficients that are more likely to represent the actual signal or image discontinuities.

8 A CRITICAL VIEW ON THE USED NOISE MODELS

A majority of the speckle filters assume fully developed speckle which is modeled as a multiplicative noise and often simplify that a logarithmic operation transforms speckle into additive white Gaussian noise.



Such a speckle model seems to be too simplistic in the case of medical ultrasound images for different reasons. Speckle is not necessarily fully developed and there exist a pronounced spatial correlation. Moreover, the ultrasound devices themselves usually perform a preprocessing of the raw data including even a logarithmic compression. Thus, in the displayed medical ultrasound images the noise differs significantly from the often assumed multiplicative model.

comparison of different method based on parameters

paramer /author	Modi ,Tejas B	Huang Cheng	Seungyong Lee	K. Kim,	H.W. Park
BER	19.5	24.5	17.01	18.02	19.25
Complexity	more	Less	more	Average	less
performance	average	Good	better	decreased	reduced
PSNR	32.02	29.26	30.58	25	23.24

9 MANY PEOPLE PROPOSED ALGORITHMS TO REDUCE TIME

On the basis of reduced search, which reduces the compatible block search using some type of grouping but this can reduce only a part of time which is involved in searching of blocks but the time to calculate error matrix does not change. So, the way is to neglect the error matrix which saves time but causes degradation in image quality because in reduced level domain image, it is not always possible to find exact matching block matching blocks. Hence, in that case it will produce an image of quality inferior than normal methods.

10 CONCLUSION

The Neural Network formula works on detection and enhancing the necessary information of a picture whereas suppressing the noise generated false information contents This technique has advantage that it doesn't dissolve the impulsive noise however eliminate it. This is often notably helpful wherever the first image having risk of being distorted by noise. Optionally, straightforward user masking will be incorporated into the formula to by selection management, the abstraction speed and to shield explicit regions. Experimental results show that our technique effectively produces extremely abstract however feature-preserving illustrations from pictures.
The Neural Network formula is repetitive and progressive, and thus the extent of abstraction is intuitively controlled. Optionally, straightforward user masking will be incorporated into the formula to by selection management the abstraction speed and to shield explicit regions. Once finding out several of strategies we have a tendency to conclude that results of image sweetening mistreatment neural networks were quite quick & amp promising.

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