THE METHOD OF THE IMAGE PROCESSING TO ELIMINATE NOISE BASED ON THE IMAGE TO RECONSTRUCT TERRAIN PHYSIOGNOMY

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ABSTRACT
The Image is the most convenient way to access information; Based on the image to reconstructed terrain physiognomy has attracted people's attention. Based on the image to reconstructed terrain physiognomy the key issue is the image processing to eliminate noise, noise reduction. The paper studied the complex topography image denoising with the wavelet packet method and its key technologies to determine the threshold method is studied, with the improved threshold determination algorithm selected threshold of landscape images. Threshold method with wavelet packet image of the landscape does denoising.

Keywords *- Images, terrain reconstruction, image denoising, wavelet packet*

I. INTRODUCTION
The method based on image 3D reconstruction is low in cost, strong in realism, high in automation, and has been widely used. It has achieved remarkable results in the medical field and has been successfully applied, but its application in terrain reconstruction is still very fresh.
How the topography image reconstruction of three-dimensional terrain model is of great significance. Therefore, the use of image capture terrain data to generate the terrain is a very important way.
The topography image contains a lot of noise, the image may be because the effect of noise cannot be effectively used, so we have to preprocess, a very important step in image processing is filtered out of them mixed with some noise. Image to remove noise restore the original appearance of the image, sharpen details in order to improve the image of the visual effects, high-quality images in order to facilitate follow-up topography image segmentation and reconstruction.
Wavelet transform has been widely used in image denoising, image compression. Analysis wavelet denoising image processing based on the proposed wavelet packet denoising of complex topography images with improved threshold determination algorithm to select a reasonable threshold of the camouflage positions images using wavelet packet threshold to noise on the landscape images were Denoising [1].

II. WAVELET TRANSFORM BASED IMAGE PROCESSING AND ANALYSIS
Wavelet transform for image noise removal provides a good image representation. Through analysis and appropriate thresholding of the transformed coefficients, the reconstructed image, and ultimately the image to noise.

A The wavelet transform
Image processing, image wavelet transform, image filtering in the horizontal and vertical degrees of freedom, and then integrated the two directions of the edge get the edge image. Image wavelet transform is defined as [2]:
Known wavelet and scaling functions, respectively, the direction of the wavelet function can be expressed as

$$\begin{cases}\varphi^{(x)}(x,y)=\varphi(x)\phi(y)\\ \varphi^{(y)}(x,y)=\varphi(y)\phi(x)\end{cases} \quad (1)$$

When the scale is $\alpha = 2^j$,

$$\begin{cases}\varphi_j^{(x)}(x,y)=2^{-j}\varphi(2^{-j}x)\phi(2^{-j}y)\\ \varphi_j^{(y)}(x,y)=2^{-j}\varphi(2^{-j}y)\phi(2^{-j}x)\end{cases} \quad (2)$$

Continuous two-dimensional wavelet transform is expressed as

$$\begin{cases}WT^{(x)}f(\alpha,x,y)=f(x,y)**\varphi_\alpha^{(x)}(x,y)\\ WT^{(y)}f(\alpha,x,y)=f(x,y)**\varphi_\alpha^{(y)}(x,y)\end{cases} \quad (3)$$

Dyadic wavelet transform image, that is called the image wavelet transform is expressed as:

$$\begin{cases}WT^{(x)}f(2^j x,y)=f(x,y)**\varphi_j^{(x)}(x,y)\\ WT^{(y)}f(2^j x,y)=f(x,y)**\varphi_j^{(y)}(x,y)\end{cases} \quad (4)$$

In the application of wavelet transform for image denoising problem, the maximum decomposition scale should be the original signal, the signal-to-noise ratio (SNR). The larger the scale, noise and signal performance of the different characteristics of the more obvious, more conducive to the signal to noise separation.

B Selection of the largest scale j

However, the choice of j in actual application depends on the specific problem. For the reconstruction of the image denoising problem, the more the number of decompositions, the larger the distortion and the larger the reconstruction error. This is a contradiction. It is not necessary to take too much. Generally, 4 or 5 is used. In fact, for complex Deformation of topographic and landscape images, generally j is only 3~5. Therefore, it is necessary to choose the appropriate j . It is easy to think that if the SNR of the image is large, the signal is mainly dominated, then j is slightly smaller to separate the noise; if the SNR is smaller, the main one is Noise is dominant, then j can only suppress noise when it is large. Therefore, the selected scale j should be based on the size of the SNR. Actually, for a general signal, if SNR>20, take $j=3$; otherwise, take $j=4$ as good [3]. In the image of the paper, we choose $j=4$ as the maximum decomposition scale of the image denoising of the position image.

Through analysis and appropriate thresholding of the transformed coefficients of the reconstructed image to remove high-frequency information in order to achieve the purpose of denoising, and ultimately to noise of the image processing. Wavelet transform for image denoising, simply remove the high frequency region also removed many image details, details of the image after the wavelet transform is also located in the high frequency region. (Small edge or texture) and more high frequency information of the topography of these complex images, the signal characteristics of wavelet transform of the multiplier will allow the high frequency part can not be a good decomposition and representation. This paper studies the combination of wavelet packet threshold denoising method to image denoising, wavelet packet decomposition, not only low-frequency decomposition of the high frequency part of the decomposition. Wavelet packet analysis at the same time on a layer of low-frequency part and high-frequency part of the subdivision, with more accurate local analysis capabilities.

III. WAVELET PACKET DENOISING ALGORITHM AND APPLICATION

The complex topography image, the image based on wavelet packet decomposition and reconstruction iterative calculation eventually remove the noise process will be the impact of the noise signal, there are wavelet basis search [4].

A. Wavelet packet decomposition of the image signal

Wavelet Packet Analysis (Wavelet Packet Analysis) wavelet decomposition of the signal differences, it not only the low frequency part of the decomposition, but also on the high frequency part of the decomposition. Therefore, the wavelet packet decomposition is finer than the wavelet decomposition decomposition method. Here is the wavelet packet decomposition characteristics of the signal and its application in image processing.

Wavelet packet decomposition of the signal shown in Figure 1. Figure, A represents a low frequency, high frequency, D represents the end of the serial number of layers wavelet packet decomposition (ie, scale number). Decomposition has the relationship:

$$S = AAA_3 + DAA_3 + ADA_3 + DDA_3 + AAD_3 + DAD_3 + ADD_3 + DDD_3 \quad (5)$$

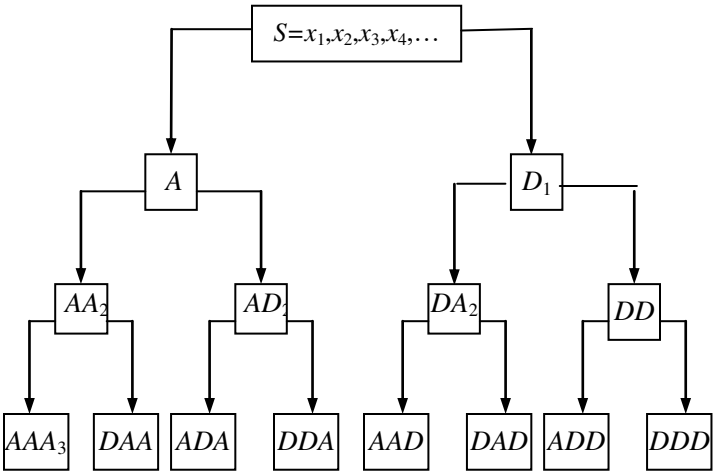

Figure 1 wavelet packet decomposition of the signal

As the scale j increases, the spatial resolution of the corresponding orthogonal wavelet basis function is higher, and the lower the frequency resolution, which is a major defect of the orthogonal wavelet base. However, the wavelet packet has the excellent property of further dividing and narrowing the spectral window which widens as j increases, thus overcoming the shortcomings of orthogonal wavelet transform. The wavelet packet can further decompose W_j , thereby improving the frequency resolution. It is a more elaborate

decomposition method than multi-resolution, and has better time-frequency characteristics

B. Wavelet packet method topography image denoising Matlab platform

Image two-dimensional discrete wavelet packet transform (on DWT), according to the different characteristics of the noise and image signal in the wavelet domain, select the appropriate threshold wavelet packet coefficients, and finally reconstructs (IDWT)the denoising images [4].

1) Wavelet Packet Denoising Algorithm

Wavelet packet decomposition of the signal not only the low frequency part of the decomposition, the high frequency part of the decomposition, wavelet packet analysis provides a more complex but also more flexible analysis tool, wavelet packet analysis on a layer ofThe low frequency part and high frequency components at the same time broken down, with a capacity of more accurate local analysis [5].

Wavelet packet decomposition of a signal can be used a variety of wavelet packet basis, in accordance with the requirements of the signal analysis, choose one of the best wavelet packet basis, the best base (optimal basis), the best base selection criteria entropy criteria, the choice of the best base available in MATLAB function besttree, namely to calculate the optimal tree.

Wavelet packet threshold denoising method steps are as follows:

(A) The wavelet packet decomposition of the signal. Choose a wavelet and determine a wavelet decomposition level N, then N-layer wavelet packet decomposition of the signal.

(B) Calculate the best tree (to determine the best wavelet packet basis). Entropy for a given standard, to calculate the optimal tree, this step is optional.

(C) Thresholding of the wavelet packet decomposition coefficients. For a wavelet packet decomposition coefficients (especially the low frequency decomposition coefficients), select an appropriate threshold and coefficients thresholding.

(D) Reconstructs reconstruct the N-layer wavelet packet decomposition coefficients and by the quantification coefficient.

In the above steps, the key is how to select the threshold and how to quantify the threshold, is directly related to the quality of the signal de-noising and compression. If the threshold is too small, the denoised signal is still the presence of noise, the threshold is too large, important image features in turn filtered out, causing the deviation. Commonly used threshold method: polynomial interpolation method to determine the threshold; soft and hard threshold compromise method; modulus square approach to terrain image denoising, wavelet coefficients estimated using the improved model [5]

2) Experimental Results And Analysis

Topography images using wavelet packet transform to eliminate the noise, here first noise cancellation function provided by the MATLAB default threshold denoising, then adjust the size of the threshold based on the actual engineering problems, to get a better noise cancellation. Topography details of the image texture is complex, and each wavelet decomposition image is divided into four parts, which the noise is mainly concentrated in the three high-frequency components. And Donoho method, selected on three high-frequency part of a uniform threshold, in fact, noise in the distribution of these three regions is uneven, and therefore more reasonable to select different thresholds for each region. The experiments show that this method can get a better effect than the Donoho threshold denoising method for the wavelet basis to Sym4.

Figure 2 shows the experimental results de-noising based on wavelet packet threshold, here with a resolution of 150 × 120 image histogram to select the topography image threshold value of 10.342. Image layer decomposition in the decomposition process, set up a full-threshold quantization of image decomposition coefficients (including the low-frequency coefficients) to improve the soft threshold, Image denoising. Figure 3 (a) of the original image without noise, Figure 3 (b) image after adding noise, Figure 3 (c) below is based on wavelet packet denoising image threshold denoising algorithm . From the quality of the image can be seen, the ideal experiment results based on wavelet packet threshold denoising method.

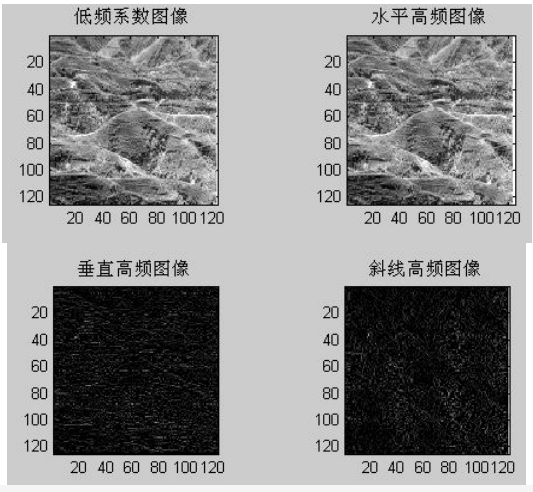

Figure 2 The threshold denoising based on wavelet packet

(a) original image in (b) noisy image map (c) global thresholding denoising image

Figure 3 Based on the threshold of the wavelet packet denoising

IV. SUMMARY

This chapter for the reconstruction of three-dimensional position of the shape of the SFS problem based on the topography image, the key technology for image denoising. The theory of wavelet transform for image denoising, and analysis of the wavelet analysis of the shortcomings of the topography image denoising is proposed Denoising images using wavelet packet threshold method. Matlab platform, ground topography image of the wavelet packet method Denoising, and achieved good effect, provides good conditions for the use of image reconstruction.

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