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Various Techniques for De-noise Image

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Abstract: Wavelet decomposition has a great role in eliminating noise, the aim of this work on different noise removal techniques by analyzing the color image. Based on the analysis of different image compression techniques, this paper provides a survey of existing research papers. Different types of method for noise are analyzed from the necessary image, where the disturbance was removed using wavelets with basic theories, and the most important details that will be presented in this work, which clarifies the proposed smooth and effective theory in terms of accuracy in our results. By creating new algorithms that explain how to use the proposed theory, some medical applications were used Discrete Wavelet Transform (DWT) where the results were satisfactory obtained, our proposed theory has been proven to be effective, and examples used will demonstrated this method.

Keywords: De-noise Image; Threshold; Soft Threshold; Hard Threshold; Wavelet Transform

1. Introduction

Wavelets have taken a wide role in many fields of science and engineering in solving many numerical problems, for example integral equations, voltera and fredholm, integro differential equation variational problems etc[1–8]. One of the most important applications of wavelets in the field of images is to de- noise and compression[6,7], in this work. Wavelets are applied to De-noise from the image and different theories, and an example was used. The fingerprint, which obtained good results, that proves the important role of wavelets in image processing, especially medical pictures[6].

$$\Psi_{a,b}(t) = |a|^{\frac{1}{2}}\Psi\left(\frac{t-b}{a}\right) \qquad a, b \in R \quad a \neq 0$$

where: $\Psi(t) = [\Psi_0(t), \Psi_1(t), \dots, \Psi_{M-1}(t)]^T$

The elements $\Psi_0(t), \Psi_1(t), \dots, \Psi_{M-1}(t)$ are the basis functions, orthogonal on the [0, 1] the color image I in size 256×256 analyses image to approximation coefficients and details coefficients select threshold will be see all details in section 2 and the results in **Table 1** and 2. In addition, it took an important role in the field of image processing technology with the help of contractions and expansions of the mother waves that are responsible for the coefficients a and b. It divides the color image in to bands according to the level where the image is analyzed by the wavelet filter, which analyzes the image to the coefficients of approximation and details[8]. There are several methods can be used to enhance any image by mathematical equations which can be used as a filter and coefficients, the images and methods can be used with image processing illustrated in[10–85].

2. De-noising image methods

Wavelet thresholding technique is used in this work influenced by the wavelet coefficient. So that each

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parameter is a threshold with the threshold of the image if the coefficient is smaller than the threshold it will be equal to zero. This which leads to all small transactions equal to zero and for rebuilding and after replacing the small transactions with zero wavelets inverse repeating the image with less noise can be summed up in three steps; constructed discrete wavelets, set the threshold and inverse of discrete wavelet. **Figure 1** shows the steps of De-noise image operation.

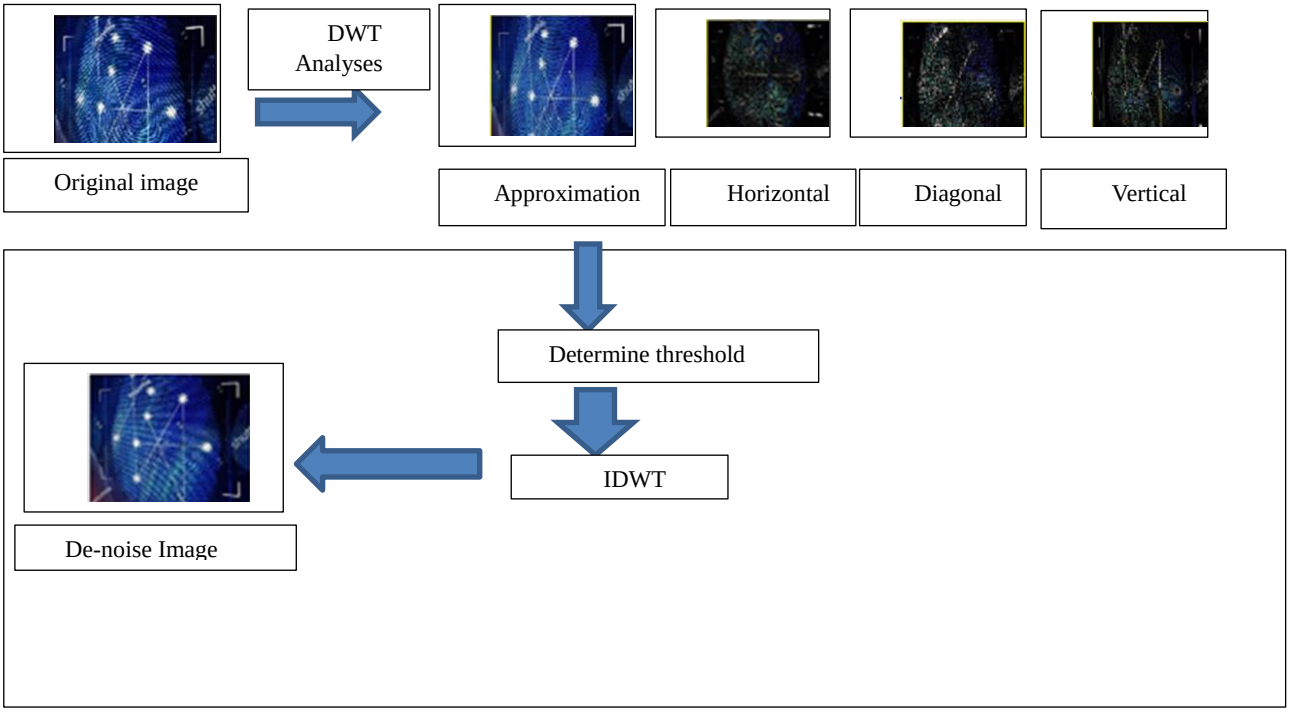

Figure 1. The steps of De-noise image operation.

The methods of threshold with discrete wavelets

1. Fixed form soft threshold
2. Penalize high hard threshold
3. Penalize medium hard threshold
4. Penalize low hard threshold
5. Bal-sparsity-norm (sqrt) soft threshold

Table 1. The threshold of each method

Number of method	**method of De-noising image**	**Level 1**	**Level 2**
1	Fixed form soft threshold	4.797	4.499
2	Penalize high hard threshold	28	28
3	Penalize medium hard threshold	16.25	16.25
4	Penalize low hard threshold	14	14
5	Bal- sparsity-norm (sqrt) soft threshold	10.56	10.56

The table shows the threshold set for each proposed method.

The remnants of the process for each method above with the recording of criteria that show which of the methods that lead to obtaining the best result from raising the noise from the image in **Table 2**.

Table 2. Result from raising the noise

No	Method of De-noising Image	L1 norm	L2 norm	Max Norm
1	Fixed form soft threshold	6.966	1478	6
2	Penalize high hard threshold	1.352	3055	32
3	Penalize medium hard threshold	7.287	1711	18
4	Penalize low hard threshold	6.061	1439	15
5	Bal- sparsity-norm (sqrt) soft threshold	1.464	3022	13

2.1 Threshold methods

Figure 2 shows the levels of threshold in every De-noise method with their residue.

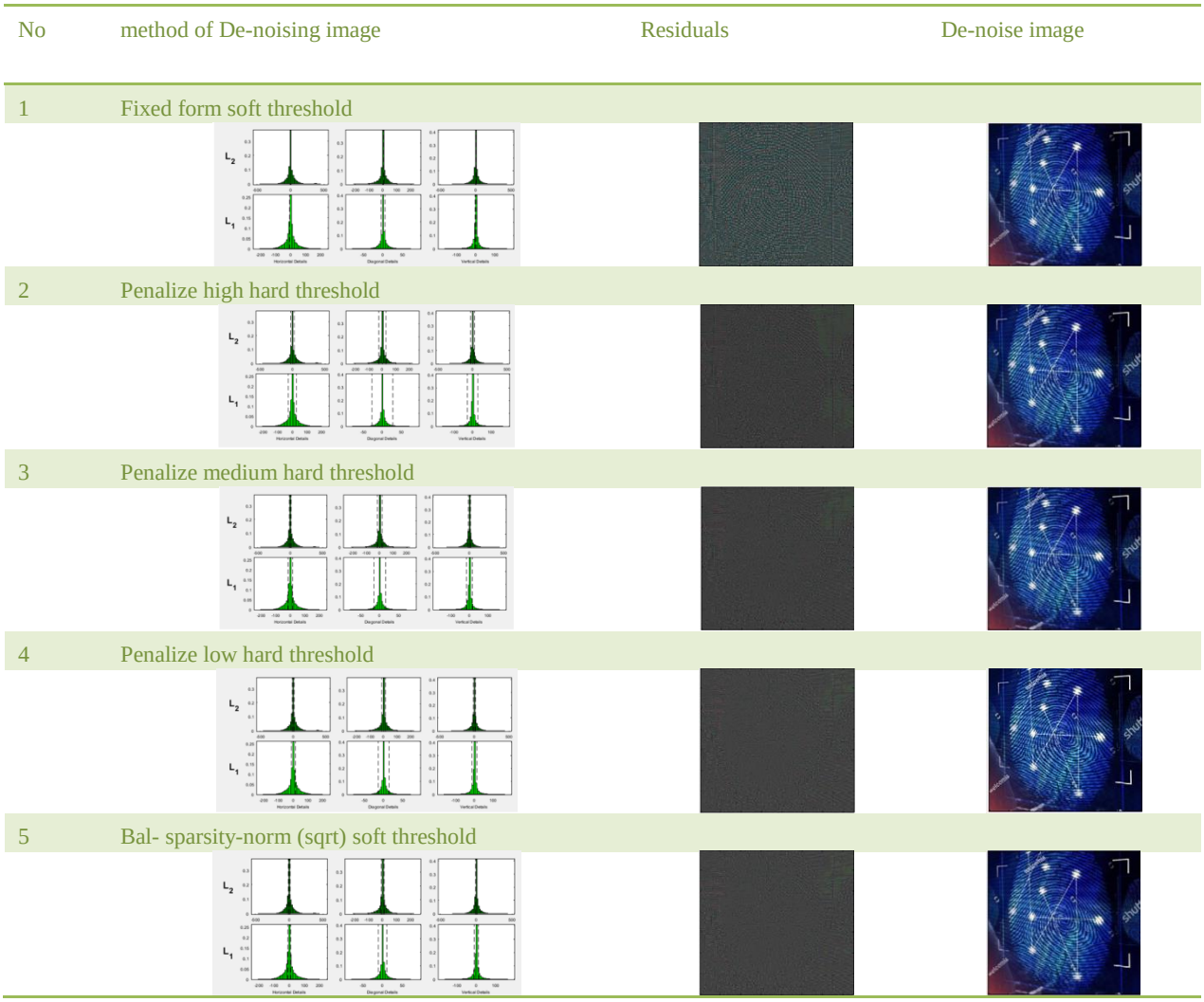

Figure 2. The threshold stages for each method with the waste and the result of raising the noise.

3. Conclusion

The aim of this work is on various noise removal techniques by analyzing the color image. Based on an analysis of different image compression techniques, this paper provides a survey of existing research papers. Different types of noise methods are analyzed from the necessary image, where the disturbance was removed using waves with basic theories and the most important details that will be presented in this work, which clarifies the

proposed smooth and effective theory in terms of accuracy in our results. By creating new algorithms that explain how to use the proposed theory, some medical applications have used separate wave transformation (DWT) where satisfactory results have been obtained and our proposed theory has proven effective, and the example that has been applied has proven the power and role of wavelets in image processing.

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