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The use of modern technology in the analysis and compression of color images

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Abstract

Modern technology in the field of images led to the issue of information transfer speed. As a result, there was need to find new and rapid technology in application to reach good results. In this paper, we propose new transformations derived from Laguerre polynomials. The image is analyzed using new wavelets to remove the noise from the color image and to avoid the problem of large data and the difficulty of transferring this data to keep it from being lost. The image is compressed to reduce the space occupied by this huge data with the help of the MATLAB program. The obtained results show the efficiency of our proposed method.

Key words and phrases: Laguerre polynomials, Image processing, MATLAB program, Discrete Laguerre, Wavelet Transform (DLWT).
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1 Introduction

Wavelets provided a tool to solve problems facing the development and amplification of information in the process of transferring this information [1]-[5]. It is the characteristic of expansion and contraction caused by the two operators which are responsible for the process of analyzing the image into the closeness and detail parameters [6]-[10]. To preserve color image data, the need to propose new wavelets in this work in order to preserve the information from the image so that image processing can be used in many fields including medicine[11]-[15]. One of the most important problems facing medical images, pharmaceutical and industrial products is exposure to theft and plagiarism with the help of wavelets. Watermark technology was used in the MATLAB program [16]-[20]. Noise augmentation and image compression are done with Wavelet Basic technology [21]-[30]. In this work, new wavelets were discovered with advanced methods and technology, so that a new filter is created from the polynomials to convert them into separate wavelets, because the polynomials carry the characteristic of orthogonality and approach, which leads to the transfer of this characteristic to the new wavelets and the derivation of the new filter to create a new algorithm to add these wavelets to the program MATLAB to take its part in image processing.

2 Applied Method

With MATLAB program, the new proposed technique is added in this work. Color images are processed after analyzing them in order to reduce noise and compress the image.

2.1 New Wavelet Transform

The coefficients of Discrete wavelets transformations (DWT), the based wavelet:

$$\omega_{a,b}(t) = |a|^{\frac{-1}{2}}\, \omega\left(\frac{t-b}{a}\right) \quad a,b \in R, \quad a \neq 0 \tag{2.1}$$

The vector $\omega(t) = [\omega_0(t), \omega_1(t), ...\omega_{M-1}(t)]^T$ basic belong $[0,1]$. New wavelets that are based on equation (2.1) obtained four arguments in:
$L_{r,s}(t) = L_{t,r,s,f}$ they are $f = 1, 2, ...$, $r = 1, 2, ..., 2^{f-1}$ m and t.

$$L_{r,s}(t) = \begin{cases} 2^{\frac{k+1}{2}} \tilde{L}_s(2^k t - 2r + 1) & \frac{r-1}{2^{f-1}} \leq t \leq \frac{r}{2^{f-1}} \\ 0 & otherwise \end{cases} \tag{2.2}$$

$\tilde{L}_s = \frac{1}{s!} L_s$ for $f = 2$ The approximate function of DLWT in equation (2.3)

$$f(t) = C_0 + \sum_{r=0}^{\infty} \sum_{s=0}^{2^r-1} C_{r,s} L_{r,s}(t) \tag{2.3}$$

With the convolution operation of the wavelet coefficients, the following matrix is obtained:

$$DLWT = \begin{bmatrix} 1.4 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1.4 & -1.4 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1.4 & -2.8 & 0.71 & 0 & 0 & 0 & 0 & 0 \\ 1.4 & -4.2 & 2.12 & -0.2 & 0 & 0 & 0 & 0 \\ 1.4 & -5.7 & 4.24 & -0.9 & 0.1 & 0 & 0 & 0 \\ 1.4 & -7.1 & 7.07 & -2.4 & 0.3 & -0.012 & 0 & 0 \\ 1.4 & -8.5 & 10.6 & -4.7 & 0.9 & -0.071 & 0.002 & 0 \\ 1.4 & -9.9 & 14.8 & -8.2 & 0.3 & -0.247 & 0.014 & -0.000281 \end{bmatrix}$$

3 Image analysis with suggested DLWT

In this section, the interaction of the wavelets with the colored image shown in the Figure (1) will be illustrated:

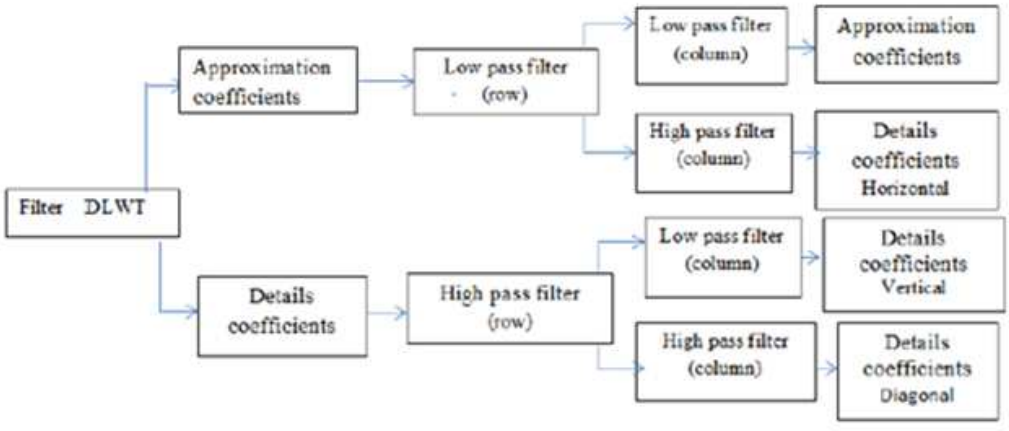
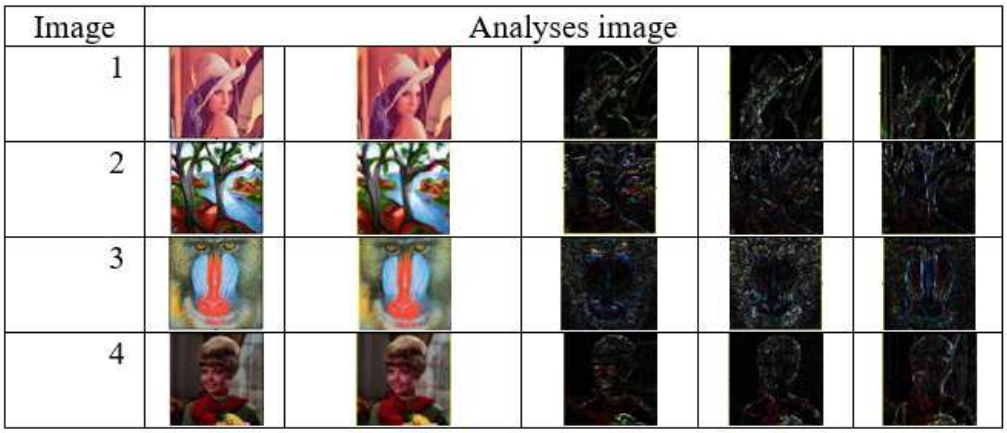


Figure 1: Use the new filter DLWT to analyze the colorful image.

Using the proposed theory on 4 samples after analyzing the color image in Table **??**.

Table 1: Analysis of color image samples with DLWT.



Discussion of the results

One of the derivation of new wavelet from the Laguerre polynomials is to derive a new filter to be used in the analysis of images, which led to obtaining the results after adding the filter on Matlab program with followers of an algorithm in the program. The use the image analyzed by the new technology, used of the new filter and after analysis image, calculated PSNR, MSE, PBB and CR with size image 256 × 256, Table (2) demonstrates and proves the efficiency of the proposed technique in this work.

Table 2: Image analysis with results using DLWT.

Samples	(MSE)	(PSNR)	(CR)	(PBB)
1	0.015	60.88	88.79%	20.668000
2	0.003	67.28	100.11%	30.9061
3	0.003	64.42	121 .16%	33.6781
4	0.009	66.74	80.11%	20.8271

4 Conclusion

In the field of image analysis or processing in terms of noise reduction and image compression, the need arises for new fast filters to reach the best results for the color image to be analyzed. This technique was proposed after deriving the new technique. The most important values that evaluate the image were calculated and Table (3) shows good results.

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