IMAGE EDGE DETECTION USING WAVELET TRANSFORM

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ABSTRACT

The image edge detection, wavelet transform provides facility to select the size of the image details that will be detected. Wavelets transform separates the lower frequencies and higher frequencies easily, which is prime important for edge detection. The wavelet scale sets the size of detected edges. For discrete wavelet transform, many signals are passed through wavelet filter for choice of the scale. For 2-D image, wavelet analysis is carried out in terms of horizontal and vertical function and edges are detected seperately.

HOW DOES IT WORK?

- **Wavelet:** A wavelet has oscillating wave-like characteristics and its energy is concentrated in time over relatively small intervals.
- Mathematically wavelet can be analysed by considering complex-valued function ψ satisfying the following condition. Here ψ is the mother wavelet function.

$$\int_{-\infty}^{\infty} |\psi(t)|^2 \, dt < \infty \tag{1}$$

$$C_\psi = 2\pi \int_{-\infty}^{\infty} \frac{|\psi(\omega)|^2}{|\omega|^2} \, d\omega < \infty \tag{2}$$

Where $\psi$is the Fourier transform of ψ. First equation implies finite energy of the functionψ, and the second equation, the admissibility condition, implies that if ψ(z) is smooth, ψ(0) = 0.

Haar Wavelet: Haar wavelet is one of earliest and simplest type among all the wavelets, which resembles with the daubechies db1.

Daubechies Wavelet: Daubechies family belongs to one of family of wavelets, the wavelet function (mother wavelet) is orthogonal to all function.

BIBLIOGRAPHY

[1] Li, J. "A Wavelet Approach to Edge Detection," Thesis (Masters), Sam Houston State University, 1-80. Kuldeep et al. International Journal of Emerging Technologies in Computational and Applied Sciences, Vol 5(1), pp. 47-55, June-August. 2013.

INTRODUCTION

Edge detection process is considered as one of the fundamental and important operation in the field of image processing and computer vision. It involves image segmentation, where edge of the object is located for recognizing the target shape. Edges of the image can be detected and analyzed by using high pass and low pass output of the wavelet transform. The edge will be shown by the function passing through zero in low pass filter.

ALGORITHM

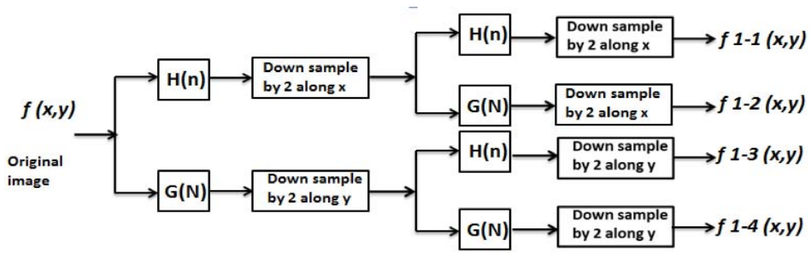


Fig.2 Wavelet decomposition

We have chosen an Original Image as shown in the image below.

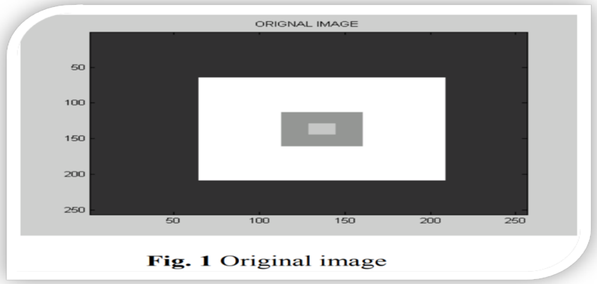


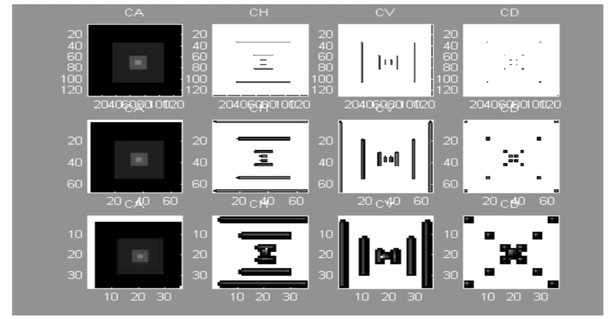
Fig. 1 Original image

FUTURE RESEARCH

A new proposed image fusion algorithm can be proposed based on region segmentation. The experimental results showed that the image fusion algorithm based on region segmentation can overcome the drawbacks of single segmentation rule and processing in specific part, and the effect is better than the traditional wavelet-based image fusion algorithm.

RESULTS

FIG2 : DECOMPOSEDIMAGE



Finally, by reconstructing the Decomposed Image, We have we have obtained the edges of the Image as shown in the image below.

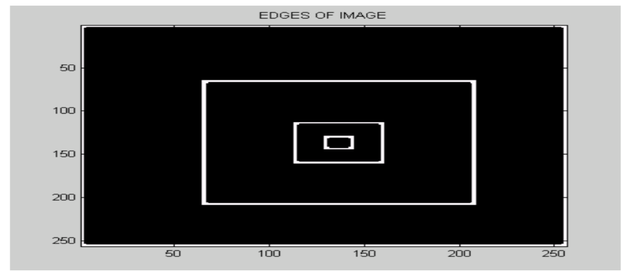


Fig. 3 Edges of the image

CONCLUSION

- Edge detection and reconstruction scheme of simple images have been investigated using wavelet transform.
- Edge detection code written for this paper is quite flexible in sense that it works for any type of wavelet, for all images and of course for any decomposition level depending on the size of image.

CONTRIBUTORS

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