CONTENT IMAGE DETAIL ENHANCEMENT ON WAVELET ANALYSIS USING SATELLITE AND MEDICAL IMAGES

Kalyan Babu CH., Karthick C. and Satish Kumar. V. H. N. S
Department of Electronics and Communication Engineering, Sathyabama University, Chennai, India
E-Mail: chinnamkalyan@gmail.com

ABSTRACT

To Improve Image Quality on Contrast and Sharpness using Wavelet based smoothness and gradient operator on Image Enhancement. Detail enhancement is required by lot of problems in the fields of computational photography and image processing. In Existing Method on Smoothing and gradient operator algorithm reduce colour deformation in the detail-improved image, especially around pointed edges. In our proposed method we implement on Wavelet using with smoothness for contrast enhancement and gradient operator on colour image sharpness enhancement. Then visibility refurbishment component utilize average colour difference standards and enhanced sharpen and contrast on image with improved feature. Finally the simulated result shows that enhanced detail image

Keywords: image, smoothing, edge preserving, contrast enhancement, resolution, noise reduction.

1. INTRODUCTION

The images taken by the satellites are used in applications like Geo-studies, Climatic conditions and selenology. The resolution plays a main task in all these application for sentimental factor of all images. Interpolation is the method used to increase the resolution of digital image. In image processing technique, Interpolation plays a predominant role for its applications like multiple description coding, Resolution enhancement, Facial reproduction of images. Interpolation is basically divided into three types: Bi-cubic interpolation, Bilinear interpolation, Nearest neighbour interpolation. In all these three interpolations, Bi-cubic interpolation is highly developed comparing from other two techniques because of its sharper images. It is an expansion of cubic interpolation for interpolating data point on a 2D regular network. Bi-cubic interpolation can be consummate using either cubic splines or cubic convolution algorithm lagrange polynomials. In many image processing applications wavelets are playing a crucial role. The decomposition of two dimensional wavelet of an image is performed by taking one dimensional discrete wavelet transform (DWT) along in image the rows are taken first and in columns, the results are decomposed. In result four decomposed sub bands are formed. They are Low-Low (contrast), Low-High (horizontal), High-Low (vertical), and High-High (diagonal). The frequencies spectrum of original image is fully covered by those sub bands of frequency components. Image resolution enhancement using wavelets is mainly new subject and also many new algorithms have arrived. For this content image detail enhancement we are using nonlocal means (NLM) algorithm and dual tree complex wavelet transform. So by using these algorithms sharpness of the reconstructed images. In dual tree complex wavelet transform, input images are divided into four sub bands. There is a interpolation between low resolution images and input images because to regenerate a high resolution image by using inverse dual tree complex wavelet transform. Each sub bands are uniquely divided into another four sub bands equally which makes a total of sixteen sub bands. Bi-cubic interpolation is used for six complex-valued high frequency sub band images to be interpolated. There is separate interpolation parallel to the input low resolution image. Lastly, Interpolated input low resolution image and Interpolated high sub band images are joined by using inverse dual tree complex wavelet transform (IDT-CWT). This inverse dual tree complex wavelet transform technique is compared with state-of-the-art image resolution enhancement techniques and conventional. By using this technique, the image has better edge preservation rather than previous methods. There is no information loss. In this planned method we have a improved resolution accurateness and Compatibility

2. CONTENT IMAGE DETAIL ENHANCEMENT ON WAVELET ANALYSIS

For Satellite and medical imaging resolution plays a key role, which gives the resolution enhancement for image will be far better than previous image. Satellite images are used by many applications, as mentioned before. For better quality of applications, resolution enhancement is carried out for images. Gradient operator is an operator which operates vector for N-dimensional scalar function. As we know about the gradient operator there are limitations at only some particular edges. It can't be done for all the edges at a time. Contrast and Edges through put rate is less. Combination of these two methods results in reduction of information. For better results we are combining the guided filter and dual-tree complex wavelet transform. Guided filter makes the image to be edge-preserving smoothing. In consideration of the total content of a guidance image the guided filter figure out the filtering, this can be the additional different picture or input picture itself. For edge-preserving smoothing operator the guided filter can be used as popular bilateral filter but near edges it has better behaviour. For smoothing process the guided filter is also a more generic concept. Beyond smoothing, it will transfer the structures and shapes of the complete guidance image to the filtering output, it enable new filtering applications like guided feathering and de-hazing .However, the guided filter

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generally has a quick and non-approximate linear time algorithm, regardless of the intensity range and kernel size. It is one of the fastest edge-preserving filters currently. Results of Experiments shows that the guided filter is both efficient and effective in a huge variety of computer graphics applications and computer vision including detail enhancement, edge-aware smoothing, joint up-sampling, image feathering/matting, HDR compression, de-hazing etc.

3. EXISTING METHOD

3.1 Edge-preserving smoothing by guided filter

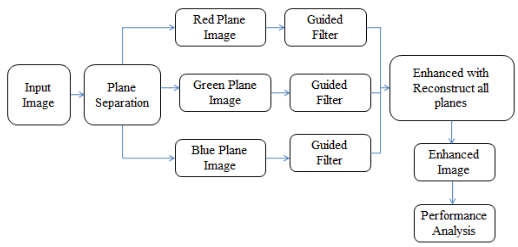

Figure-1. Block diagram of edge-preserving smoothing by guided filter.

Satellite and medical images which we want to have a clear smoothing and edge preservation are usually chosen as input (1) images. Plane separation (2) of red, green, blue is processed for input image. The different coloured plane images are added to Guide filter. In different coloured plane images the noise is reduced separately by using Guided filter. Enhancement of all three planes is done and combined to form an output image. At result, the input and output images are compared by graphical representation as performance analysis. The output image is nothing but Enhanced image

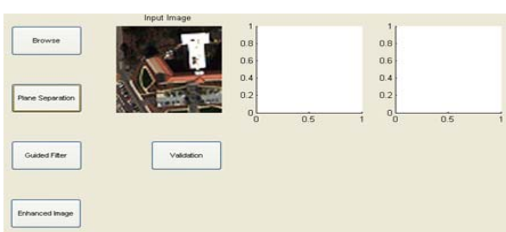

Figure-2. Input images.

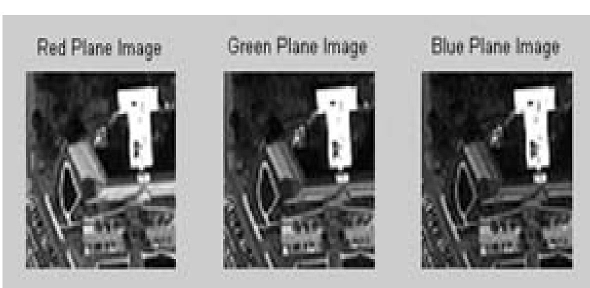

Figure-3. Plane separation.

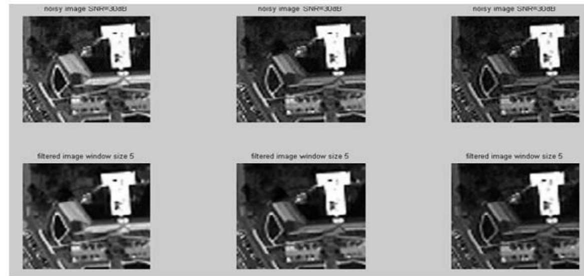

Figure-4. Guided filters with plane separation.

Figure-5. Enhanced image.

4. PROPOSED METHOD

4.1 Better edge-preserving smoothing by guided filter with DT-CWT

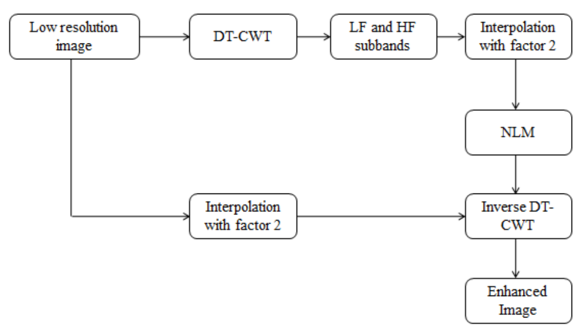

Figure-6. Block diagram of better edge-preserving smoothing by guided filter with DT-CWT.

Dual tree complex wavelet transform is applied to a satellite low resolution input image. Wavelet is separation of four different sub bands namely Contrast, Vertical, Horizontal and Diagonal but in Dual tree complex wavelet transform there is a division of each sub band into four different individual sub bands as mentioned above. The divided sub bands have High and low frequencies. Interpolation is done with Factor2 for each sub band. For image de-noising an Algorithm called Non-Local Means algorithm is used.

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For given noisy image $f=\{f(i)\mid i\in\Omega\}$, the NL-means denoised value $\hat{f}(i)$ at pixel i is obtained by a weighted average of all pixels in its neighborhood

$$\hat{f}(i)=\frac{1}{C(i)}\sum_{j\in\Omega_i} w(i,j)f(j)$$

$C(i)=\sum_{j\in\Omega_i} w(i,j)$ is a normalization constant

$w(i,j)$ is determined by the similarity of the Gaussian neighborhood between pixels i and j

$$w(i,j)=\exp(-\frac{\|N_i-N_j\|_{2,a}^2}{h^2})$$

An Inverse Dual tree complex wavelet transform is used to integrate all the sub bands. Other interpolation with factor2 is combined with IDT-CWT and gives the result as enhanced image

5. EXPERIMENTAL RESULTS

Several different satellite images have been tested under this technique. In this figures with low resolution satellite images, the images will be enhanced by using Bi-cubic interpolation, enhanced images by using Guided filter with Dual tree complex wavelet transform as shown. Lastly, the enhanced images obtained by this technique are shown. It is clear that the resultant image, enhanced by using this technique noise reduction, sharper than previous techniques, edge smoothing of satellite image as taken in example the low resolution satellite image is separated into three planes by plane separation. The Red plane, Green plane, Blue plane are operated by Dual tree complex wavelet transform decomposition. As shown below Figures. (a), (b), (c), (d) every sub band is divided into four individual sub bands. In every plane, reduction of noise process is applied for each sub band. Again all the sub bands are merged and give an Enhanced image, which is noise reduction, sharper than previous techniques, Edge smoothing.

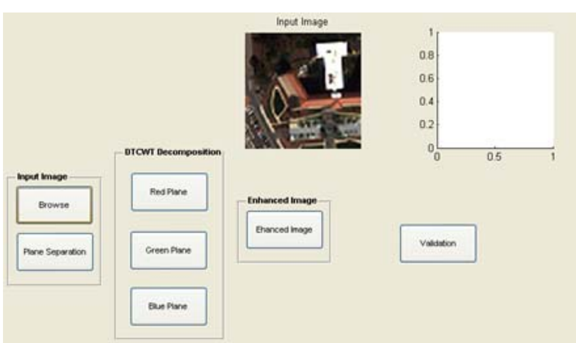

Figure-7. Applying DT-CWT with guided filter.

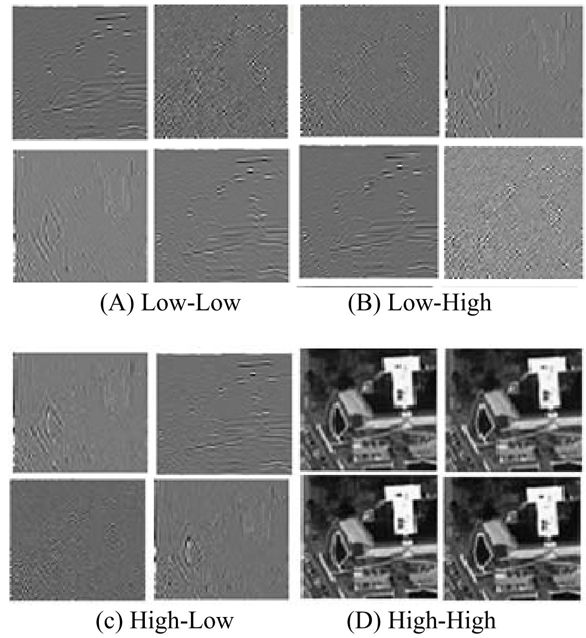

Figure-8. Separation of four sub bands.

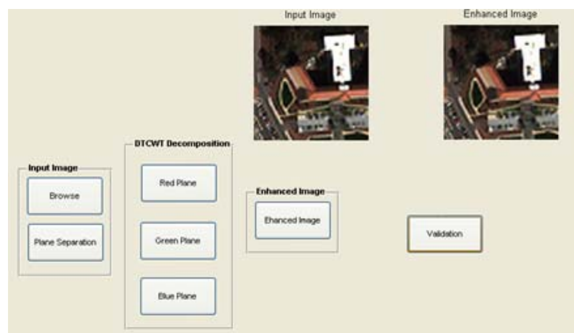

Figure-9. Enhanced output image DT-CWT with guided filter.

6. COMPARISON OF PSNR VALUE

When we use guided filter for input satellite image gives the PSNR value 32.314 and with DT-CWT guided filter it gives PSNR value of 38.9088.

Table-1. Comparison of PSNR value between existing and proposed work.

	Guided filter (PSNR)	**DTCWT with Guided filter** (PSNR)
Satellite image	32.314	38.9088

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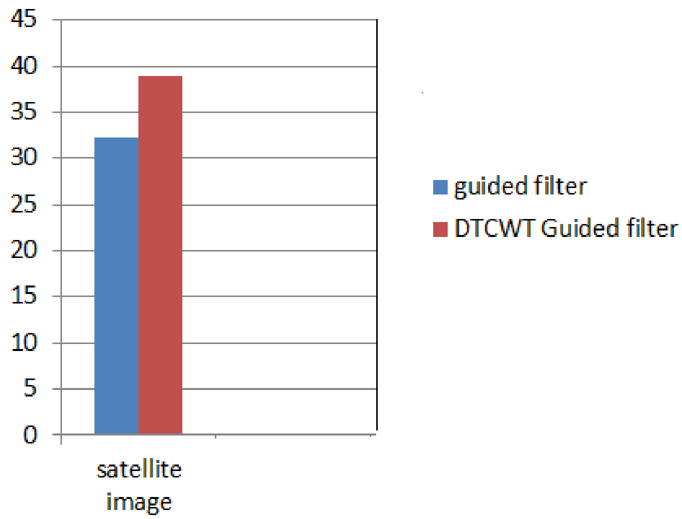

Figure-10. Graphical representation of PSNR value.

Table-2. Comparing different parameters between existing and proposed image enhancement level.

Parameters	Guided filter (existing method)	DT-CWT with guided filter (proposed method)
Smoothing	low	High
Edge preserving	medium	High
Resolution	medium	High

6. CONCLUSIONS

By this project we compare between GUIDED filter and DT-CWT with GUIDED filter. This proposed system will be Better edge preservation rather than previous existing methods. In this project no information loss. Better resolution accuracy and compatibility with reduction in noise. The Peak to Signal Noise Ratio (PSNR) is regularly used as a quality amount between original and compressed image. PSNR value for proposed method is 38.9088 which is higher than the existing method is 32.314. Higher PSNR value leads to the better quality of the compressed image.

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