



Implementation for Gabor Filter Using on Satellite Images Enhance the Image Quality

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Abstract—In this paper satellite image resolution and brightness enhancement technique based on the Gabor wavelet transform has been proposed. Satellite images are used in many applications such as geosciences studies, astronomy, and geographical information systems. The input image is enhanced first using Colour Space Transform and then a filter consisting of Gabor wavelets is used to extract texture features from the satellite image. The feature formation process models the texture features from Gabor filter as a Gaussian distribution. The use of Gabor filters is driven by the potential they have to isolate texture according to particular frequencies and orientations. The parameters that define a Gabor filter are its frequency, standard deviation and orientation.

Keywords :- Wavelet Transform , Image Enhancement, Feature Extraction , Application.

I. INTRODUCTION

Texture is an important property of surfaces which characterizes the nature of the surface. An important task in image processing is the task of segmenting regions of different texture in an image. The wavelet transform could perform multi-resolution time-frequency analysis. Gabor functions provide the optimal resolution in both the time and frequency domains[7]. Gabor wavelet transform, satellite images are used in many applications such as geoscience studies, astronomy, and geographical information systems. One of the most important quality factors in images comes from its resolution[2]. Interpolation in image processing is a well-known method to increase the resolution of a digital image. Interpolation has been widely used in many image-processing applications such as and resolution Resolution is an important feature in satellite imaging, which makes the resolution enhancement of such images to be of vital importance. As it was mentioned before, there are many applications of using satellite images, hence, resolution enhancement of such images will increase the quality of the other applications. The main loss of an image after being superresolved by applying interpolation is on its high-frequency components (i.e., edges), which is due to the smoothing caused by interpolation.[5]. Gabor wavelet transform has both the multi-resolution and multi-orientation properties and are optimal for measuring local spatial frequencies[11]. A resolution-enhancement technique using interpolated GWT high-frequency sub-band images and the input low-resolution image. It has been applied to combine all these images to generate the final resolution-enhanced image[2].

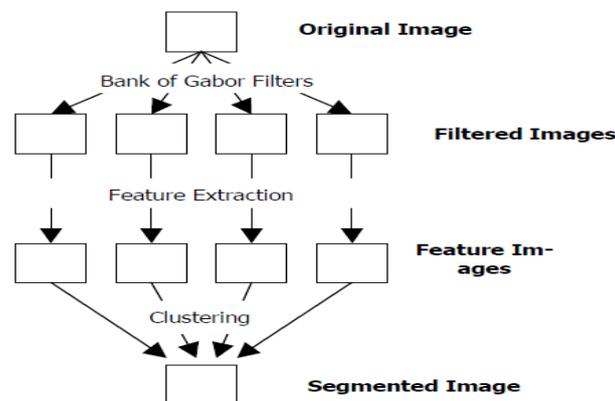


Fig 1:- Segmentation Process

The process of texture segmentation using Gabor filters involves proper design of a filter to different spatial-frequencies and orientations to cover the spatial-frequency space, decomposing the image into a number of filtered images, extraction of features from the filtered images and the clustering of pixels in the feature space to produce the segmented image.[7]

II . WAVELET TRANSFORM

A. Wavelet Transform in 1D

The wavelet transform is defined as decomposition of a signal into a family of functions obtained through translation a discrete wavelet transform does not require the explicit forms , but it only depends on filter coefficients the 1D wavelet transform of a discrete signal is equal to passing the signal through a pair of low-pass and highpass filters.[1]

B. Wavelet Transform in 2D

2D wavelet transform is to apply two 1D transforms separately. This transform called dyadic wavelet transform is characterized by 2D scaling function. 2D wavelet transform is to use nonseparable sampling and filtering. One of the most widely used nonseparable wavelets is the Gabor wavelet.[1]

C. Gabor Functions and Wavelets

Gabor functions form a complete but non-orthogonal basis set. Expanding a signal using this basis provides a localized frequency description. A class of self-similar functions referred to as Gabor wavelets, is now considered. the Gabor wavelet, then this self-similar filter dictionary can be obtained by appropriate dilations and rotations.[1]

D. Gabor Filter Design

The non-orthogonality of the Gabor wavelets implies that there is redundant information in the filtered images, and the following strategy is used to reduce this redundancy. the lower and upper center frequencies of interest the number of scales in decomposition. Then the design strategy is to ensure that the half-peak magnitude support of the filter in responses in the frequency spectrum touch each other.[1]

III . IMAGE ENHANCEMENT

Image enhancement techniques are designed to improve the quality of an image as perceived by a human being to improve the interpretability of the information present in images. It can be done both in spatial as well as in the frequency domain. The spatial domain method operates directly on pixels, whereas the frequency domain method operates on Fourier transform of an image and then it back to the spatial domain. images are being represented in the compressed format for efficient storage and transmission display of a colour image depends upon gaussian filter using differ factors.[10]

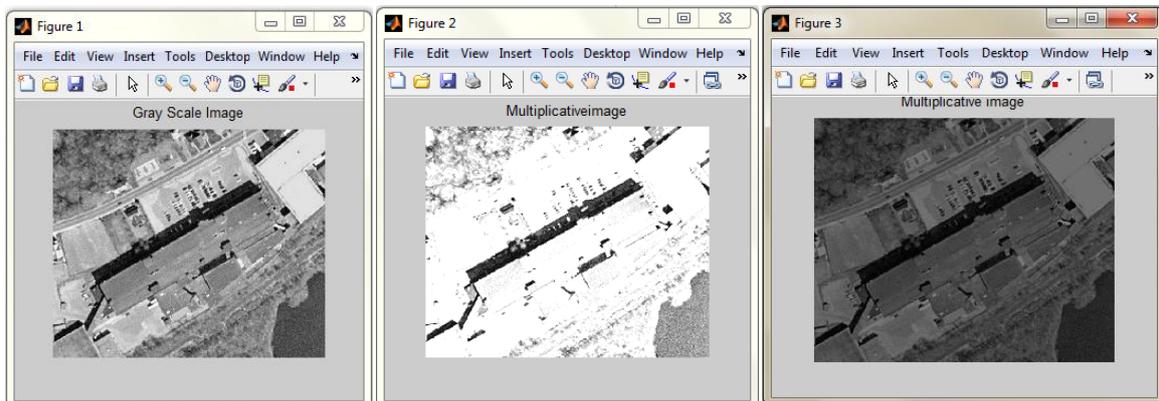


Fig 2:- Impact Of Gausion Filter

The proposed method performs the colour image enhancement operation in three steps. In this fig show to change the intensity value. First, it uses the original gray scale images. The next step preserves the contrast of the image increase the intensity values 2 is used. and the last one preserves the colours of the image is decrease the intensity values 0.5 is used. Figure 1 shows an example of input gray scale image and other figures shows the multiplication image.

III. FEATURE EXTRACTION

A. Gabor Wavelet Transform

Gabor wavelet transform has both the multi-resolution and multi-orientation properties and are optimal for measuring local spatial frequencies it has been found to yield distortion tolerance space for pattern recognition tasks. The multi-resolution and multi-orientation properties of the Gabor wavelet transform makes it a popular method for feature extraction even if the nonorthogonality exists. The two dimensional Gabor-Wavelet filter has been applied which removes noise and is a step of feature extraction. The filter executes very fast. Wavelet transform could extract both the time (spatial) and frequency information from a given signal The Gabor wavelet transform has some impressive mathematical properties and has been used frequently on researches of image processing. After applying Gabor filters on the image with different orientation at different scale. The main purpose of texture-based retrieval is to find images or regions with similar texture. It is assumed that we are interested in images or regions that have homogenous texture, therefore the following mean and standard deviation of the magnitude of the transformed coefficients are used to represent the homogenous texture feature of the region and it is used for remove the noise of different images.[11]

B. Gabor Filter

Gabor filter is a linear filter whose impulse response is defined by a multiplied Gaussian function. It is optimally localized as per the uncertainty principle in both the spatial and frequency domain. Gabor filters can be highly selective in both position and frequency, boundary detection. 2-D Gabor filters are effectively in computer applications.

2-D Gabor filters have been applied as an efficient for feature extraction. thus resulting in sharper texture boundary detection. Gabor filter related segmentation is based on filter. The filters focus on particular range of frequencies. If an input image contains two different texture areas, the local frequency differences between the areas will detect the textures in one or more filter output sub-images. [7] Gabor filters are extensively used for texture segmentation because of their good spatial and spatial frequency localization. Gabor filter is used to remove the noise into different filters of images. Filter are used to laplacian and gaussian filter.

IV. APPLICATION OF GABOR FILTER

Applications can be obtained by using the Gabor wavelet. They used notation is in accordance with the first order derivative of image and second order derivative. it denotes a derivative obtained at the location of an point and calculated by using a Gabor wavelet with scale. Gabor wavelet using different application like gabor filter. it is used for different types of filter used laplacian, gaussian, other standard deviation and variance.[4]

A. Edge Detection

Edge Detection is performed with variously dilated wavelets (e.g., separately in row and column directions). It is necessary to use a wavelet which serves as the first order partial differential operator (e.g., a first derivative a Gaussian function). a given threshold are considered (due to noise and slight edges). the edges for each scale are obtained. the edge detection is to use a wavelet which serves as the second order partial differential operator. In this case, edges are located in a zero-crossing points. It is used in detectors based on Laplacian, Laplacian of Gaussian (LoG).

i). Sobel

The sobel edge detector computes the gradient by using the discrete differences between rows and columns. The sobel operator is based on convolving the image with a small, separable, and integer valued filter. a sobel edge detection mask is given which is used to compute the gradient in the vertical and horizontal directions.

ii). Prewitt:

Prewitt operator edge detection masks are the one of the oldest and best understood methods of detecting edges in images. The Prewitt edge detector uses the following mask to approximate digitally the first derivatives. A prewitt mask used to compute the gradient in the vertical and horizontal directions.[9]

iii). Laplacian:

In mathematics the Laplacian is a differential operator given by the divergence of the gradient of a function on Euclidean space.

iv). Laplacian of Gaussian (LOG)

This detector finds edges by looking for zero crossings after filtering $f(x, y)$ with a Laplacian of Gaussian filter. the Gaussian filtering is combined with Laplacian to break down the image where the intensity varies to detect the edges effectively. It finds the correct place of edges and testing wider area around the pixel.

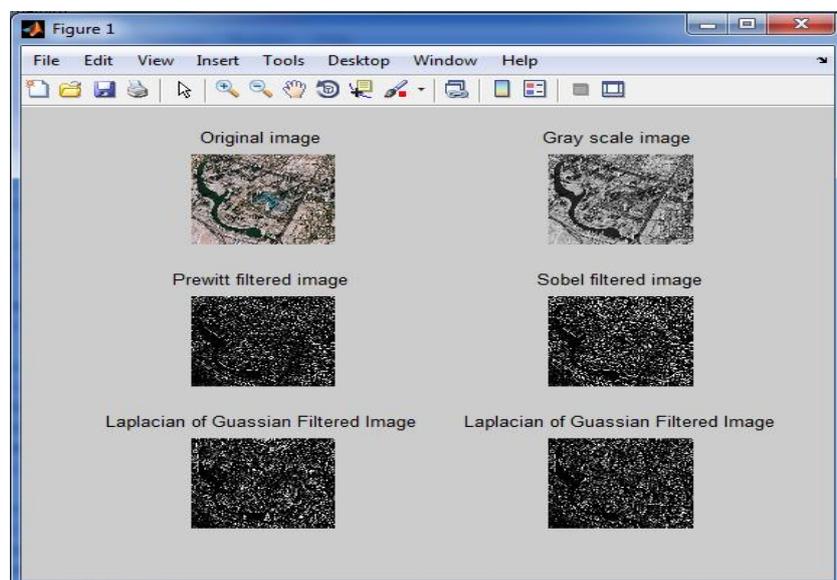


Fig3 :-Impact Of Laplacian Of Gaussian Filter On Satellite Images

B). Histogram

This process is used to extract a histogram and histogram statistics based on the image, which are included with the image service definition as part of the process metadata. This process should only be used when histogram statistics are explicitly required. For example, some stretch functions can be based on values in the histogram such as standard deviation or minimum/maximum values. You can choose to include or exclude transparent values as well as the histogram bin values. An image service client can view the histogram values on the Properties dialog box under the Metadata tab. The Server Process node on the Metadata tab provides the histogram values calculated on the image service. The Source node presents three additional tabs. You can click the Metadata tab on the Source node to access the histogram values calculated for the source images that are used to create the returned image. [6]

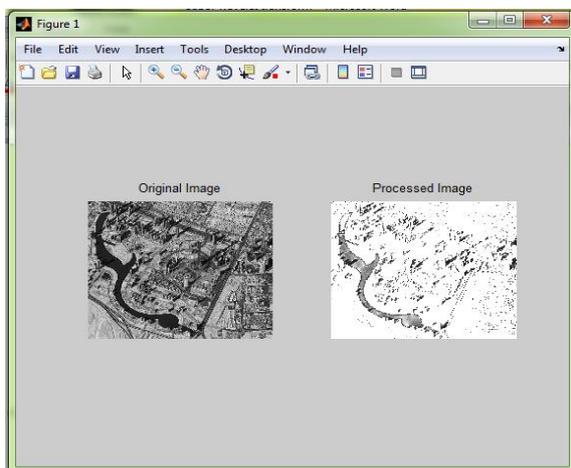


Fig4 :- Impact Of Original And Processed satellite Image satellite Image

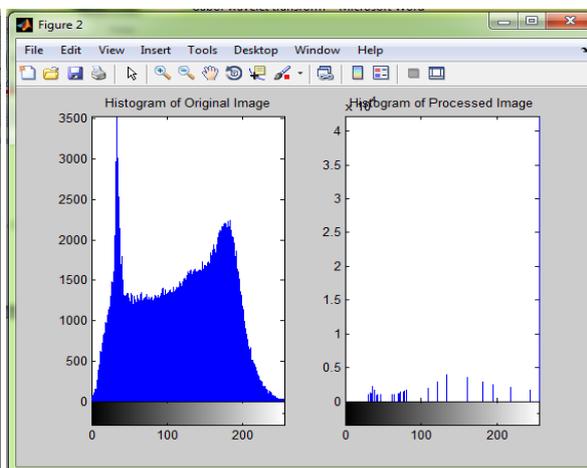


Fig5 :- Comparison Of Original And Processed Histogram

IV. CONCLUSION

In this paper we have used to extraction the edges in satellite images. The satellite Images also find edge detection using different gabor filters. The above presented wavelet transform used in 1D and 2D using the gabor filter is very efficient technique for gabor wavelet . The multi-resolution and multi direction is applied to Gabor filtered image. There are different application uses in gabor filter like edge detection ,it is used for laplacian of gaussian filter on gray scale data images.In Future Work we can apply gabor filter used in laplacian and gaussian filter of satellite imges to calculate the PSNR and MSQ.

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