Certain Investigations on Change Detection In Sar Images Based on NSCT And Spatial Fuzzy Clustering Approach

B.Leena[1], Dr.A.N.Jayanthi[2]
[1]Assistant Professor, Dept of Electronics and Communication Engineering
[2]Associate Professor, Dept of Electronics and Communication Engineering
[1, 2] Anna University Regional Campus Coimbatore

Abstract- *Synthetic aperture radar (SAR) with change detection approach for images based on an image fusion and a spatial fuzzy clustering algorithm is proposed. In order to generate difference images using complementary information from a mean-ratio image and a log-ratio image fusion technique is introduced Non- subsampled contourlet transform fusion based on an average operator and the minimum local area energy are selected for the fusion of the contourlet coefficients for a low-frequency band and a high-frequency band, respectively to restrain the background information and the changed regions in the fused difference image is enhanced.*

I. INTRODUCTION

Most important applications of remote sensing technology is the detection of changes that is occurring on the earth surface due to the use of multitemporal remote sensing images. This depends on the fact for many public and private institutions, the knowledge of the dynamics of either natural. Useful in addressing change detection applications that is same as to environmental monitoring, agricultural surveys, urban studies, and forest monitoring.

The process of combining information from two or more images into a single image is image Fusion. The fused image is complete information which is more useful for human or machine perception.

II. PROPOSED METHOD

Change detection approach for synthetic aperture radar images based on an image fusion and a spatial fuzzy clustering algorithm. The inter image fusion technique is to give a difference image by the method of complementary information that is from a mean ratio image and a log ratio image. NSCT (Non- sub sampled contourlet transform) based fusion involves an average operator and maximum gradient coefficient selection are chosen to fuse low-frequency and a high-frequency band to restrain the background information ,in the fused difference image the information of the fused region must be enhanced. A spatial fuzzy clustering algorithm will be proposed for classifying changed and unchanged regions from fused image with performance analysis.The first step of this process to generate the difference images to the changes of the source image must be enhanced. Rationing has been done to obtain difference images in logarithmic and mean scale.

It is strongly high to speckle noise. Logarithmic scale based difference part will be generated to identify changes and unchanged region and it is weakening the high intensity and enhancing the low intensity pixels.

So along with this, mean ratio operator and fusion approach is used to reduce this limitation and produce detailed portion from source images for accurate detection of changes.

The ratio difference image is usually expressed in a logarithmic or a mean scale because of the presence of speckle noise. In the past dozen years, there was a widespread concern over the logarithm of the ratio image since the log-normal model was considered as a heuristic parametric probability distribution function for SAR intensity and amplitude distributions. With the log-ratio operator, the multiplicative Speckle noise can be transformed in an additive noise component.

Fusion of low-frequency coefficients

Considering the images' approximate information is constructed by the low frequency coefficients, average rule is adopted for low-frequency coefficients. Suppose $B_F(x, y)$ is the fused low-frequency coefficients, then

$$B_F(x,y) = \frac{B_1(x,y) + B_2(x,y)}{2}$$

Where$B_1(x, y)$ and 2 $B_2(x, y)$denote the low-frequency coefficients of source images.

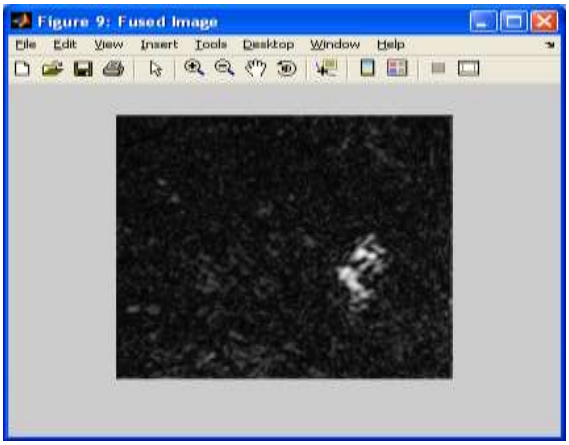

Figure 1.Fused Image

Fusion of high-frequency coefficients

High-frequency coefficients always contain edge and this performed by using spatial fuzzy C means clustering algorithm. Based on their inherent distance from each other it will classify the input data points into multiple classes.It is an unsupervised clustering algorithm . The gradient of an image will be defined as,

G = Sqrt (dzdx. ^2 + dydx. ^2).

Where, the dzdx and dydx are the y derivatives and x derivatives obtained by the sobel edge operators. Then these coefficients are fused based on the searching maximum gradient of these two using decision rule.

Image Segmentation

The segmentation refers to the process of partitioning a digital image into multiple segments. The goal is to simplify and change the representation of an image into something that is more meaningful and easier to analyze.

The segmentation is performed by using spatial fuzzy C means clustering algorithm.It is an unsupervised clustering algorithm that classifies the input data points into multiple classes based on their inherent distance from each other.To get the accurate result by analyzing local neighborhood information**,**it has the spatial function to modify membership function.

III. EXPERIMENTAL RESULTS

In this section, the performance of system will be evaluated from following parametric such as correlation, Sensitivity, Peak signal to Noise ratio. The segmented results will be compared with desired results. Here, the used test samples and ground truth are displayed as following

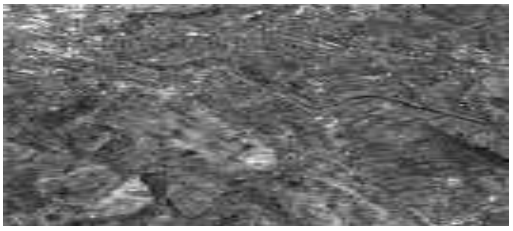

Figure 2.Image before flooding

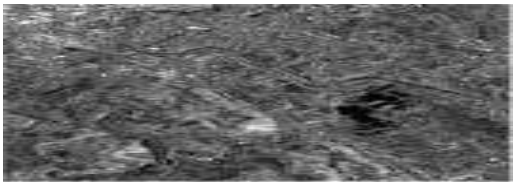

Figure 3.Image after flooding

Figure 4.Ground truth

Figure 5.Segmented Result

IV. CONCLUSION

This paper gives Multi temporal image change detection using image fusion and segmentation. It was done to generate a difference image by using complementary information from a mean ratio image and a log-ratio image. NSCT based fusion involves an average operator and maximum gradient coefficient selection are chosen to fuse low-frequency and a high-frequency band to restrain the background information in order to enhance the information that is in changed regions in to the fused difference image. A spatial fuzzy clustering algorithm was utilized for classifying changed and unchanged regions from fused image with performance analysis such as correlation

REFERENCES

[1] M. K. Ridd and J. Liu, “A comparison of four algorithms for change detection in an urban environment,” Remote Sens. Environ., vol. 63, no. 2, pp. 95–100, Feb. 1998

[2] Francesca Bovolo, Lorenzo Bruzzone, "A Wavelet-Based Change Detection Technique for Multitemporal SAR Image," IEEE International Geoscience and Remote Sensing Sympos, pp. 85-89, 2005

[3] HUANG Shiqi, LlU Daizhi, Hu Mingxing, "Multi-temporal SAR Image Change Detection Technique Based on Wavelet Transform," ActaGeodaeticaet Cartographica Sinica, Vo1.32, NO.2, pp.180-185, 2010.

[4] E. Rignot and J. van Zyl, “Change detection techniques for ERS-1 SAR data,” IEEE Trans. Geosci Remote Sens., vol. 31, no. 4, pp. 896– 906, Jul. 1993.

[5] A. Ferro, D. Brunner, and L. Bruzzone, “Building detection and radar footprint econstruction from single VHR SAR images,” in Proc. IEEE IGARSS, Jul. 2010, pp. 292-295.

[6] S. Brusch, S. Lehner, T. Fritz, M. Soccorsi, A. Soloviev, and B. van Schie, “Ship surveillance with TerraSAR-X,” IEEE Trans. Geosci. Remote Sens., vol. 49, no. 3, pp. 1092–1103, Mar. 2011.

[7] Y. Bazi, L. Bruzzone, and F. Melgani, “An unsupervised approach based on the generalized Gaussian model to automatic change detection in multitemporal SAR images,” IEEE Trans. Geosci. Remote Sens., vol. 43, no. 4, pp. 874–887, Apr. 2005.