ISSN: 0974-2115
www.jchps.com Journal of Chemical and Pharmaceutical Sciences

Uncovering changes in images using a supervised classifier and image exploration by NSCT fusion

Abila M*
Department of Computer Science and Engineering, Sri Krishna Engineering College, Chennai
***Corresponding author: E-Mail:birdabiblue@gmail.com**

ABSTRACT

This proposed paper presents alteration recognition approach for synthetic aperture radar (SAR) images based on an image fusion and supervised classifier scheme. The image fusion technique is introduced to generate a difference image by using complementary evidence from a mean-ratio image and a log-ratio image. NSCT (Non-sub sampled contour let transform) fusion rules based on an average operator and minimum local area gradient are chosen to fuse the contour let coefficients for a low-frequency band and a high-frequency band, correspondingly to detain the background information and enhance the information of reformed regions in the merged difference image. On behalf of the remote sensing images, differencing (subtraction operator) and rationing (ratio operator) are renowned techniques for producing a difference image. An artificial neural network type multi-layer perception or else back propagation with feed forward network will be proposed for classifying changed and unchanged regions in the fused difference image. The results will be proven that rationing generates better difference image for change detection consuming supervised classifier segmentation approach and efficiency of this algorithm will be exhibited by sensitivity and correlation evaluation.

KEYWORDS: fusion, contour let transform, gradient, neural network, rationing, differencing, correlation.

1. INTRODUCTION

Change detection is a process of primary importance for a large number of applications including metropolitan planning, natural reserve monitoring, agricultural surveys and natural hazard prevention and monitoring. Unlike optical sensors, synthetic aperture radar (SAR)systems have been less exploited and several supervised methods have been developed. Satellite is used for a large number of purposes common types include military and resident earth surveillance satellites, communication satellites in navigation satellites and weather satellite. The first phase of any visualization scheme is the image acquisition stage. The objective of this paper is the availability of very high resolution (VHR), synthetic aperture radar(SAR) images, which can be acquired by satellites over the same geographical area. The system is used to find the changes occurred in some locations from one period to another period. This paper also uses fusion technique for morphing two period pictures to identify the changes effectively. Segmentation technique uses fuzzy logic which is used to detect the periodic changes. It also detect hot spots and to reduce the noise impact, a multi-level depiction of the multi time -based information.

Existing System: The system existing only identifies that the Averaging and Maximization methods based spatial level fusion is very sensitive to sensor noise and high spatial distortion. Due to this sensitivity, unwanted changes in the landscape are detected. This also causes more computational complexity. As small unwanted changes are detected, processing of an image makes high spatial distortion. Contrast information loss is vigorous due to averaging method. Grouping of similar objects is difficult due to sensitive changes in landscape. Luminance of the image varies with time and it cannot be performed effectively for the detection of objects in landscape. Gray level threshold and K means clustering method is not suitable for all lighting condition of images and is difficult to measure the cluster quality Mason, 2010.

Proposed System: The Proposed system has been developed for implementing change detection which is a process of primary importance for a large number of applications including urban planning, natural resources monitoring and agricultural surveys .It is an approach to change detection in multi temporal very high geometrical resolution (VHR) SAR images for surveillance applications. The approach takes advantage of 3 concepts: (i) multiscale representation for a preliminary detection of areas showing noteworthy modifications in backscattering among the two images (hot spots); (ii) exploitation of prior information about classic usage of sectors of interest in the area under control; and (iii) definition of features and change detectors optimized for an actual detection of specific changes in each sector of interest. Thus the proposed approach is designed for providing the solutions for many investigations and change detection research problems (Lehner S, 2011) Multi temporal synthetic aperture radar image analysis for land cover change detection based on NSCT based image fusion approach for accurate detection of foreground changes. It also based on artificial neural network with feed forward back propagation model.

System Architecture

The Fig.1 shows the system Architecture includes the following main modules in the proposed paper:

- Difference image Generation
- NSCT decomposition
- Pixel level Fusion approach

- Back propagation with feed forward network.

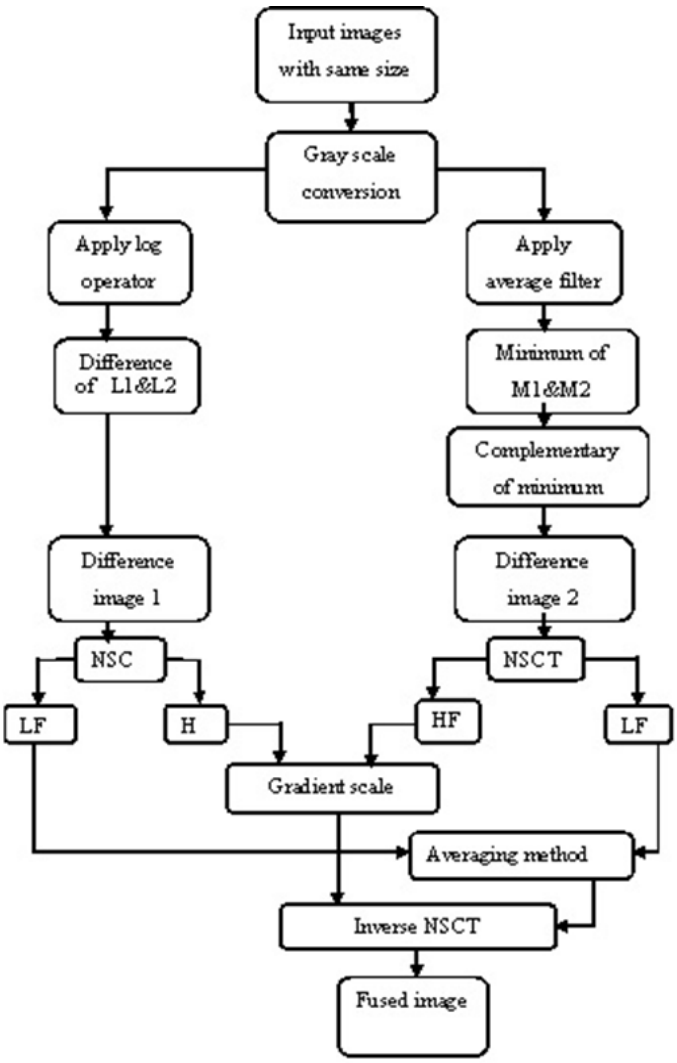

Figure.1.System Architecture

Difference image Generation: The first step of this process to generate the difference images to boost particulars about deviations between source images. Here rationing will performed to obtain difference images in mean and logarithmic scale. It is extremely robust to speckle noise. Logarithmic scale based difference part will be created to detect changes and unchanged region and it is weakening the high intensity and enhancing the low strength pixels (Bruzzone, 2006).

NSCT decomposition: NSCT decomposition is to compute the multi gauge and diverse direction components of the discrete images. It involves the two stages such as non-sub sampled pyramid(NSP) and non-sub sampled directional filter bank(NSDFB) to extract the texture, contours and detailed coefficients. NSP decomposes the image into low and high frequency sub bands at each decomposition level and it produces n+1 sub images if the condition decomposition level is n. NSDFB abstracts the detailed coefficients from direction decomposition of high frequency sub bands obtained from NSP (Inglada, 2007). It generates m power of 2 direction sub images if number of stages be m.

Pixel level Fusion approach: The sub band images of two source images obtained from NSCT are utilized for morphing process to get the enhanced detail about changes region from unchanged region. Here, the pixel level fusion method is approached for this process. It will be implemented based on averaging and gradient detection for coefficient selection. The low frequency sub bands of two difference images will be fused by averaging rule and high frequency sub bands will be fused by gradient measurement to first-rate preferred coefficients.

Lastly, the fused two different frequency sub bands are inverse transformed to reconstruct the merged image and parameters will be assessed between input and fused image. Decomposed low frequency and directional edges sub bands are fused by using the method of pixel level fusion with averaging and gradient based coefficient selection. An averaging rule will be defined by,

$F_{lf} = (L_{f1} + L_{f2})/2.$ (1)

Gradient will be defined by,
Magnitude: Gm = Sqrt (Fx^2 + Fy^2), where Fx and Fy are the First order derivatives along rows and columns.
Minimum gradient values will be chosen for fusing directional wedges.

Back propagation with feed forward network: Back propagation is a shared method of teaching artificial neural networks. From a desired output, the network acquires from many inputs. It can be a supervised learning method, and it is a generalization of the delta rule. It requires a dataset of the preferred output for several inputs, building up the training set. It is most useful for feed-forward networks (networks that have no response or simply, that have no contacts in that loop). Back propagation requires that the activation function and those functions used by the neurons or "nodes" be differentiable.

The aim of any supervised learning algorithm is to find a utility that best plots a set of inputs to its correct output. An example would be a simple classification task and here the input is an image of an animal, and the exact output would be the name of the animal. Some input and output outlines can be easily cultured by single-layer neural networks (Kozan, 2000). A single-layer neural network however, must learn a function that yields a label merely using the strength of the pixels in the image.

There is no way for it to learn any abstract types of the input from the time when it is restricted to having solitary one layer. A multi-layered network overcomes this limitation as it can generate internal depictions and learn diverse features in each layer. The first layer may be responsible for learning the positions of lines using the inputs from the individual pixels in the image.

Each higher level acquires more and more non concrete features such as those stated above that can be used to classify the image. The feed forward neural network the data or information transfers in only one direction, forward, from the input nodes, through the concealed nodes and then to the output nodes. There will be no cycles or loops in the network of the feed forward neural network Bazi, 2007.

Implementation: The implementation was done using MATLAB operational with an image. Mat lab is a together a powerful computational environment and a programming language that easily handles matrix and complex arithmetic. It is a high-level language and interactive environment for data analysis and mathematical computing functions and provides interactive tools for 3D plotting functions. Source images are got from satellites within a short interval of time. These images are used to detect changes in a same geographical area as shown in Fig.2.

Difference image is generated by using log ratio and mean ratio. Log ratios are used to obtain changed and unchanged region. It's weakening the high intensity pixels but it enhancing the low intensity pixels, where mean ratios are used to produce accuracy of changes in the source images. Fused images are obtained by using the NSCT technique as shown in Fig.4. It also uses the pixel level fusion technique to detect the changes in the SAR images.

In segmentation process pixel level classifier is used in the proposed paper. Here it compares the segmented output with the ground truth images. In segmentation it separates the foreground and background by using 0's and 1's. In segmentation we get the high resolution image and it detect the accuracy of changes between two SAR images. Back propagation is a shared technique of exercising artificial neural networks. It is said to be a supervised learning method and it also requires a dataset. In existence they uses single layer neural network. In proposed paper the multilayer network which is used where it gives different features of each layer.

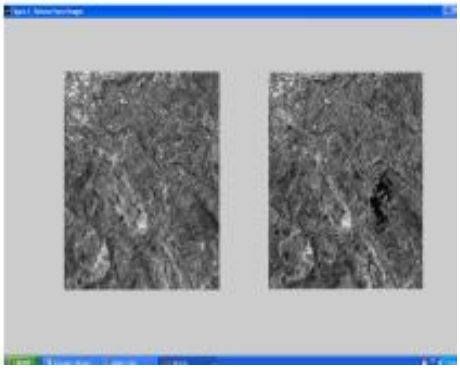

Figure.2.Source Images

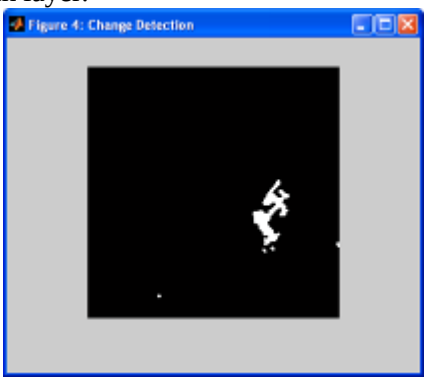

Figure.3.Fused Image

Fig.4.shows the Performance analysis is used to define the performance of the detection of changes in the satellite images efficiently. Correlation Coefficient is used to find the similarity between two different objects with their region features. It is described by,

Correlation coefficient = [sum (sum (u_1.*u_2))] / [sqrt(sum(sum(u_1*u_1))*sum(sum(u_2*u_2)))];

Here $u_1 = F_1$ – mean of F_1 and $u_2 = F_2$ – mean of F_2

F_1 – Feature set1 and F_2 – Features set2

PSNR (Peak Signal to Noise Ratio)= 10log10255*255/MSE

MSE (Mean Square Error)= $(1/M*N)\sum\sum(a_{ij}-b_{ij})$

Here M,N are the number of Rows and Columns

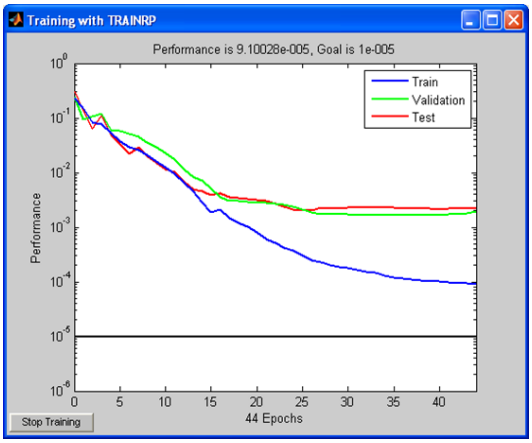

Fig 4. Performance Analysis

2. CONCLUSION

This paper describes a new framework for detecting changes in remote sensing satellite images based on an image fusion and a spatial fuzzy clustering algorithm. Recognition of changed section intricate the fusion approach for morphing the two images taken at different times to enhance details of changed region from unchanged region. Here, NSCT decomposition was effectively used to remove the smoothing and curve segments from images to make pixel level fusion with better efficiency. In this system, an averaging rule and gradient detection were utilized. Here, the changes will be detected using back propagation network from the fused image with less time. The simulated results shown that generated fused image has less error and segmented transformed region with enhanced signal to noise ratio, better sensitivity and accuracy.

Future Enhancement: As future enhancement of the work include extending the experimental analysis to long time series of images in order to further validate in different conditions. In this paper, using segmentation technique with the help of supervised training data set but as a future work we can use unsupervised training dataset. In particular, the project currently identifies the changes in particular area but we can also identify the changes in multiple objects like water bodies. Moreover we can also increase the variety of change detectors to make the analysis of scenarios. The applications of the project are to identify changes like Earth land changes detection in Satellite field. Surveillance can be done by using our project in various fields. Change detection is useful for detecting movement of ship containers, movement of cargo ships, etc. Detection of changes are mainly helpful for natural resources monitoring, agricultural surveys. While natural hazards like earthquake, flood, it is used to detect the affected areas from unaffected areas.

REFERENCES

Bazi Y, Bruzzone L and F. Melgani, Image thresholding based on the EM algorithm and the generalized Gaussian distribution, Pattern Recognit., 40(2), 2007, 619–634.

Bazi Y, Bruzzone L and Melgani F An unsupervised approach based on the generalized Gaussian model to automatic change detection in multitemporal SAR images, IEEE Trans, Geosci, Remote Sens, 43(4), 2005, 874–887.

Bovolo F and Bruzzone L, A detail-preserving scale-driven approach to change detection in multitemporal SAR images, IEEE Trans, Geosci, Remote Sens, 43(12), 2005, 2963–2972.

Bovolo F and Bruzzone L, A split-based approach to unsupervised change detection in large-size multitemporal images: Application to tsunami-damage assessment, IEEE Trans. Geosci. Remote Sens., 45(6), 2007, 1658–1670.

Brunner D, Lemoine G and Bruzzone L, Earthquake damage assessment of buildings using VHR optical and SAR imagery, IEEE Trans. Geo sci. Remote Sens, 48(5), 2010, 2403–2420.

Brusch S, Lehner S, Fritz T, Soccorsi M, Soloviev A,and van B Schie "Ship surveillance with Terra SAR-X," IEEE Trans. Geo sci,Remote Sens, 49(3), 2011,1092–1103.

Bruzzone L and Carlin L, A multilevel context-based system for classification of very high spatial resolution images, IEEE Trans. Geosci. Remote Sens., 44(9), 2006, 2587–2600.

Bruzzone L and Prieto F, An adaptive parcel-based technique for unsupervised change detection, Int. J. Remote Sens, 21(4), 2000, 817– 822.

Inglada J and Mercier G, A new statistical similarity measure for change detection in multitemporal SAR images and its extension to multiscale change analysis, IEEE Trans, Geosci, Remote Sens, 45(5), 2007, 1432–1445.

Kozan E, Optimising container transfers at multimodal terminals, Math. Comput. Model., 31(10), 2000, 235–243.

Mason D, Speck R, Devereux B, Schumann GP, Neal J and Bates P, Flood detection in urban areas using Terra SAR-X, IEEE Trans, Geo sci, Remote Sens, 48(2), 2010, 882–894.

Mason D, Speck R, Devereux B, Schumann G.P, Neal J and Bates P, Flood detection in urban areas using TerraSAR-X, IEEE Trans, Geosci.Remote Sens, 48(2), 2010, 882–894.

Werninghaus R and Buckreuss S, The Terra SAR-X mission and system design, IEEE Trans, Geo sci, Remote Sens, 48(2), 2010, 606–614.