An Iterative Technique for Image Change Detection using SAR Images in WSN

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Abstract— Satellite remote sensing imagery has been used to path changes on the Earth surface for applications including, plantation monitoring, and urban database updating. To achieve this, different sensors have been investigated including optical, synthetic aperture radars (SAR) or multi-spectral sensors. Optical sensors provide high resolution images due to the involved wavelengths. Remote sensing images are commonly used to monitor the earth surface evolution, this surveillance can be directed by perceiving changes between images acquired at different times and possibly by different kinds of sensors. A demonstrative case is when an optical image of a given area is available and a new image is acquired in an crisis situation (resulting from a natural disaster for instance) by a radar satellite. In such a case, images with heterogeneous properties have to be equated for change detection. This paper proposes a new approach for similarity measurement between images developed by heterogeneous sensors. The approach exploits the considered sensor physical properties and specially the associated measurement noise models and local joint distributions. These properties are inferred through manifold learning. The resulting similarity measure has been successfully applied to detect changes between many kinds of images, including pairs of optical images and pairs of optical-radar images. In addition, both low resolution and high resolution are taken for speckle noise removal with various thresholds and are taken for similarity measurement and image classification using Enhanced Fuzzy C-mean Clustering (EFCM) algorithm.

Key words: Satellite Images, Optical images, SAR Images, EM algorithm, Segmentation, EFCM algorithm

I. INTRODUCTION

Image processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image.

Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it. Image processing usually refers to digital image processing, but optical and analog image processing also are possible. Digital image processing is the use of computer algorithms to perform image processing on digital images. As a subcategory or field of digital signal processing, digital image processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and signal distortion during processing. Since images are defined over two dimensions (perhaps more) digital image processing may be modeled in the form of multidimensional systems.

In this proposed system is a new statistical model to describe multi-channel images and analyze the joint behavior of the channels to detect changes, in contrast with channel by channel analysis multi-spectral and panchromatic images and new similarity measure showing encouraging results for homogeneous and heterogeneous sensors. The proposed system is Interesting for many applications Change detection, Classification and image segmentation method.

This paper mainly concentrated on the detection of changes between optical and synthetic aperture radar images. The proposed model could be interesting for many other applications such as image segmentation, image registration, database updating, image indexing or image classification

- Improve the pictorial information of an image for human interpretation,
- Render the image should be more suitable for independent machine perception.
- Used for de-noising different types of noises.

II. EXISTING SYSTEM

The existing system introduces a flexible statistical model for the pixel intensities associated with several images acquired by different sensors. To achieve this, the marginal statistical properties of the pixel intensities contained in a homogeneous area are taken. Then it defines the joint distribution of a group of pixels belonging to a homogeneous area contained into the analysis window. An extension to pixels belonging to a non-homogeneous area is also introduced.

A homogeneous area of an image is a region of the image where the pixels have the same physical properties. To segment the image based on the pixels similarity, first, the speckle noise is found out and eliminated. Then based on the gray scale values, the image is segmented into land, water and other type (thick grass, thin grass, etc).

III. DRAWBACKS

- All the given images are taken for speckle noise removal with same threshold values.
- Low resolution and High resolution images are not differentiated.
- Various regions such as land, water and other types are not highlighted.
- Comparison between old and new images of same area is not carried out and difference in percentage is not found out.

IV. PROPOSED SYSTEM

In addition, with all the existing system approach, the proposed system includes applying various threshold values for speckle noise removal. In addition, the low and high resolution images are classified before noise removal and then image area is segmented for all the given images. Then

comparison between old and new set of images are carried out for difference in image data.

V. ADVANTAGES

- All the given images are taken for speckle noise removal with different threshold values.
- Low resolution and High resolution images are differentiated.
- Various regions such as land, water and other types are highlighted.
- Comparison between old and new images of same area is carried out and difference in percentage is found out.

VI. MODULE DESCRIPTION

The following modules are present in the project.

1) ADD IMAGE
2) SPECKLE NOISE REMOVAL
3) IMAGE RESOLUTION WITH MEDIAN FILTER
4) SPECKLE NOISE REMOVAL WITH THRESHOLD VALUES
5) SIMILARITY MEASURES BETWEEN IMAGES

A. Add Image:

In this module, the image is selected using open file dialog control and saved in the images folder of the project.

B. Speckle Noise Removal:

Speckle Noise is multiplicative in nature. This type of noise usually occurs in almost all coherent imaging systems such as laser, acoustics and SAR (Synthetic Aperture Radar) imagery. This type of noise is an inherent property of optical images and because of this noise the image resolution and contrast become reduced, which affects the diagnostic value of this imaging modality. So, speckle noise reduction is an essential preprocessing step, whenever ultrasound imaging is used for medical imaging.

In this project, worked mainly on this type of noise along with AWGN noise among the many methods that have been proposed to reduce this noise, there exists a class of approaches that use a multiplicative model of speckled image formation and take the advantage of the logarithmical transformation in order to convert multiplicative speckle noise into additive noise with some assumption.

C. Image Resolution With Median Filter:

In this module, median filter comes under the class of nonlinear filter. It also follows the moving window principle, like mean filter. A 3× 3, 5× 5, or 7× 7 kernel of pixels is moved over the entire image. First the median of the pixel values in the window is computed, and the n the center pixel of the window is replaced with the computed median value. Calculation of Median is done as first sorting all the pixel values from the surrounding neighborhood (either ascending or descending order) and then replacing the pixel being considered with the middle pixel value.

D. Speckle Noise Removal With Threshold Values:

In this project, worked mainly on this type of noise along with de noise images (land, water and other images) among the noise removal methods that have been proposed to reduce this noise, there exists a class of approaches that use a multiplicative model of speckled image formation and take the advantage of the logarithmical transformation in order to convert multiplicative speckle noise into additive noise with threshold values.

E. Similarity Measure Between Images:

This module uses the statistical model and to analyze the behavior of the correlation efficient between the mutual information as change indicators in SAR images. According to the proposed model, the joint distribution of these images should be a mixture of Gaussian components estimated joint distribution of the two images. This distribution has been estimated using a histogram, which was computed using an appropriate number of bins obtained by cross validation.

VII. CONCLUSION AND FURTHER ENHANCEMENTS

It is believed that almost all the system objectives that have been planned at the commencement of the software development have been net with and the implementation process of the project is completed. It is intended for general users to manage the records. It simply gets the images at various time periods and detects the land change. A trial run of the system has been made and is giving good results the procedures for processing is simple and regular order. The process of preparing plans had been a new experience, which was found use full in later phases of the project is completed. Efforts have been taken to make the system user friendly and as simple as possible. However at some points some features may have been missed out which might be considered for further modification of the application. The project provides a best assistance in image segmentation processing. The following options can be added in future.

- Auto threshold value for speckle noise removal can be analyzed in future.
- Improvement in finding (Low resolution/ High resolution) by the system itself.
- The application if designed as web service, then it can be consumed from anywhere.

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