International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

IJIEMR Transactions, online available on 4th Sept 2020. Link :http://www.ijiemr.org/downloads.php?vol=Volume-09&issue=ISSUE-09

Title: CHANGE DETECTION IN REMOTE SENSING IMAGES USING SSIM

Volume 09, Issue 09, Pages: 59-63

Paper Authors

N. SAI RACHANA, M. SURYA NARAYANA, S. PRAKASH, Y. RAVI KRISHNA, DR. R. VIJAY KUMAR REDDY

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

CHANGE DETECTION IN REMOTE SENSING IMAGES USING SSIM

N. SAI RACHANA[1], M. SURYA NARAYANA[2], S. PRAKASH[3], Y. RAVI KRISHNA[4], DR. R. VIJAY KUMAR REDDY[#]
[1-4]Student, [#] Assistant Professor, Department of Information Technology, Prasad V Potluri Siddhartha Institute of Technology

Abstract: In this paper a new authentication technique in change detection in remote sensing images. Analyzing of two multi temporal satellite images to find any changes that might have occurred between the two time stamps. It is one of the major utilization of remote sensing and finds application in a wide range of tasks like defense inspections, deforestation assessment, land use analysis, disaster assessment and monitoring many other environmental/man-made changes. As natural calamities changes from time to time, finding difference between two satellite images of two different time stamps. Image recognition and comparison is a topic that has been in focus for a long time within computer science. However, none of these companies have managed to create a solution that can do this flawlessly. Histogram comparison is one solution to this problem, though not the most optimal one. Using an algorithm that uses key point detection is the most optimal solution, if training of the algorithm is an option. One of the ideas to improve the precision is allow the user to choose between the five best dishes that the algorithm recommends. In this way one increases the probability of that the wanted dish is one of the recommended dishes. Future work in this topic can involve researching on how training the HOG, Histogram of Oriented Gradients, algorithm would work, to get a better result that could let the FLANN, Fast Approximate Nearest Neighbor Search Library, algorithm work faster.

Keywords: Image comparison, Unsupervised learning, Image subtraction.

Introduction

In remote sensing, identifying the difference between two images of the same scene captured at different time series is challenging and have different applications. It will be termed as change detection. Change detection is the heart process of many applications utilizing remote sensing images. It has a wide range of uses, including land use and land cover change monitoring, risk assessment, urban growth studies and environmental investigation. Change Detection methods could be categorized as either supervised or unsupervised according to the nature of data processing. In supervised approaches, change detection is considered as a binary classification problem using bi-temporal images. Unsupervised change detection techniques mainly use the automatic analysis of change data which are constructed using multi-temporal images. Land cover change detection is an important problem in the Earth Science domain because of its impacts on local climate, radiation balance, biogeochemistry, hydrology, and the diversity and abundance of terrestrial

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

species.

Existing System

The existing system is not too effective. At present there are three types of change detection methods, they are:

a. Binary Change Detection

b. Multiclass Change Detection

c.Change detection in long time series of images

Binary Change Detection:

Threshold selection is a critical step in using binary change detection methods.The threshold determines the accuracy of change detection results but is highly subjective and scene-dependent, depending on the familiarity with the study area and the analyst skill. Nearest neighbor classification is a non-parametric classifier, which was applied to remove the threshold. In order to find the most suitable feature to detect construction and farmland changes, a variety of single and multiple variables were explored.

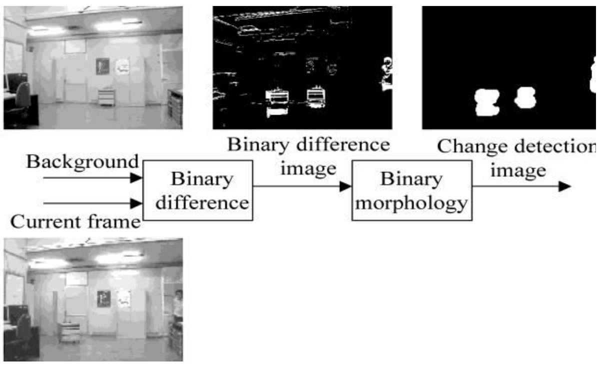

Fig. 1 Binary Change Detection

Multiclass Change Detection:

The advent of a new generation of multispectral sensors has given rise to new challenges in the development of automatic change detection techniques. In particular, typical approaches to change detection are not able to well model and properly exploit the increased radiometric resolution characterizing new data as this results in a higher sensitivity to the number of natural classes that can be statistically modeled in the images. The potential of the propose framework is demonstrated on the very common problem of binary change detection based on setting a threshold on the magnitude of the method based on the expectation-maximization algorithm and Bayes decision is proposed. Its effectiveness is demonstrated on a large variety of data sets from different multispectral sensors.

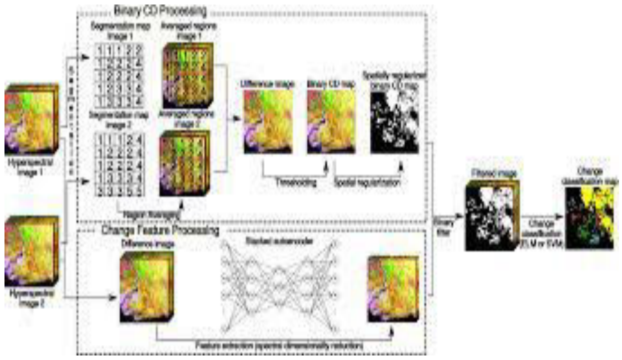

Fig.2 Multiclass Change Detection

The above two procedures also give the correct change detection values.

Proposed System

In this project we are working with Structural Similarity Index Measure(SSIM) :The Structural Similarity Index(SSIM) is generally considered to be a milestone in the recent history of Image Quality Assessment(IQA). Image quality assessment is an emerging field of signal processing. More or less defined as the task of designing an algorithm to automatically judge the perceived "quality" of a photograph, it remains a largely open problem. The Structural Similarity Index(SSIM) is a perceptual metric that quantifies the image quality degradation that caused by processing such as data compression or by losses in data transmission. This metric is basically a full reference that requires two images from the same shot; this means two graphically identical images to the human eye. The second image generally is compressed or has a different quality, which is the goal of this index. SSIM is usually used in the video industry, but has as well a strong application in photography. SSIM actually measures the perceptual difference between two similar images. It cannot judge which original one is and which has been exposed to additional processing such as compression or filters. In this project, we develop a system to compare two remote sensing images using python. To perform our comparison, we made use of the Mean Squared Error (MSE) and the Structural Similarity Index (SSIM) functions. While the MSE is substantially faster to compute.

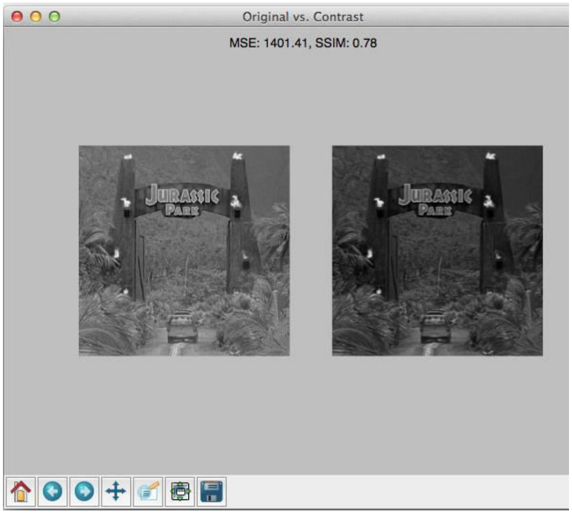

Fig.3 Structural Similarity Index

Experimental Results

In this process we do the following steps:

i. First open Bhuvan website and download two image datasets of different time lines.

ii. In the GUI first mention the images in the source code then run the code.

iii. After that a window is opened and then images are converted to grayscale.

iv. Next, Structural Similarity Index (SSIM) algorithm is applied on both images.

v. Later, the contours are identified on the both the images and the images will shown in another window as diff and thresh.

vi. The pixel difference percentage will be shown in output window.

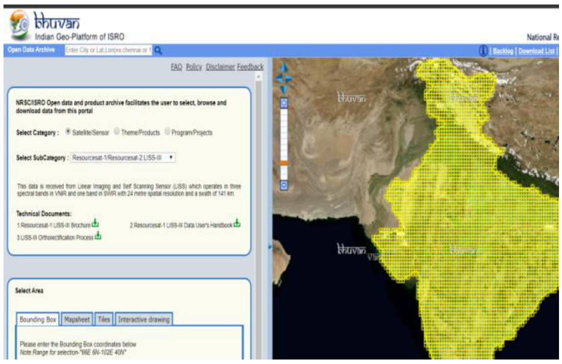

Fig.4 Opening Bhuvan website

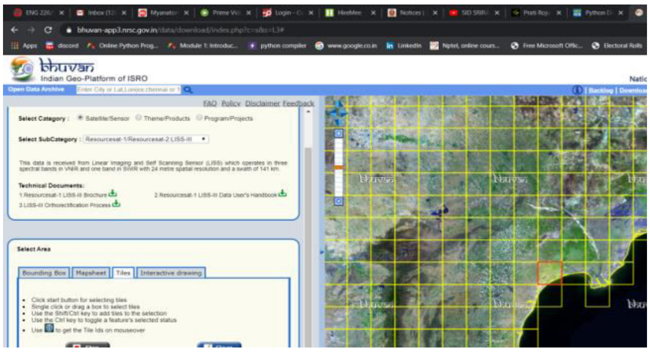

Fig.5 Selecting tiles

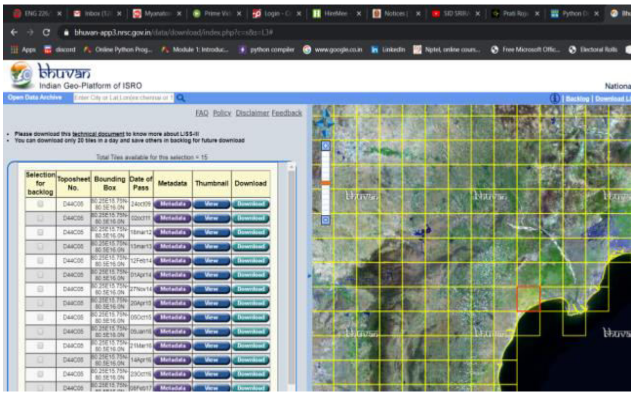

Fig.6 Downloading images

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

Fig7. Input image

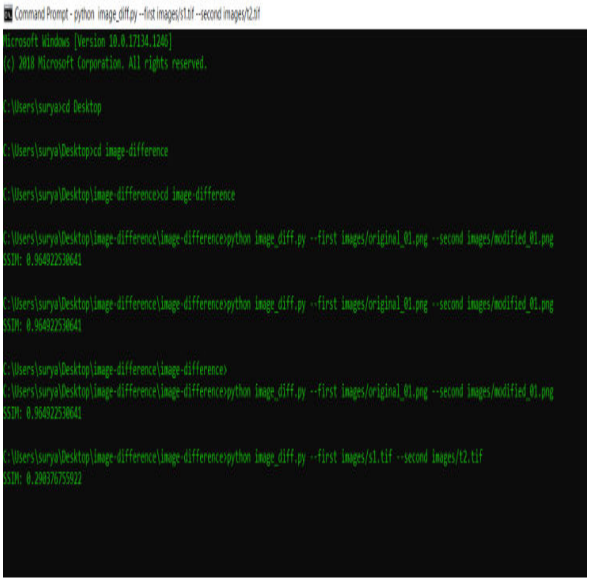

Fig.8 Command prompt

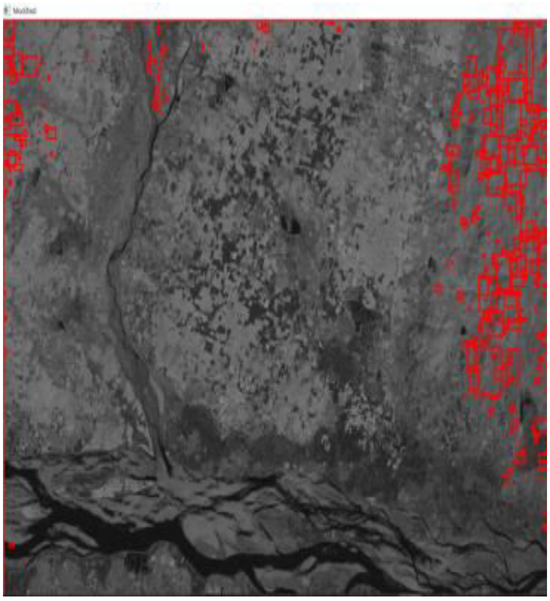

Fig.9 Identifying contours on image

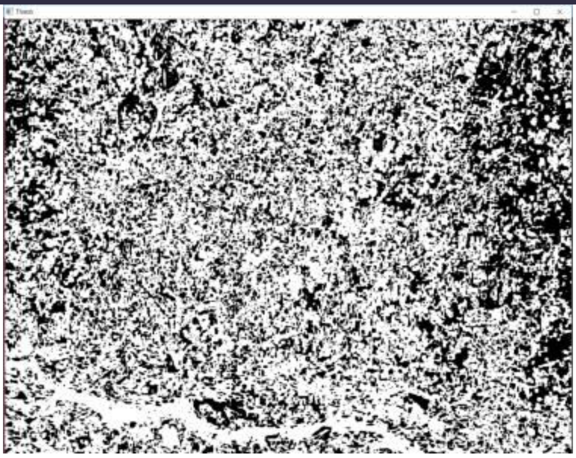

Fig.10 Output image

Conclusion:

So, we can observe that the existing system is not too efficient in terms of giving accurate values. Since satellite image sets of two different time lines are compared and analyzed to detect changes between to images. One of the most fundamental requirements of change detection is the registration between the two input images. It implies that the images should have perfect alignment between them, otherwise change detection would give many false alarms. By analyzing them contours are generated to each image sets and these contours are helpful to identify the changes. Contours are not easy to be identified and need considerable effects and survey of the locations from the remote sensing agencies.

References

[1]https://bhuvan.nrsc.gov.in/bhuvan_links.php

[2] Turgay Celik, "Unsupervised change detection in satellite images using Principal Component Analysis and K-means clustering", IEEE Geoscience and Remote Sensing Letters, Vol. 6, No.4, October 2009

[3]RJ Radke, S Andra, O Al- Kofahi, B

Roysam, Image change detection algorithms: a systematic survey. IEEE Trans. Image Process. 14(3), 294–307(2005)
[4]F Bovolo, L Bruzzone, M Marconcini, A novel approach to unsupervised change detection based on a semisupervised SVM and a similarity measure. IEEE Trans. Geosci. Remote Sens. 46(7), 2070– 2082 (2008)