REGIONAL LAND USE DYNAMIC MONITORING BY HIGH RESOLUTION SATELLITES DATA

Introduction

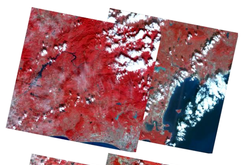
In the applications of remote sensing, land use and land cover change information is important because of its practical uses in various applications, including disasters monitoring, damage assessment, urban planning, urban expansion, land management and deforestation. Digital change detection techniques by using multi-temporal satellite imagery helps in understanding landscape dynamics. This study illustrates the spatio-temporal dynamics of land use/land cover of Sanya City, Hainan Province, China by using high resolution satellite images from GF series acquired in 2013 and 2015. The study area is approximately 500 square kilometers, cover the area of Sanya city

Method

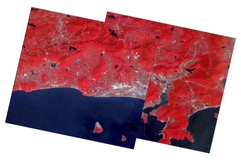
To illustrate the dynamics change of land use/and cover, the satellite image were prepared. Four images of GF-1 and two images of GF-2 were used. The data was acquired in 2013 and 2015 respectively with the spatial resolution of 2 meters. The image pre-processing consist of geometric rectification, pansharpening and image mosaicking were done by GIS and remote sensing software including ENVI, ERDAS and ArcGIS. The detail of process are as follow:

Image Pre-processing

2013 | GF Raw Data | 2015



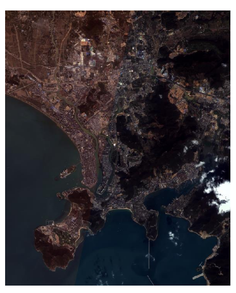
GF-1
acquired on 19 Nov 2013
(4 multispectral + 4 panchromatic)

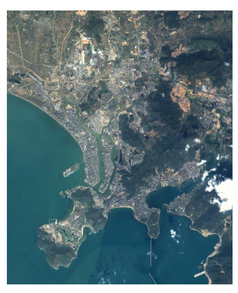


GF-2
acquired on 17 Oct 2015
(2 multispectral)

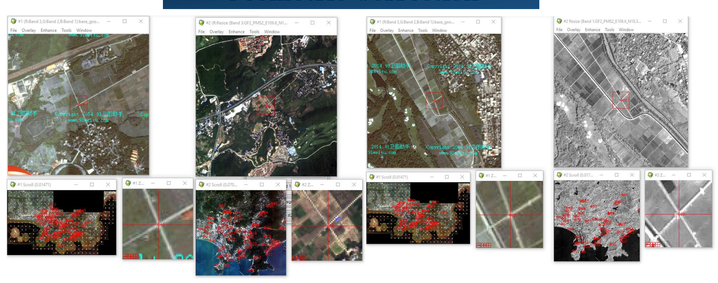
Radiometric Correction

*Only for learning purpose. This step is already done by Chinese Institutions.

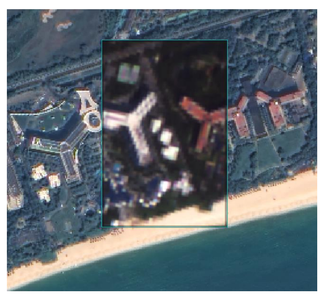


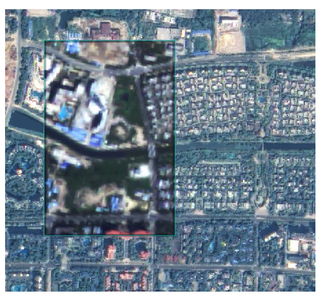


Geometric Correction



Pansharpening





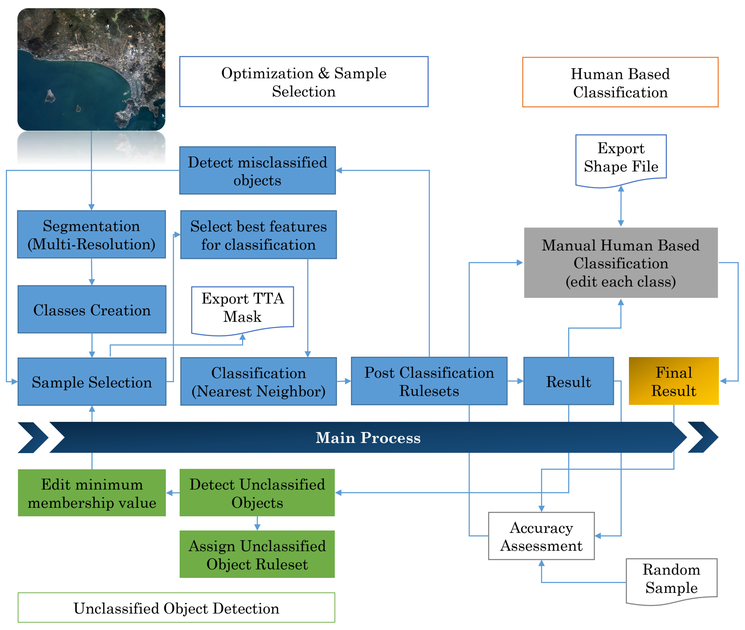
Gram-Schmidt Pan-sharpening algorithms are used to sharpen multispectral data using high spatial resolution panchromatic data.

Mosaicking and clipping

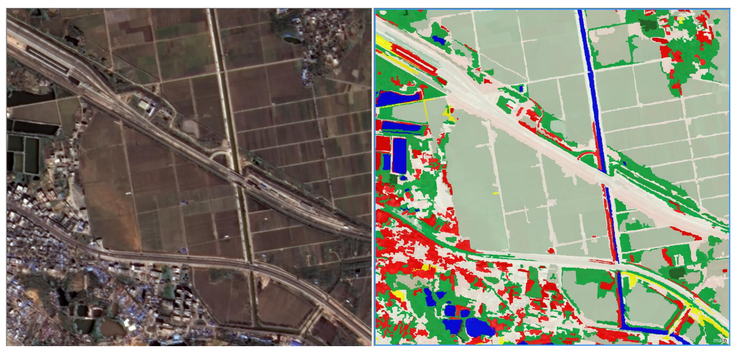
Automated seamline mosaicking and clipping GF images for 2013 and 2105 based on the same AOI polygon

Object-based Classification

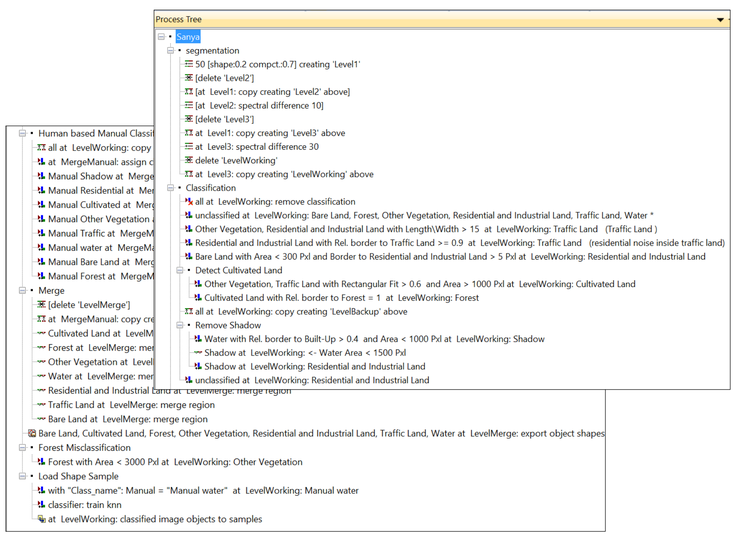
The image classification approach in this project is based on an object-based classification which classifies not single pixels but groups of pixels that represent the existing objects in satellite image. The approach is based on supervised nearest neighbor classification which classifies image objects with the given samples for the each classes.



The first step of image analysis is to cut the image into pieces, which is called segmentation. This project used multiresolution segmentation algorithms to do this.



Supervised Nearest Neighbor classification which is also a sample-based classification algorithm was used in this project based on user-defined samples.



Development of Ruleset for object-based classification

Land Use Dynamic Monitoring

The multiresolution segmentation algorithms and object-based classification was done by eCognition software by using the land use standard of China as a reference. To perform the change detection, this project applied two approach; Thematic Change which takes two classification images of the same scene taken at different times and identifies differences between them. The resulting classification image shows class transitions, for example, from vegetation to built-up. The second approach is Image Change which compares two images of the same geographic extent and identifies the differences. Below are the results of temporal dynamics of land use/land cover of Sanya city.

Thematic Change Detection

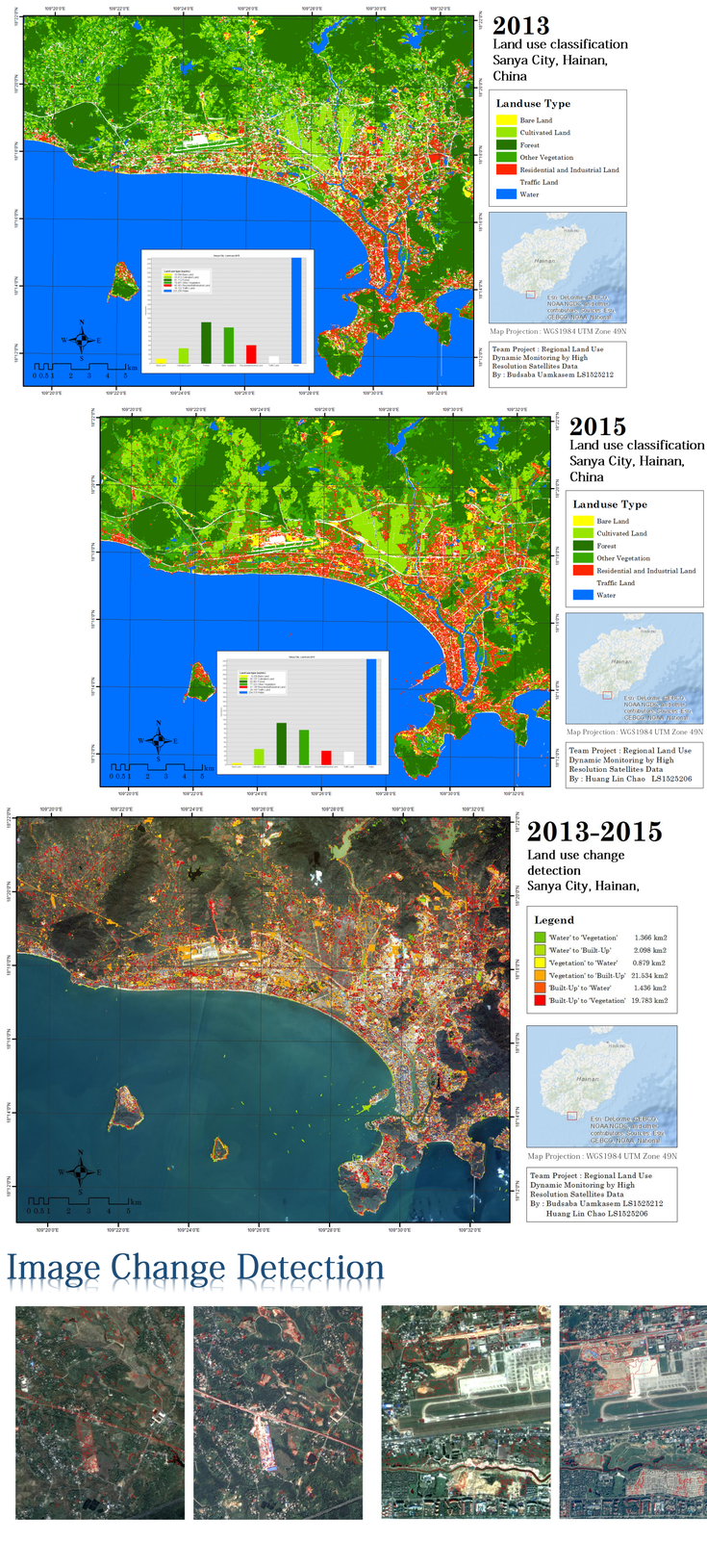


Image Change Detection

Conclusion

The idea of this project is that the image classification is not based only on the interpretation of single pixels but on whole group of objects. The GF image were successfully done basic image processing for image classification approach to illustrate the change detection over the certain area. However, the study shown that it is most desirable to use two images acquired with the same sensor, so that spatial, spectral, and radiometric resolution are the same. Also the atmospheric effects must also be accounted for in a change detection analysis.

Team Members

LS1525212 Budsaba Uamkasem (Thailand)
LS1525206 Huang Lin Chao (Bolivia)
MASTA 2015 (RS&GIS)
Beihang University

Project Advisor

Prof. Dr. Bi Jiantao
Institute of Remote Sensing and Digital Earth,
Chinese Academy of Science