

Assessing Land Cover Change During Drought Period in a Coastal Area of Binh Thuan Province, Viet Nam Using High Resolution Imagery

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Introduction

Binh Thuan Province is located in the Southern Center Coast of Viet Nam. The coastal area of this province has been suffered a rapid change of land use and land cover due to effects of desertification processes, economic transition as human impacts, and more frequent occurrence of drought event. The dry period of 2014-2015 brought severe drought to Northern of Binh Thuan, especially the coastal area.

This research is involving three coastal communes of Tuy Phong district, Northern of Binh Thuan. They are Binh Thanh, Lien Huang and Phuoc The.

High resolution images acquired for 5 year interval 2011-2016 are analyzed and classified to access land cover change due to the occurrence of severe drought. Additionally, the results can be used to examine land management practices during a severe weather event, and to evaluate alternative strategies to protect land. A validation is conducted based on the field trip in summer 2016

Methods & Materials

A. Materials:

Two images acquired in May 22, 2011 and June 16, 2016 are involved in this research. Although acquisition time of these images is 3 weeks different, it is feasible to access land cover change as May and June are starting time of growing season.

2011 image is acquired by World View 2 at 2m resolution for eight multispectral bands, and 0.5 m for panchromatic. The GeoEye-1 2016 image is at 2m resolution for four multispectral bands, and 0.4m for panchromatic.

B. Methods:

There are two approaches for deriving the land cover change from images.

1. PCA approach: quickly access the changes between two images based pixel value analysis.
2. Object oriented and pixel-based classification : establish two maps of land cover in 2011 and 2016, and the extract the changes based land cover types.

Results

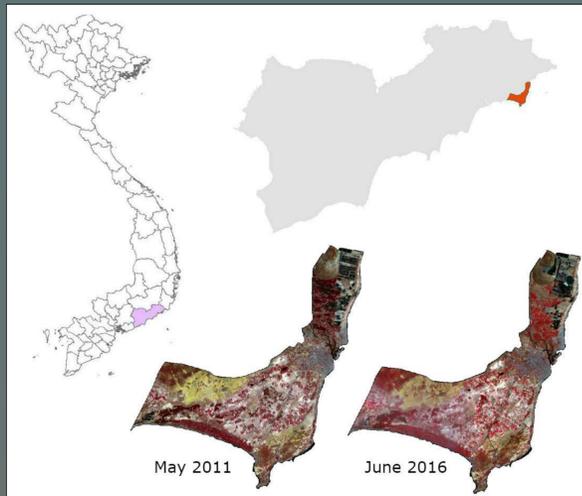


Figure 1. Study area and collected images

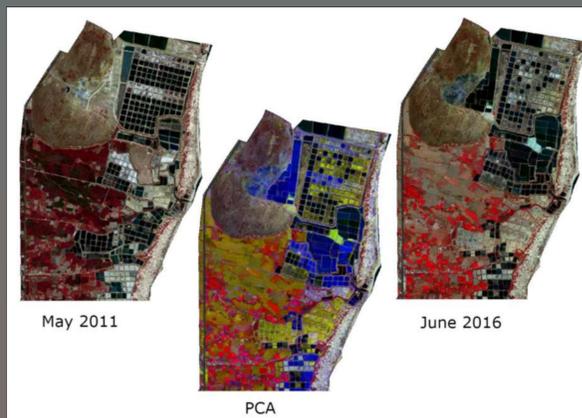


Figure 2. First three band composite of PCA (Principle Component Analysis) image



Figure 3. Different types of land use/cover

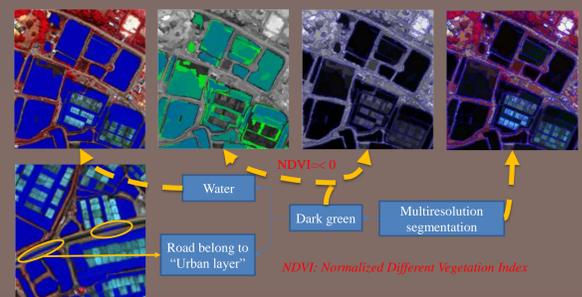
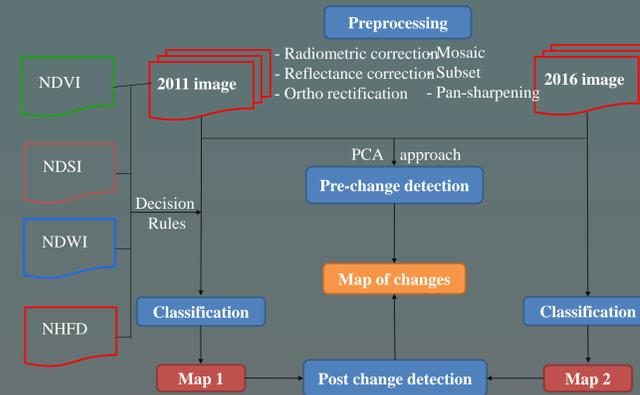
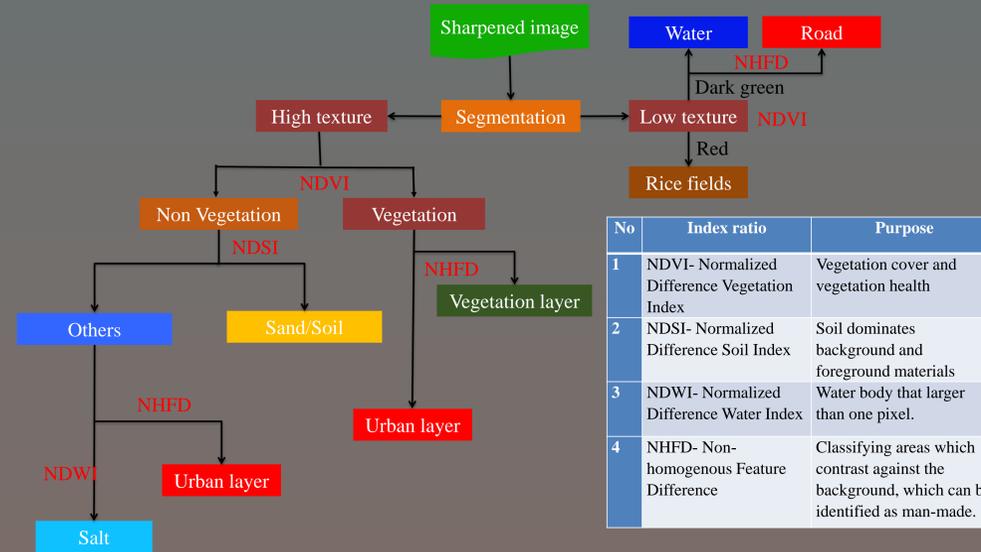


Figure 4. An example of decision tree based color and NDVI

Flowchart of the research's procedure



Object Oriented Classification applied for 2011 image



Some Notes for Classification Procedure

1. Shadowed areas: In this case study, we did not observe any significance of shadow effect. However, if the shadow effect is obvious, it is necessary to involve object-spatial relationship (neighborhood for instance) as one of indicators in the decision tree.
2. Effectiveness of band ratios: Despite of using objects' characteristics (shape, or color), applying band ratios can be considered as a good approach to categorize objects into layer due to their specific spectral information. However, values of those indices are quite sensitive and depend much on the pre-processing procedure.
3. Segmentation procedure: This procedure requires a lot of time consuming and analyst's experiences. Too small or too large sub-divided regions may lead to long time processing or missing data.
4. Decision tree: Constructing decision tree to classify objects into right categories is very important, but it is not an easy mission. Each object has its own specific characteristics, but also shares some common ones with others. More indicators may be helpful but costs a lot.

Pixel Based Classification applied for 2016 image

Some Notes for Classification Procedure

1. Pixel based classification though is easier to establish because the decision tree or rules are not necessary.
2. One of obstacles for the pixel based classification is that some land types share the same identities, such as color or pixel value. Uncultivated land and bare land is an example. The roof of houses and white sand is other example. Thus, creating homogenous classes or signature file is the most important step.
3. The Maximum Likelihood is selected to perform the classification procedure. Due to the "salt and peppers" occur on the final result, a generalization process is conducted to mitigate this error.

Conclusions

We are now establishing our proposed method to get the results. We have figured out some of obstacles need to be overcome:

1. Because of being acquired by different sensors, the processing procedures of the World View 2 image and the Geo Eye 1 image have consumed much of time and efforts.
2. The PCA approach may quickly detect the changes of land cover. However, this process typically based on the pixel values, it is not sufficient to conclude the change during the time observation as the fact of two different sensors and different spectral ranges.
3. Classification procedure based Object Oriented consumes more time than Pixel based. The decision rules need to be operated, and fixed sequentially.

In the future plan, we will focus more on conducting a complete decision tree, then generating final results and validating at last.

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