Algorithms and techniques for the extraction of urban attributes: The build-up areas

Introduction

Land cover classification is very important because it provides a vital information for assessment and monitoring of natural resources in different geographical locations

In this study a building area extraction is done using the landsat-8 images for the area of Beijing to Tianjin using three different methods:

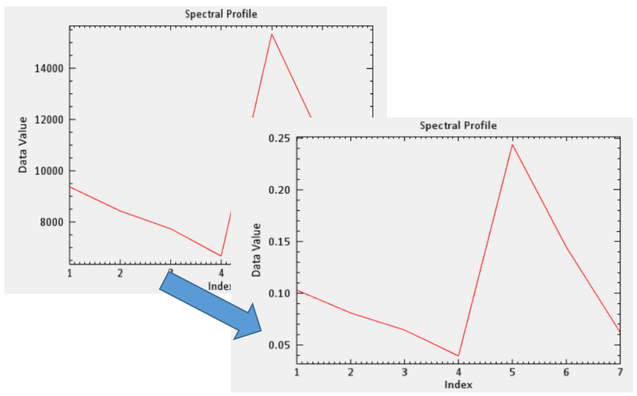
- Indexes;
- Supervised classification ;
- Decision tree classification.

Data and study area

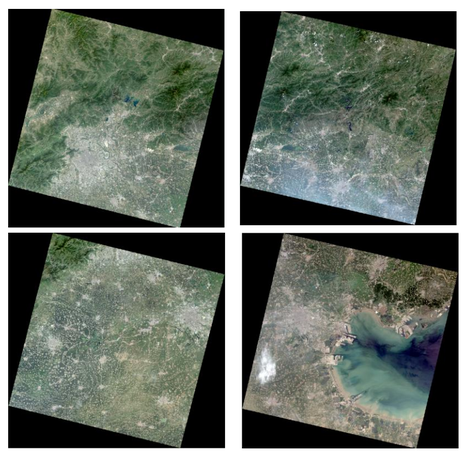
Landsat 8 was launched on 11 February 2013, it consists of two sensors that provide a spatial resolution of 30 meters (visible[5 bands], NIR, SWIR); 100 meters (2 thermal bands); and 15 meters (panchromatic).

The study area is located in the Northern CHINA, between Beijing and Tianjin and some part of Hebei, between 114.96° and 119.63° East longitude and between 37.83° and 41.40° North latitude on a total area about 150 000 km2.

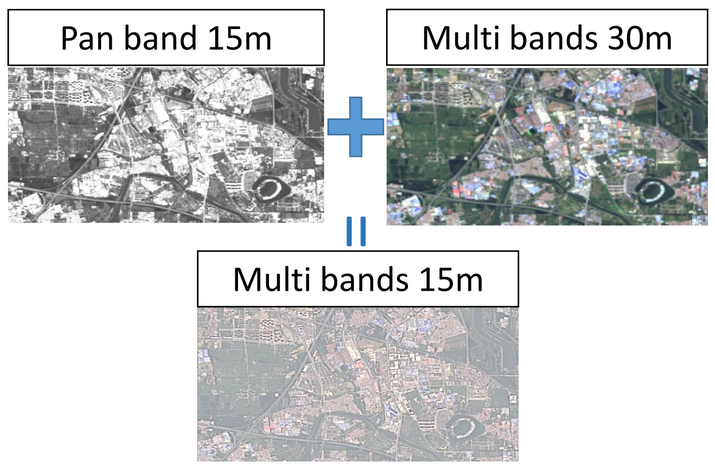
Step 1: Pre-processing



Radiation correction

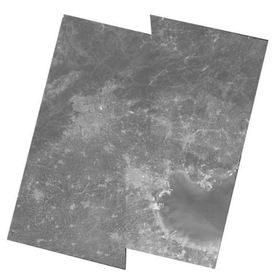


Mosaicking

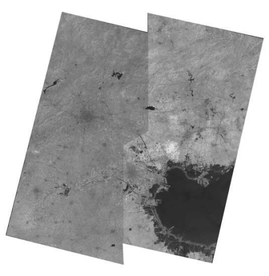


Pan-sharpening

Step 2 (A) Index

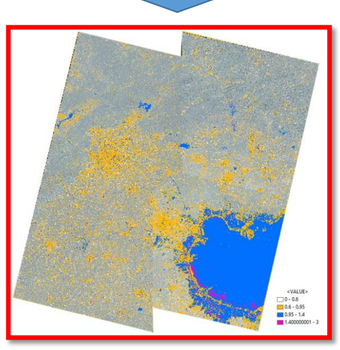


Band 4
(Red band)

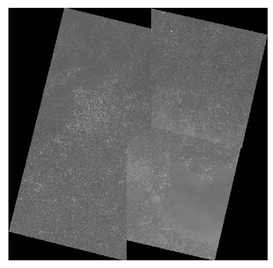


Band 5
(NIR band)

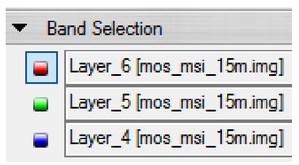
$$SR = \frac{RED}{NIR}$$

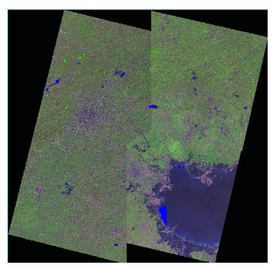


Step 2 (B) Supervised

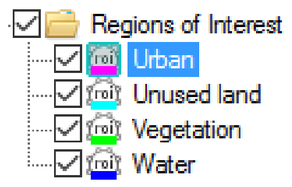


Bands selection

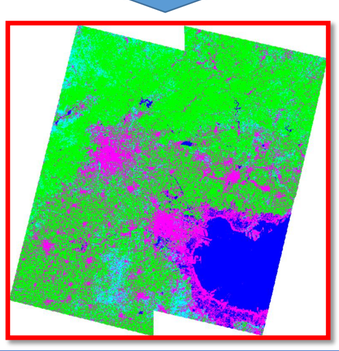




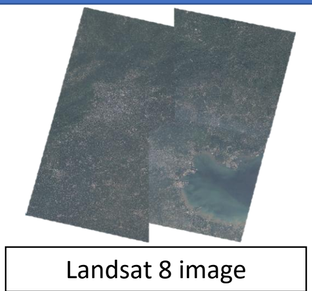
Training data selection



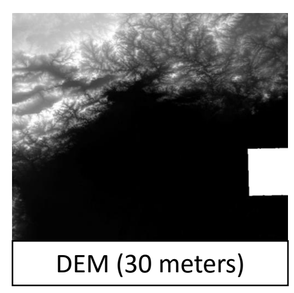
Maximum Likelihood Algorithm



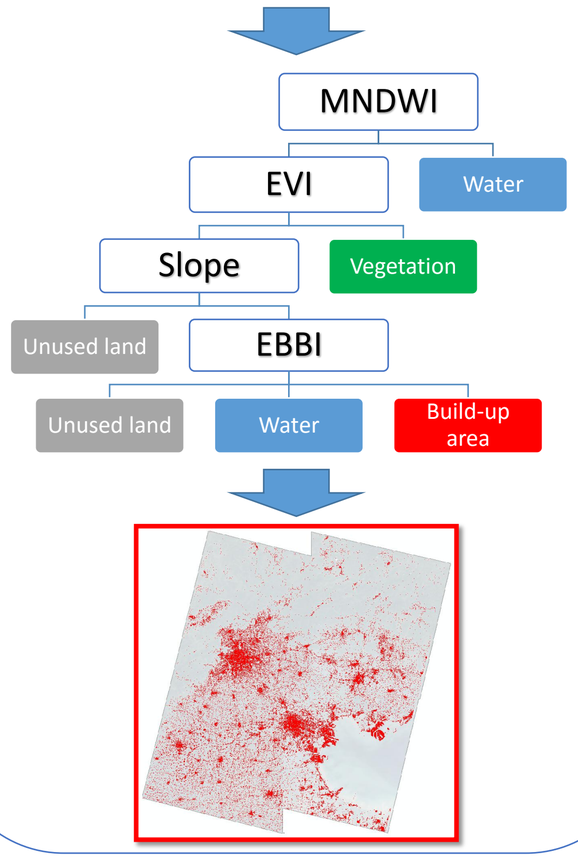
Step 2 (C) Decision Tree



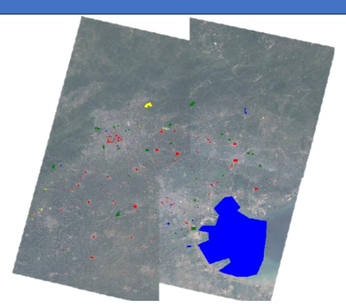
Landsat 8 image



DEM (30 meters)



Step 3: Accuracy assessment



Ground training data

Class	Nbr of samples
Building	194
Vegetation	36
Water	25
Unused	19

Methods	Ratio index	Supervised	Decision tree
Building Accuracy	68.78%	65.12%	84.42%

Conclusion

These three semi-automatic methods has shown the possibility to get an accurate land cover map for any area in a short time and with the minimum expenses.

From this study we can conclude that:

- The index method has shown some limitation to get the build-up area => it will be better to use a combination of indexes instead of only one.
- The supervised classification has suffer from some problems with the uncultivated vegetation land and brand land with the build-up area => The training data should be enhanced.
- The decision tree has given the best results with an accuracy of 84.42% => it can be enhanced by using a supervised classification on the original image with the use of the DT results.

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