THE UTILIZATION OF THE GLOBAL THRESHOLDING TECHNIQUE FOR DETECTING THE SEA FARM FACILITIES FROM HIGH-RESOLUTION SATELLITE IMAGERY

Yun-Jae Choung[1], Hyeong-Hun Kim[1], Do-Ryoeng Kim[1], Woo-Hyeon Kim[1]
[1]Research Institute of Spatial Information Technology, Geo C&I Co. Ltd., 435 Hwarang-ro, Dong-Gu, Daegu, 41165, Republic of Korea
Email : {chyj, hhkim, drkim, whkim}@geocni.com

KEY WORDS: Sea Farm Facilities, Spectral Reflectance Curve, Near Infrared Band, Global Thresholding

ABSTRACT: A sea farm is a manmade facility for breading the ocean resources such as seaweed, oyster, abalone, etc. Mapping sea farm facilities using the high resolution image sources is the necessary task for the management of the ocean resources and the estimation of their total productions. This research utilizes the global thresholding technique for detecting the sea farm facilities from the high-resolution satellite imagery through the following steps. First, the appropriate band suitable for identifying the sea farm facilities is determined by considering the surface reflectance curves. Next, the global thresholding technique is applied into the selected band for detecting the sea farm facilities from the given high-resolution satellite imagery.

1. INTRODUCTION

`A sea farm is defined as a man-made facility for breading the various ocean resources such as seaweed, oyster, abalone, etc. Mapping sea farm facilities using the high resolution image sources is the necessary task for the management of the ocean resources and the estimation of their total productions. Remote sensing datasets are useful for mapping the sea farm facilities because they can provide the geometric and spectral information of huge marine area without human access. Research on mapping the important features in marine/coastal areas using the remote sensing datasets has been carried out. Choung(2015) and Choung and Jo(2015) have utilized the satellite imagery and the airborne topographic LiDAR (Light Detection And Ranging) data for mapping the shoreline features. The proposed research includes the multiple steps for mapping the sea farm facilities illustrated as follows. First, the appropriate band suitable for identifying the sea farm facilities is determined by considering the surface reflectance curves. Finally, the global thresholding technique is applied into the selected band for detecting the sea farm facilities from the given high-resolution satellite imagery.

2. STUDY AREA AND DATASETS

In this research, we selected the marine areas nearby Jindo Island (see Figure 1) due to the data availability. As seen in Figure 1, the various sea farm facilities were located in the selected study area.

Figure 1. Sea farm facilities located in marine areas nearby Jindo Island

The given high-resolution satellite image was acquired from KOMPSAT-3 satellite and the given image source was taken in.

3. METHODOLOGY

For detecting the sea farm facilities, we needed to select the appropriate band from the given image source. In general, the sea farm facilities are floating in the water, and it cause the sea farm facilities are well visualized in the band which the difference between the water and other materials is significant. Considering these characteristics, we selected the Near-InfraRed (NIR) band that have the significant spectral reflectance difference between water and other features (see Figure 2).

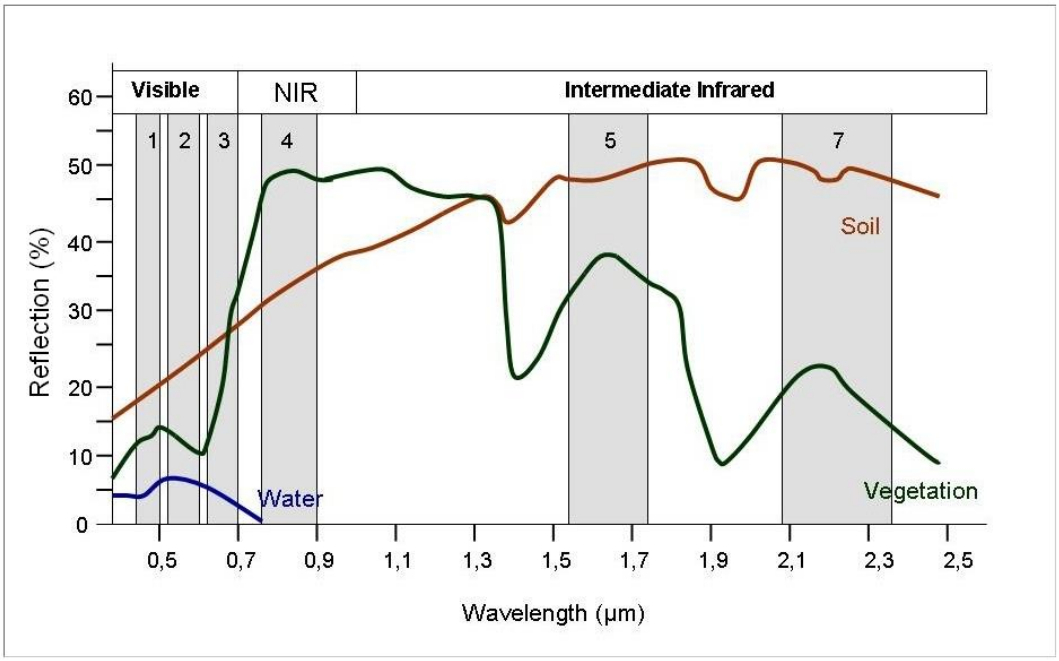

Figure 2. Spectral reflectance curve in different bands (Science Education Through Earth Observation for High School, 2016)

Figure 3 shows the selected NIR band showing the study area.

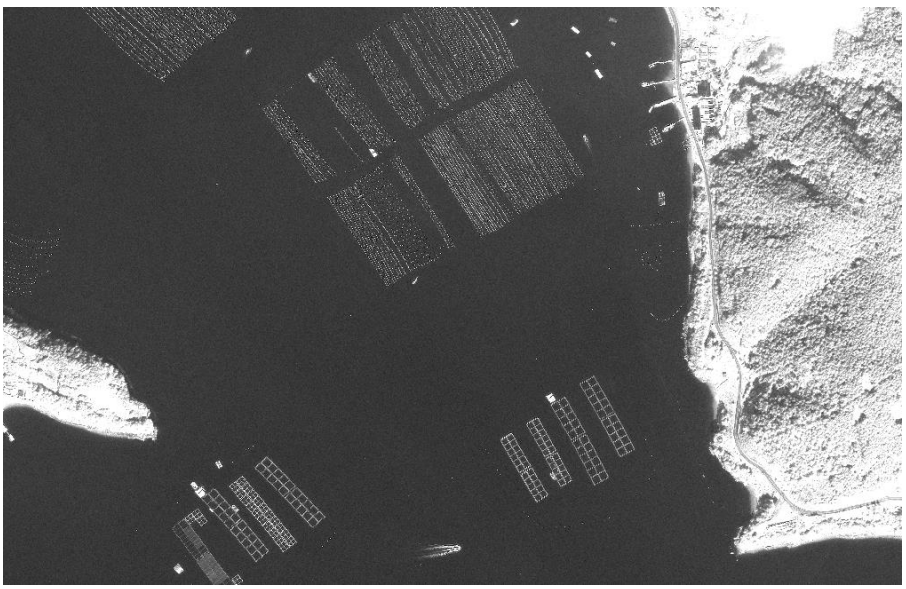

Figure 3. Selected NIR band showing the study area

After the appropriate band was selected, the global thresholding method was applied to separate the sea farm facilities and water. Figure 4 shows the binary image (sea farm facilities: white regions; water: black regions) generated by the global thresholding method.

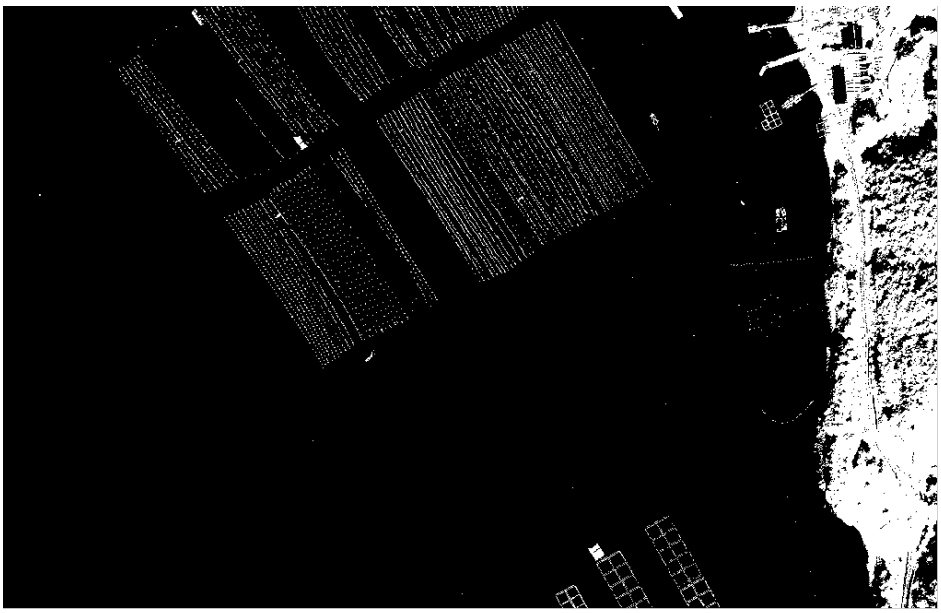

Figure 4. Binary image generated by the global thresholding method

As seen in Figure 4, the sea farm facilities were well visualized and separated from water.

4. CONCLUSIONS

This research proposes a new methodology for mapping the sea farm facilities from the high-resolution satellite image. The shapes of the sea farm facilities obtained through the proposed methodology are well recognized.

5. ACKNOWLEDGEMENT

This research was supported by Basic Science Research Program through the National Research Foundation of Korea(NRF) funded by the Ministry of Science, ICT & Future Planning(NRF-2014M1A3A3A03067386)

6. REFERENCES

- Choung, Y. 2015. Mapping 3D Shorelines Using KOMPSAT-2 Imagery and Airborne LiDAR Data. Journal of the Korean Society of Surveying, Geodesy, Photogrammetry and Cartography, 33(1), pp. 23-30.
- Choung, Y. and M. Jo. 2015. Shoreline Change Assessment for Various Types of Coasts Using Multi-Temporal Landsat Imagery of the East Coast of South Korea. Remote Sensing Letters, 7(1):91-100.
- Science Education Through Earth Observation for High School. 2016. Spectral Reflectance Properties, Retrieved September 12, 2016, from http://www.seos-project.eu/modules/remotesensing/remotesensing-c01-p05.html.