Artificial Neural Network Approach for Vessel Detection Using Visible Infrared Imaging Radiometer Suite Day/Night Band

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Abstract : In this paper, vessel detection using the artificial neural network is proposed in order to automatically construct the vessel detection model from the satellite imagery of day/night band (DNB) in visible infrared in the products of Imaging Radiometer Suite (VIIRS) on Suomi National Polar-orbiting Partnership (Suomi-NPP).The goal of our research is the establishment of vessel detection method using the satellite imagery of DNB in order to monitor the change of vessel activity over the wide region. The temporal vessel monitoring is very important to detect the events and understand the circumstances within the maritime environment. For the vessel locating and detection techniques, Automatic Identification System (AIS) and remote sensing using Synthetic aperture radar (SAR) imagery have been researched. However, each data has some lack of information due to uncertain operation or limitation of continuous observation. Therefore, the fusion of effective data and methods is important to monitor the maritime environment for the future. DNB is one of the effective data to detect the small vessels such as fishery ships that is difficult to observe in AIS. DNB is the satellite sensor data of VIIRS on Suomi-NPP. In contrast to SAR images, DNB images are moderate resolution and gave influence to the cloud but can observe the same regions in each day. DNB sensor can observe the lights produced from various artifact such as vehicles and buildings in the night and can detect the small vessels from the fishing light on the open water. However, the modeling of vessel detection using DNB is very difficult since complex atmosphere and lunar condition should be considered due to the strong influence of lunar reflection from cloud on DNB. Therefore, artificial neural network was applied to learn the vessel detection model. For the feature of vessel detection, Brightness Temperature at the 3.7 μm (BT3.7) was additionally used because BT3.7 can be used for the parameter of atmospheric conditions.

Keywords : artificial neural network, day/night band, remote sensing, Suomi National Polar-orbiting Partnership, vessel detection, Visible Infrared Imaging Radiometer Suite

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