

ABSTRACT

The objective of the research is to study the usability of Compact Polarimetry mode CTLR and evaluate the potential in improving the accuracy of the ship detection algorithms covering wider swath with reasonable degree of False Alarm (FA). The research limits use of SAR (RISAT-1 CFRS & MRS data, Sentinel 1A GRDH & IW data) and software tools, such as, ERDAS Imagine, Matlab and Exelis ENVI for analysis. The observation of maritime activity is the need of time which has improved since inception of Synthetic Aperture Radar (SAR) imagery from space and aerial platforms. However the large amounts of modern SAR systems image data generate are capable of quickly overburdening a human observer. Conventionally EO image interpretation is done manually is accurate but has got limitations of high processing cost & time besides being in-efficient in adverse weather conditions like fog or clouding. However Microwave SAR remote sensing offers cost-effectiveness with better efficiency and flexibility for the identification of ship under all weather conditions. This research has taken the problem of ship detection and aimed to solve it using advanced computational techniques. The research also discusses techniques which can be adapted for better visualization and classification of image in systematic coverage for ship detection which both Sentinel-1A & Risat-1 has been analysed. Support Vector Machine (SVM) has been used to analyse systematic coverage Medium Resolution to Fine Resolution data and improvised the various techniques for image analysis that could be used for Ship detection problem. An addition paradigm to the Ship Detection and capability enhancement is attempted by proposal of a robust empirical model based classification that can be utilised

with limited knowledge of the environment. The various decomposition techniques and classification techniques has been used to derive the target signatures of target using Hybrid Polarimetry to enhance the ship detection algorithms. Objective analysis of the PolSAR data for detection performance, accuracy assessment and validation has been done for Medium resolution Sentinel-1A and Risat-1 PolSAR data using a Histogram Frequency Slicing based classification technique and Fine resolution Risat-1 Hybrid Polarimetry strengths has been explored for further target analysis. The research also discusses as to which techniques can be adapted for better visualization and classification of image in systematic coverage for ship detection, assess usefulness of the compact polarimetry or hybrid polarimetry (Circular Transmit Linear Receive data) towards enhancement of ship detection and assess the accuracy of classification in the proposed histogram frequency slicing method.

Keywords: SAR, Ship detection, semi-automatic detection, RISAT-1, Sentinel- 1A, Systematic coverage, Support Vector Machine (SVM) detector.