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SHIP MONITORING BY SAR DATA IN SUPPORT TO INTEGRATED MARITIME SURVEILLANCE SERVICES

Abstract

National and international security agencies are interesting in matters like maritime traffic security, pollution control, monitoring migration flows and detection of illegal fishing activities. In this concern the European Maritime and Safety Agency is going to integrate its services to provide vessel traffic monitoring information using geographical information service to improve the capability to detect illegal oil spills and to indentify responsibilities. Furthermore maritime security is also under consideration by European Space Agency in the framework of the European crisis response architectures to comply with different issues: counter piracy actions, tanker accident monitoring, rescue support in the Artic region. In addition, the kick-off of the BlueMassMed pilot project was held in 2010, granted by the European Commission, which aims at increasing the cooperation for maritime surveillance in the Mediterranean Sea, including surveillance of illegal immigration, illicit trafficking, environmental pollution and reinforcement of the Search and Rescue efforts. Up until now, different options have been considered for vessel monitoring: transponders onboard vessels (AIS), optical imagery, etc. However, the achieved results in real scenarios (Margarit, IEEE TGRS, 2007) have shown that none of the off-the-shelf commercial systems is mature since they do not provide accurate, reliable near-real time information. The major problem is the impossibility to detect ships at every sea state and to separate ships from other artificial offshore objects. SARs are a valuable solution since they monitor wide areas with high spatial resolution, day and night and independently from weather. However, in spite of significant research activity focused on ship detection and motion estimation, there are no efficient and robust algorithms that can routinely provide useful detection of ship and estimates of the speed and heading of detected ships (Dragosevic, GRSL, 2008). This paper deals with ship monitoring (detection, classification, tracking) algorithms based on SAR data. Since satellite images are characterized by large swaths, it is likely that the imaged scenes contain a large number of ships, with the vast majority, hopefully, performing legal activities. Therefore, the imaging system needs a supporting system which identifies legal ships and limits the number of potential alarms to be further monitored by patrol boats or aircrafts. Specifically the work focuses on maritime surveillance by using SAR data adequately integrated by AIS information to individuate innovative and reliable SAR-based products for sea traffic monitoring. The developed approach is finally validated using different combinations of both simulated and real-world AIS and COSMOSkyMed data.