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OIL SPILL DETECTION ON RADAR IMAGES BY USING MATHEMATICAL MORPHOLOGY

Abstract

Remote sensing systems on board of satellites represent the best way to observe the earth without any constraint on the location of the region of interest. As a consequence of this possibility to access practically any place of the Earth satellites can be used to gather information everywhere without any restriction related to geographical and/or political reasons. Considering Earth observation systems orbiting on GEO (Geostationary Earth Orbit) or LEO (Low Earth Orbit) revisit frequency ranging from several minutes (15 min for MSG/SEVIRI) to few weeks (16 days for ASTER) and spatial resolution ranging from few km to tens of cm can be obtained. Due to the current technological limits the observation characteristics allowed by these two systems categories can be easily distinguished since GEO observations provide fast revisit and coarse resolution whereas LEO observations provide slow revisit frequency and a wide range of resolutions from very high (lower than 1 m) to coarse (about 1 Km). Satellite constellations, like the Italian 4-satellites constellation Cosmo-SkyMed, have been designed with the aim to fill the gap between GEO and LEO systems performances. In fact, this constellation, when complete (three satellites have been placed in orbit up to now) will guarantee a 12-hours revisit frequency with a spatial resolution of the order of 1 m thanks to their on-board radar systems. The increasing availability of high spatial resolution satellite images, if opportunely exploited could result very useful to provide information suitable to support decision makers in managing disasters or emergencies.

The problem of processing huge amount of images looking for object of size, location and spectral characteristics unknown cannot be deal with by using manual processing approaches. The CRPSM (Centro di Ricerca Progetto San Marco) have been analysing the problem of automatizing the processing chain as a consequence of is involvement in the GMOSS Network of Excellence funded by European Commission in the mainframe of the FP6 (Framework Program 6). In particular, the authors were involved in activities related with the Border and Population Monitoring and Early Warning work packages. Therefore, this paper aims at showing the results obtained by applying algorithms able to automatically detect "oil spills" on RADAR images (like ERS, ENVISAT, etc), developed starting from techniques already successfully applied to optical images.

The objective of detecting in an automatic way oil spill on RADAR images has been achieved by using innovative techniques based on Mathematical Morphology.