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Coastal and marine monitoring

A Proactive System For Maritime Environment Monitoring

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Oil pollutions impact the environment, the economy and the quality of life for coastal inhabitants. The increasing importance of petroleum products raised the concern on maritime safety and environmental protection, leading to a greater interest in frameworks for remotely detecting oil spill at sea. Several technological advances were made, especially under the propulsion of catastrophic events. Nevertheless, most of the approaches have been focused on large oil spills while smaller ones and operational discharges in regional area have received somewhat less consideration, despite their importance in the routine work of local authorities, especially in protected areas of great environmental value. In addition, classical remote sensing frameworks can be enriched by adding information collected in situ thanks to static and mobile sensors and leveraging on innovative methods for data correlation and fusion. In this work, we aim at addressing these issues by proposing an integrated and interoperable system based on advanced sensing capabilities from a variety of electronic sensors along with geo-positioning tools, yet suitable for local authorities and stakeholders. In particular, the proposed Marine Information System (MIS) integrates multispectral aerial data, SAR satellite processed data, environmental data from in situ monitoring stations (e.g. buoys), dynamic data acquired from in situ mobile sources (e.g. volunteers, Autonomous Underwater Vehicles ...). The MIS is enriched with a collection of environmental decision support services, for i) automatically screening the overall situation, ii) quantitatively representing risk factors and iii) proactively notifying events that deserve the consideration of end users. A model for the computation of dynamic risk maps has been included, by aggregating the available heterogeneous data source ranging from maritime traffic density to water quality parameters sensed by electronic noses. Visualization of the risk map provides a quick yet effective way to have an outlook of the situation in the monitored area, while its automatic analysis – performed by intelligent agents – allows the delivery of proactive alerts to local authorities in charge of monitoring. The proposed system has been demonstrated during extensive test exercises held at the National Marine Park of Zakynthos and at National Parkf of Tuscany Archipelago in the framework of FP7 Project Argomarine. Keywords: Marine Information System, Oil spill monitoring, Environmental Decision Support Systems, Proactive environmental monitoring