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SATELLITE IMAGE APPLICATION SYSTEM DEVELOPMENT FOR KOREAN MARITIME DOMAIN AWARENESS

Abstract

Korea Aerospace Research Institute (KARI) is developing Korea Coast Guard Satellite Image Application System (KCGSA) with the aim of starging the service in 2028. This project is to develop a system for the organic integrated operation and convergence application of three types of satellite systems, which are remote sensing, communication, and Korea Positioning System (KPS) to be used by Korea Coast Guard (KCG). KCGSA aims to support Korean Maritime Domain Awareness (MDA) system being promoted by KCG. Korean MDA is a preemptive response system by establishing a national surveillance and information network to effectively understand the situation and environment of offshore Korean Peninsula. However, terrestrial based Automatic Identification System (AIS) has limitations in supporting wide-range maritime surveillance with high accuracy because it is possible to avoid AIS surveillance by illegal ships and cannot receive AIS signal far from the coast. The mission of KCGSA is to support rapid response measures in marine disaster situations by combining various types of data based on satellite images and providing the information required by MDA. Therefore KCGSA will enable wide area monitoring of offshore beyond AIS data limitation. KCGSA is largely composed of foaur subsystems in terms of system management and six types of application services. The subsystem in terms of system management consists of Service Integration and Management Subsystem (SIMS), Data Collection and Management Subsystem (DCMS), Satellite Image Request Subsystem (SIRS), and Satellite Image Enhancement Subsystem (SIES). Six subsystem with application service function consists of Vessel Detection Identification Subsystem (VDIS), Vessel Activity Monitoring Subsystem (VAMS), Vessel Route Safety Subsystem (VRSS), Coastal Facility Monitoring Subsystem (CFMS), Maritime Pollution Monitoring Subsystem (MPMS), and Maritime Incident Response Subsystem (MIRS). KCGSA application services are provided by generative AI trained with machine learning algorithms, which play a key role in analyzing and interpreting complex maritime environments for improved response and prevention measures in marine disaster situations. Traing data is employing optical and synthetic aperture radar (SAR) images from Korean domestic remote sensing satellites, such as KOMPSAT and CAS, and overseas public data. Also the application services additionally use the multi-domain data, for example ship location information, such as terrestrical and satellite AIS, ship registration record, ocean current prediction information, and weather information. KCGSA is in the priliminary design phase and this paper introduces KCGSA system architecture and operation concept of application services.