ARTIFICIAL INTELLIGENCE-BASED VIRTUAL CONTROL ROOM

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Introduction

Maritime navigation, surveillance, and communications systems, combined with today's network technologies have created enormous amounts of available data collected from vessels and various other sources. Due to these vast amounts of data, threats and other significant maritime events of interest are often lost and hidden in regular traffic patterns. Without intelligent processing of data, there is a risk of information overload, the situational picture getting over complicated leading to decision-making delayed or impaired.

AI-ARC project improves maritime safety and security by developing Virtual Control Room (VCR), an artificial intelligence (AI) based platform that answers to the above-mentioned challenges. By processing the collected data, VCR provides situational awareness improving decision-making and safety for all maritime actors without increasing workload. VCR consists of different layers targeted for civilian mariners or for authorities.

Materials and methods

To find out what are the needed services for different user profiles, both civilian mariners and authorities were interviewed in the early stage of the project. The end-users are involved during the whole project in testing and validating the VCR and giving feedback in each development phase.

The VCR collects information from multiple data sources such as AIS, satellite-AIS, and satellite images, and in situ data from seafarers. The data is used for improving the end-users' situational awareness through several types of services for different end-user profiles.

Results

The VCR will improve both civilian and authorities' maritime situational awareness, risk management, reaction and operational capabilities. For example Coast Guards will have predictions of vessel movements to detect illegal activities and civilian mariners will have predictions of icepack movements to ensure safe navigation. The system detects anomalies and alerts users. Detection of oil spills or other environmental emergencies is based on processing satellite data and in-situ data. The maritime situational picture and outcome of the services are visualized in VCR to enhance the probability of detecting unexpected phenomena. The VCR will give an alert to the operator in case of an anomaly is recognized. This supports operator's decision-making capabilities.

The novelty of the system is to bring the possibility for mariners to share their observations by in-situ data. In-situ data complements the situational picture. For example, oil spills and navigational hazards or environmental risks can be shared with other users by utilizing the in-situ data feature. Also, the Business Process Model (BPM) as a feature of VCR supports decision-making capability by proposing the next actions in case of emergency, for example, Search And Rescue-situations.

The VCR platform is interoperable with different data sources and surveillance systems in order to facilitate improved information exchange and collaboration among different actors. The VCR platform will be interoperable with the Common Information Sharing Environment (CISE). The VCR includes 3D, laptop, and mobile phone versions.

Implications on sustainable maritime operation

The VCR increases the safety of navigation and thus decreases the risk of grounding or collision, which can cause a serious environmental disaster. If the accident happens, it gives Search and Rescue authorities a better situational picture and supports the decision-making (BPM). VCR also promotes surveillance and preservation of natural resources, such as fisheries. Enhanced early detection of oil spills and environmental disasters enables rapid and coordinated response. This makes it easier to find the source of the oil spill.