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NORTH STAR: DATA-DRIVEN SAILING FOR AN EFFICIENT AND SAFE PASSAGE IN THE ARCTIC OCEAN

Abstract

Because of its location in the high latitudes, maritime navigation in the Arctic Sea is fraught with danger such as strong atmospheric Electro Magnetic Interference (EMI), bitterly cold weather, unreliable satellite signal and coverage, amongst others. A vessel not knowing its position while navigating in the Arctic may find itself in a life-and-death situation for the crew. In the framework of the 2nd Cassini Hackathon aimed to promote ideas based on a safe passage in the Arctic, the authors developed a product called North Star. The aim of North Star is using Earth Observation data provided by Galileo and Copernicus services to improve upon the navigation in the Arctic. It consists of an on-board neural engine, the AI Pilot, which searches for and identifies a safe route for the user. The neural engine is trained on the Copernicus data from the Sentinel constellation, which includes information such as ice thickness, iceberg distribution, wind speed direction, and wave height for a specific passage. In the event of a satellite signal loss, the AI Pilot reuses the information received from Galileo and EGNOS up to that point and integrates them with the vessel's own maritime sensors to maintain the viability of the projected route. The idea behind the AI Pilot is that when a vessel is within communication range with other North Star vessels, they form an ad-hoc mesh network of data collectors with edge computing capabilities. The creation of a mesh network can provide augmented data to the entire GNSS ecosystem. While shipping transportation of oil and gas across the Artic passages undergoes more strict regulations, private tourism and charter yacht operators in the Arctic are an emerging market, due to the relatively unsafe travel conditions. North Star can have a beneficial impact on the tourist branch as first target, extending afterwards to support Search and Rescue (SAR) operations, as well as contribute to the protection of the environment and the Arctic fauna. This research presents the concept of operations of North Star, as well as its high-level description from the technical perspective. The potential of this business case is further investigated, to include a roadmap of services offered until the return of investment, potential customers, and current competitors.