HASMAR

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Context and motivation

Correction services, such as Galileo HAS, enhance the accuracy of GNSS-derived navigation data. These services not only improve accuracy but also facilitate integrity algorithms by increasing the likelihood of detecting and excluding erroneous measurements.

Various correction services are available, supporting different GNSS constellations and offering varying levels of performance. One of those services, the Galileo HAS, introduces several key features:
- Available globally
- Accessible via both Galileo satellites and the internet
- Supports both Galileo and GPS
- Supports both single and dual frequency
- Utilises PPP for improved performance
- Offered free of charge to users

The inclusion of Galileo HAS in Kongsberg Discovery's GNSS-based products is therefore essential for maintaining competitiveness in the maritime market.

Due to the relatively weak nature of GNSS signals, they are susceptible to threats such as jamming, meaconing, and spoofing. Addressing these threats involves using alternative positioning sources, like inertial systems and other ranging technologies, as well as enhancing GNSS robustness. In the DPS product, Galileo HAS will be combined with inertial sensors. Robustness against jamming can be achieved using Controlled Reception Pattern Antennas (CRPAs), while spoofing may be mitigated through authentication methods. The project will assess the application of CRPA antennas and implement authentication via Galileo OSNMA.

Targeted GNSS innovation
Galileo HAS, CRPA antennas

Targeted Product
Galileo HAS in Kongsberg Discovery's high-end products for Dynamic Positioning (DP)

Scope

The project aims to integrate Galileo High Accuracy Service (HAS) into Kongsberg Discovery's high-end products for Dynamic Positioning (DP) Class 1 and 2, including the DP reference system DPS i-series, DARPS, and Seapath. Requirements for using Galileo HAS in DP operations will be defined, focusing on the safety case of auto docking which will be discussed with class societies.

The solution will further be demonstrated in a maritime auto-docking operation on the Flakk-Rørvik ferry crossing, a part of Norwegian county road 715.

Apart from Galileo HAS, the project will also use additional means for increasing integrity and resilience with the use of Galileo Open Service Navigation Message Authentication (OSNMA) and Controlled Reception Pattern Antennas (CRPAs). The solutions will be tested under spoofing and jamming conditions, including participation at Jammertest .

Challenge & technical solution

The technical solution includes:
- Integrating Galileo HAS into Kongsberg Discovery's DP i-series and achieving TRL-8
- Demonstrating Galileo HAS in auto-docking operations to achieve TRL-9
- Implementing Galileo OSNMA at the product prototype level
- Replacing standard GNSS antennas with CRPA antennas