AISS 23
Autonomous Inland
& Short Sea Shipping

Information Platform Concept for HD Inland Waterway Mapping

Lukas Hösch and Daniel Medina, Deutsches Zentrum für Luft- und Raumfahrt, Institut für Kommunikation und Navigation (Abteilung Nautische Systeme), 17235 Neustrelitz, name.surname@dlr.de

Abstract

While encouraging inland waterway transport (IWT) as an efficient way of mass good transportation, traffic circulation on inland waterways is expected to increase. Precise and well-updated chart data is a key-factor for safe operation and furthermore required by advanced driver assistant systems (ADAS). Traditional survey methods are intense in cost and time. Furthermore, regarding the representation of bridges in inland waterway maps, traditional survey methods are limited to the description of horizontal and vertical clearances.

The project AutonomSOW [1] addresses these challenges by equipping a relevant number of inland vessels with sensors for visual perception and precise navigation. These vessels can then be treated as information platforms, that acquire spatial mapping data while being underway. From the spatial mapping data, bridge contours are extracted and transmitted to a database to create a self updating HD-chart of inland waterways.

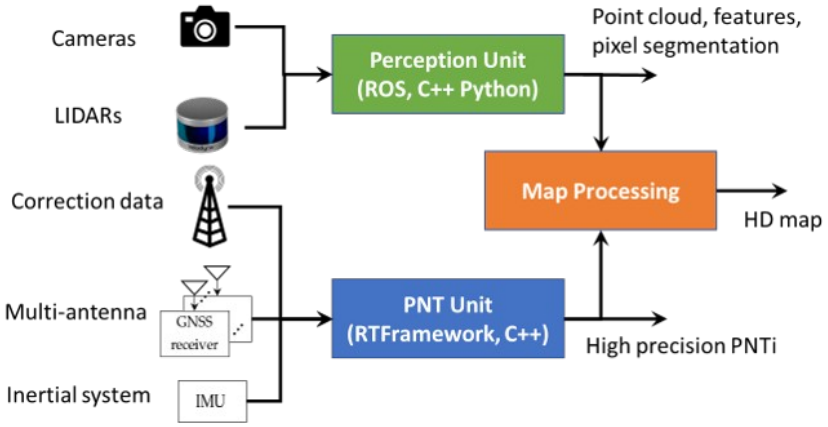

Figure 1: Overview of the sensor inputs for HD map generation within our information platform.

This work presents the deployment of the described sensor platform for measurement campaigns and discusses the characteristics of different sensors with respect to IWT-related infrastructure mapping. An overview of our concept for HD mapping is illustrated in Fig. 1. The HW selection and mounting are justified, along with the navigation, perception and mapping algorithms employed. Regarding the HW, DLR's research vessel *AURORA*, a 9-meter motorboat (Quicksilver Pilothouse 675), is used as moving platform. For localization purposes, AURORA incorporates three GNSS (Global Navigation Satellite System) geodetic antennas and receivers and two inertial measurement units (IMU), with differential and high precision GNSS correction data received over GSM. As perception sensors, AURORA features two stereo-cameras with different focal lengths, three LiDAR (Light Detection and Ranging) sensors with different characteristics (i.e., various horizontal and vertical field of views, number of channels or maximum range). A SoNAR (Sound Navigation and Ranging) sensor is used for water depth mapping.

As the mentioned sensors would be necessary already for the implementation of ADAS, it is desirable to include them in the process of map generation for exactly these systems. Possible precision shortcomings compared to traditional survey methods are expected to be leveraged by the numerical interpolation of various measurements.

Literature

[1] Alberding GmbH (2022) Projektsteckbrief autonomsow ii. [Online]. Available: https://www.autonomsow.de/autonomsow2.html