Vacancy: PhD position in Situation awareness for harbour operations and auto-docking in maritime transport

About this position

The digital transformation of marine transportation is progressing further. The promise of machine learning is to increase safety, reduce costs and conserve the environment. One very active research field within this topic is autonomous shipping and situation awareness, specifically the process of safe harbour operations and docking. The term situation awareness in autonomous harbour operations covers a wide spectrum of applications:

Full autonomy would refer to a system, that without any human interaction assess the environmental situation, devises a harbour operation and docking manoeuvre and physically controls the ship motion to the docking station.

A lower degree of autonomy would be a decision support system. Such a system would provide a comprehensive analysis of the current environmental conditions and may recommend a possible harbour and docking manoeuvre, but would not steer the ship.

The difference between these two variants is the form in which the information is represented. A fully digital system can process data differently than a human. Crucial for the fidelity of a docking system is the quality of the input data. The environmental conditions in a harbour operations scenario are comprised of the harbour topology/bathymetry, traffic and weather data, including wind, waves, currents and tide-level. This information has to be location specific and real time. Furthermore, an environmental forecasting model is needed, that can predict the local conditions within a short term time window. As with every extrapolation method, the quality of the forecasting depends greatly on the input data.

The PhD research will be carried out in an interdisciplinary environment. The institute currently have several ongoing PhD projects working on related aspect of digital transformation in the maritime industry, such as developments within autonomy, remote ship operations, situational awareness and management challenges due to digitalization. In line with the strategy of the institute, the candidate will be expected to make use of the lab concept and field data in the project.

Main duties and responsibilities

The research objectives are the need for a decision support system, and the challenges that come with it motivated the following research project: “The development of a data driven scenario forecasting system”. Towards this objective the following items have to be realized:

- Concept development of a sensor system and forecasting model.

- Assessment of existing instrumentation equipment and extension with additional sensor.

- Development of a signal processing system for the complete range from individual sensors over time series analysis, sensor fusion, regression model to classification and visualization.

The primary focus of this research project is the establishment of a functional system. To gain practical knowledge and assess the quality of the forecasting system, physically measured and not simulated data must be used.