CAPTN Förde Areal – A smart and clean technology platform for the testing and development of future autonomous passenger ferries

Daniel Laufs (M.Sc.), Wissenschaftszentrum Kiel GmbH, 24118 Kiel, d.laufs@wize-kiel.de

Prof. Dr.-Ing. Hendrik Dankowski, Fachhochschule Kiel, Institut für Schiffbau und Maritime Technik, 24149 Kiel, hendrik.dankowski@fh-kiel.de

Prof. Dr.-Ing. Hauke Schramm, Fachhochschule Kiel, Institut für Angewandte Informatik, 24149 Kiel, hauke.schramm@fh-kiel.de

Prof. Dr. Olaf Landsiedel, Kiel University, Institute of Computer Science, Distributed Systems Group, 24118 Kiel, ol@informatik.uni-kiel.de

Prof. Dr. Dirk Nowotka, Kiel University, Institute of Computer Science, Dependable Systems Groups, 24118 Kiel, dn@informatik.uni-kiel.de

Daniel Sommerstedt, Raytheon Anschütz GmbH, 24106 Kiel, daniel.sommerstedt@raytheon.com

Abstract

The “Clean Autonomous Public Transport Network”, short CAPTN, initiated and coordinated by Kiel University, has been evolving in the city of Kiel, Northern Germany, since 2018 and combines transdisciplinary activities in the field of smart public transport. Forming a new innovation ecosystem, it attracts diverse actors from research, politics, and industry with the aim to establish an integrated inner-city mobility chain of autonomous clean modes of transport on water and on land including its interfaces. Three Kiel research institutes – Kiel University, Kiel University of Applied Sciences, and Muthesius Academy of Art – collaborate with industrial players such as Raytheon Anschütz GmbH, Thyssen Krupp Marine Systems, and ADDIX Internet Services GmbH. DSN Connecting Knowledge and Kiel Science Hub (Wissenschaftszentrum Kiel) guide the technology transfer processes. The CAPTN initiative consciously combines technical, economic, social, design, and socio-political issues in order to develop and offer innovative, marketable, system-compatible and sustainable products and services worldwide.

The development of an autonomous passenger ferry is one core element of the CAPTN initiative, where three projects focus on this topic: CAPTN Vaiaro shows two design studies of future ferries and raised public awareness of future urban water mobility in a city like Kiel. CAPTN Förde5G aims at the development of the 5G infrastructure at the Kiel Fjord for the ferry itself and further 5G relevant applications in the area like harbor logistics, sailing events, or the Kiel Canal entrance. This contribution is about the ongoing project CAPTN Förde Areal to construct and build a true-to-life-dimensioned test vessel including the configuration of a marine test field. The F&E GmbH at Kiel University of Applied Sciences coordinates the project in close partnership with Kiel University, Raytheon Anschütz GmbH, ADDIX Internet Services GmbH and the Kiel Science Hub.

The Kiel Fjord is a highly complex area to test autonomous ships. Located at the entrance of the Kiel Canal, one of the busiest artificial waterways in the world, there is a high traffic volume in addition to sailors, SUPs, and other obstacles. Thus, a marine test field offers a safe environment for the testing and development of an autonomous passenger ferry.

Figure 1: The Kiel Fjord as a future technology hub for urban autonomous shipping

The test vessel itself acts as a technology demonstrator and starts operating within the time scope of the CAPTN Förde Areal project. It is designed as a fully electric, lightweight and efficient catamaran of about 20 meters length and features a large deck area partly sheltered, sufficient under deck space to test different technologies along with a sensor technology and scientific demands integrated right from the beginning. It combines a unique design with the latest engineering technology like an efficient hull form and modern battery technology for a complete emission-free and safe operation.

The equipment of the test vehicle comprises several sensor systems to enable a high degree of autonomy. Sensor fusing and deep learning paint a complete picture of the surroundings of the autonomous ferry. This allows to locate hazardous situations and to plan a safe trajectory through the Kiel Fjord. These systems need to work in real-time to meet the highest safety standards and react in a timely manner.

This contribution focuses on the test vehicle itself and gives an overview on the project, the status of the construction and design of the test vessel, the planned sensor equipment for autonomous shipping along with an outlook on future capabilities.