Autonomous Shuttle Ferry
Ferry in Trondheim
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• Technologically feasible
• Scalable and reconfigurable system
• Low environmental footprint and cheaper than bridge
• A new tourist attraction for Trondheim City
Concept

• “On-demand ferry” - push the button for the ferry to come
• Traveling time: 1 minute → low latency
• Passengers: 12 persons
• Electrical propulsion, Automatic charging of batteries
• Navigation: High-precision GNSS (cm accuracy) plus backup system
• Anti-collision system
Time schedule

Phase 1 (2016): Concept study, student projects. Dynamic Positioning system to be tested onboard ReVolt from DNV-GL in Trondheim Harbour.

Phase 2 (2017/2018): Autonomous pilot ferry for concept testing and to study behaviour of the other boat traffic. Webcam and radar to register boat traffic in the harbour.

The AUTOSEA project

- Funded under the MAROFF programme of the Research Council of Norway.
- Budget 11MNOK, with contributions from DNV GL, Kongsberg Maritime and Maritime Robotics.
- Duration: August 2015-Spring 2019.
- Competence building project: The aim is to educate PhDs with expertise on maritime collision avoidance.
- The project funds 2 PhD candidates and one postdoctoral fellow. In addition, 2 PhD candidates and several MSc candidates are affiliated with the project.
- Project is owned by the Department of Engineering Cybernetics at NTNU.

Focus areas of the AUTOSEA project

- AIS
- Charts
- Target tracking
- Imaging sensors
- Navigation sensors

Sensor fusion module

Collision avoidance module
- Collision detection
- Collision avoidance

Guidance

Control system

Actuators

Link to operator
Uncertainty representation

Kinematic estimation uncertainty

Data association uncertainty

Ownship guidance uncertainty

Target vessel intention uncertainty

Full-scale collision avoidance experiments
Phase 1: Test area Trondheim Harbour

Test area 100 x 100m
Phase 2: Boat traffic monitoring in the Harbour
(Collaboration Maritime Robotics)
Phase 2: Pilot Ferry (development platform)

- Funded by NTNU and Amos
- Aluminum hull with scale 1:2 (5 meter long)
- Testing of propulsion system, batteries, and charging system
- Development of navigation system and automatic docking
- Testing of anti-collision sensors
Phase 3: Full Scale Ferry

**Success criteria**

**Safety**
- Risk assessment
- Automatic registration of passengers
- Robust anti-collision system
- Redundant navigation systems
- Monitoring and support from Harbour authorities

**Reliability**
- Easy to use
- Work all around the year
- Efficient transportation – low latency
- Robust design – low probability of errors
- Minimized need for maintenance