Session 1: Use cases for autonomous and remotely operated test vessels [9:05 – 11:30]

Lunch and demonstrations [11:30-12:30]

Session 2: Next generation user interface solutions [12:30-14:00]

Coffee break and demonstrations [14:00-14:30]

Session 2 continues [14:30-15:00]

Panel discussion [15:00-15.30]

Cocktails and demonstrations [15:30-17:00]

Session 1: Use cases for autonomous and remotely operated test vessels [9:05 – 11:30]

Associate Prof. Ole Andreas Alsos, NTNU:
Experiences from the trial operation of milliAmpere2, an autonomous electric passenger ferry for urban waterways

Dr. George Rossides, CMMI:
Robotic System Implementation: From simulations to full-system field tests

Dr. Heigo Mõlder, MindChip:
The multi-purpose autonomous robotic vessels

Tommy Valojoki, Novia - MAST

Jarkko Paavola, TUAS - ARPA

MAST!

Institute for Maritime Software Technology

MAST!

Institute for Maritime Software Technology

Established: 2018

Vision: Maritime digitalization research platform

Strategy: Knowledge exchange, education development and innovations

Objectives: International research institute in autonomous shipping,
Improve Turku area competence, New innovations

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Institute for Maritime Software Technology

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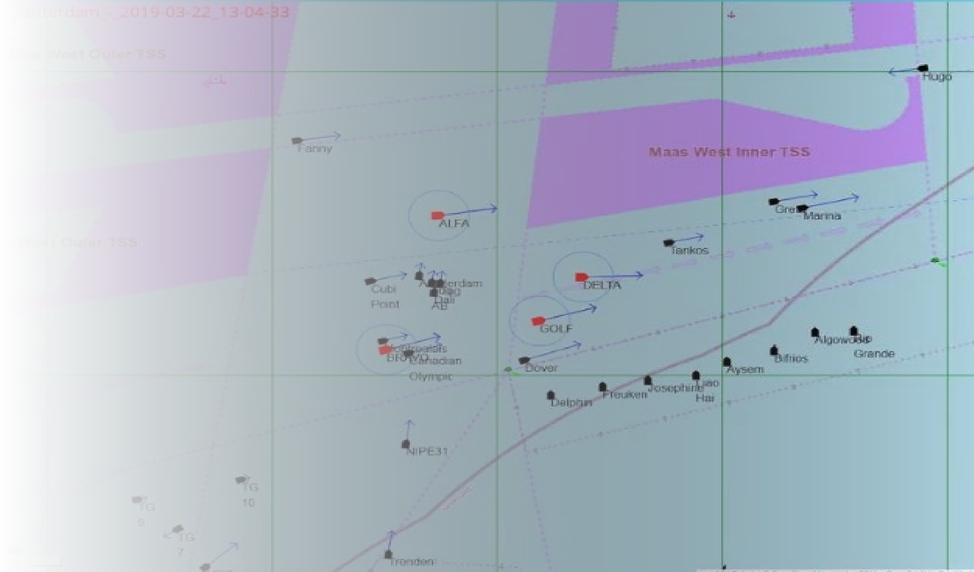
Åbo Akademi

ABOA MARE MARITIME EDUCATION

- Autonomous shipping education
- Simulation data → Machine learning
- Maritime topics for ÅA Project Course
- "ÅBOAT" sensor platform vessel
- Maritime data –workshops
- Publications and theses



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ABOA MARE 18 13 MARITIME EDUCATION

- Aboa Mare simulator demos
- MAST! Webinars
- Internships and ERASMUS trainee exchange

Publications: www.mastinstitute.fi →Results

FUTURE: Fraunhofer Innovation Platform – Smart Shipping@Novia:

www.fip-s2.fi

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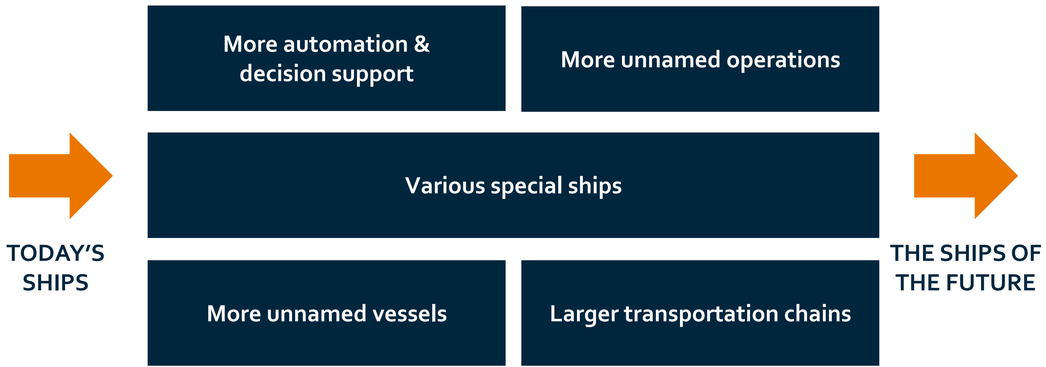
Applied Research Platform Autonomous Systems (ARPA)

15.12.2022

Towards the autonomous systems

- Testing environments and long-term research is needed for trust and tech & operational safety
- Automation enables new services and business models, logistic system improvement, enhanced energy efficiency, better safety



ARPA goals

- Setup test platforms for automated, autonomous and remotely operated systems in maritime environment
- Tools for testing
  - Create digital twins for virtual testing environments and situational awareness tools
  - Vessels and equipment for piloting and gathering data
  - Create high quality open data sets for R&D purposes
- Boosting knowhow and collaboration around autonomous systems in research and business

Project data

- Joint project with Turku UAS & Novia UAS
  - Several research teams with complementary competences
- Funded by Ministry of Education and Culture – RDI profiling funding
- Budget 2,0 M€
- Duration Nov 2020 – Oct 2023
- Advisory board consists of companies, Åbo Akademi and Traficom

BRIGHTHOUSE INTELLIGENCE

awake.ai

VTT SenseWay

KONGSBERG

VALMET AUTOMOTIVE

TRAFICOM Finnish Transport and Communications Agency

GROKE

Åbo Akademi

Case study: Stereo Vision and Multi-View Object Detection ((joint activity with MAST!)

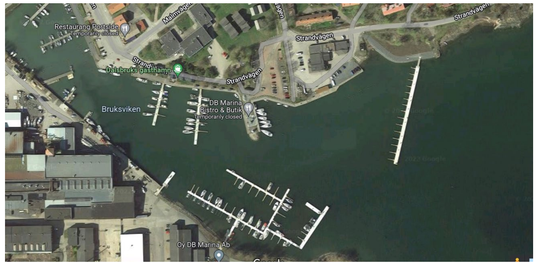
- Design a stereo-vision camera for long distance
- Cameras and Lidar calibration
- Data Collection: Stationary & Mobile data
- Data Labeling
- Running Stereo vision deep networks on Nvidia AGX Orin
- Train a Multi-View Object Detection to improve the accuracy

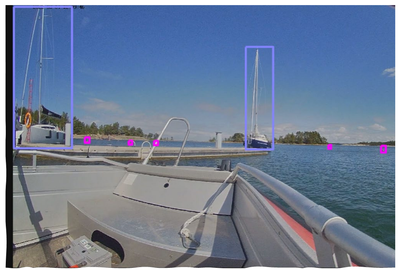
Long-range stereo vision-camera

Short-range stereo vision camera

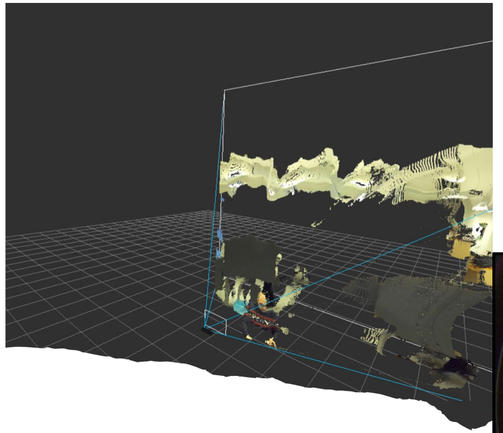
Data Collection and labelling

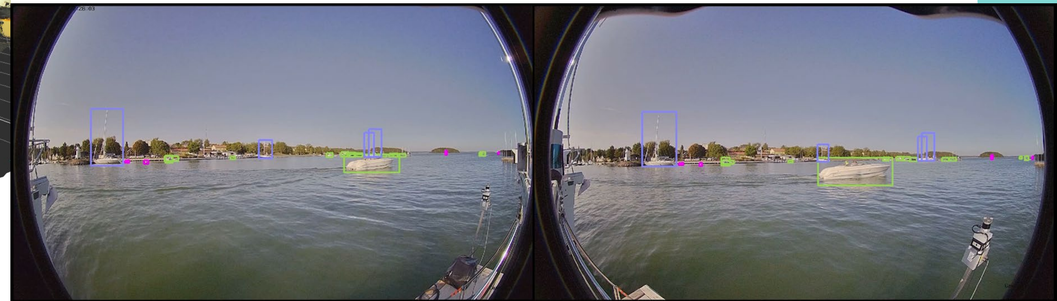
- Stationary data:
  - Location: Dalsbruk
  - Amount: 72 hours × 2
- Mobile data
  - Location: Kustavi
- 36 hours of labeled video
- 36000-180,000 labeled images





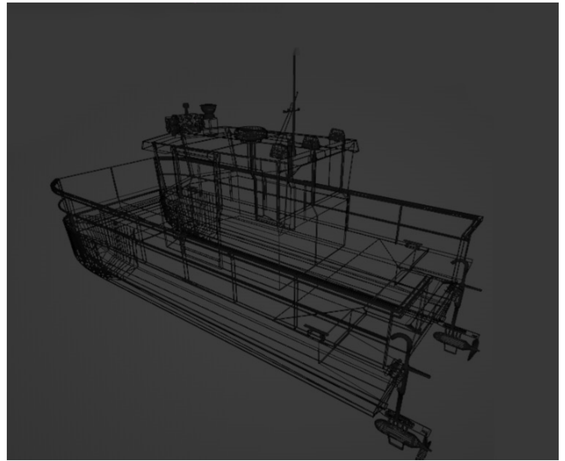
Running Stereo vision DNN on Nvidia AGX Orin / Multi-view Object Detection





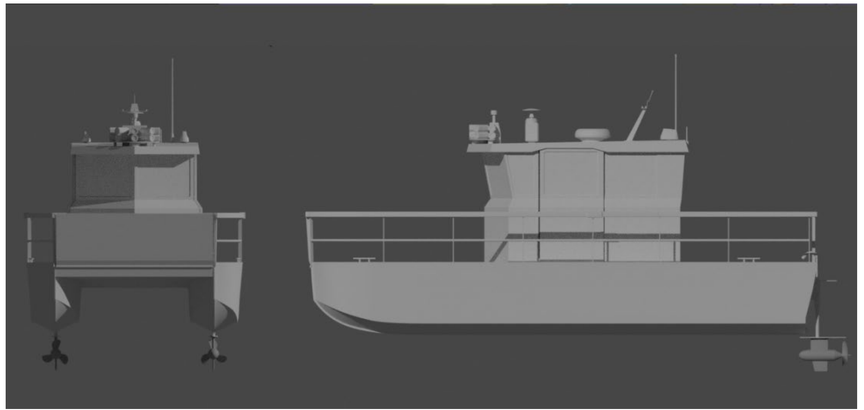
Autonomous research platform / test boat

- Alpo Pro Boat Max 68 body
- 6,8 meters long and 3 meters wide aluminum body with a cabin
- Two electric outboard pod motors suitable for hydraulic steering
- Batteries and a battery management system; capacity 34 kWh
- ICT infrastructure for AI algorithm testing.



Autonomous research platform / test boat

- TUAS autonomous test boat can be used as a sensoring platform to collect data and test autonomous operations in Turku archipelago area
- Sensor examples:
  - RGB cameras, thermal cameras
  - Lidars
  - Weather data
  - AIS
  - Radar
  - Sonar
  - Spectrum sensor for mobile network analysis



Data platform

- ARPA data platform is a central data storage for ARPA
  - Test boat's sensors and AI algorithm decisions
  - Related open data (AIS from digitraffic, weather data from FIM etc.)
  - Enables MLOps for algorithm evaluation
- For collaborators
  - Access to all stored data through queries based on time, location and MMSI
  - Datasets created from the collected data
  - Testbed for AI algorithm evaluation

Introduction to demos

- Test boat cockpit and a digital twin in Simulink
- Data collection with a stereo camera setup
- Stereo camera distance estimation and object detection demonstration
- Object detection using low-cost hardware (Google Coral)
- Simulator bridge VR at Aboa Mare
- Åboat

Let's talk!

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Session 2: Next generation user interface solutions [12:30-15:30]

Prof. Yin Leng Theng, NTU Singapore:
Keynote: Workplace Safety Ownership Model in the Singapore Context: Findings, Insights and Lessons Learned

Dr. Joscha Wasser, Fraunhofer FKIE:
Vehicle Automation in Partially Automated Convoy Driving for Military Logistic Trucks

Prof. Kari Tammi, Aalto University:
Connectivity for Digital Twin – Mixed Reality Solutions

Timo Haavisto, Turku UAS
Advantages of multi-user environments in big data visualisation and remote control

Panel discussion:
How advanced UIs for example in metaverse could improve safety in industry?