AutoMated Vessels and Supply Chain Optimisation for Sustainable Short Sea Shipping

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Presentation outline

The problem

Project facts

MOSES use cases

AI in MOSES

Pilot demos
The EU container supply chain

* the total container throughput in the Mediterranean increased from 20 m TEU (2000) to 51 m TEU (2015)
Maritime transport is efficient and green, mainly due to economies of scale!

The EU aims at shifting cargo from land-based transportation to more environmentally friendly modes.

To increase the share of SSS in the container supply chain:

- Feeder routes must reach more destination ports.
- Feeder vessels must carry less cargo cost effectively.
Facts about the MOSES project

- **Project Title:** AutoMated Vessels and Supply Chain Optimisation for Sustainable Short SEa Shipping
- **Duration:** 01.07.2020 - 30.06.2023 (36 months)
- **Budget:** 8 million €
- **Consortium:** 17 Partners
MOSES ambition

Significantly **enhance the SSS component** of the European container supply chain!

- **sustainable feeder services**

- **5%** Minimum decrease of end-to-end costs for container transport with feeder services
- **15%** Increase of feeder traffic between large terminals and small ports
- **10%** Modal shift to Short Sea Shipping in designated areas
MOSES ambition – What we want to change
“Western MED-Spain” use case

- Feeder service with a frequency of **three weekly services**, with geared ships.
- The expected cost-effective capacity of the vessel is **600-700 TEUs**.
“Eastern MED-Greece” use case

- The 7 island ports represent **87% of the total general cargo traffic** (based on 2019 data)
- The feeder would be competitive to existing cargo transport options if **80% of the maximum estimated demand** is captured
- The expected cost-effective capacity of the vessel is **300-400 TEUs**
- At least **two weekly services** in each port
The MOSES Concept
Autonomous Tugboats

Training AI to manoeuvre a large containership!

Virtual environment
• Unity 3D Game Engine
• Validated through real and simulated data
• Built-in training and inference
Autonomous Tugboats

Learning through reinforcement – reward and penalty!

Start of agent training

Trained agents

- Distance from docking position
- Maximum allowed speed
- LiDAR distance & approach angles
- etc...
Autonomous Tugboats

Learning in specific scenarios!

State at t=0

State on task accomplishment

the containership is parallel to the dock at a distance of 5 m
Innovative feeder with Robotic Cargo Handling

Innovative features
• Enhanced manoeuvrability (azimuth thrusters)
• Environmentally friendly (Hybrid, all electric, fuel cell)
• Automated cargo handling
• Autonomous navigation will be simulated
Innovative feeder with Robotic Cargo Handling

**Intelligent Operator Support System (IOSS):**
It uses AI to solve issues caused by another AI!

**Remote supervisory control**
- Enabling local situation awareness
- Robot self awareness in problem detection
- Control Intelligence
- Dynamic task allocation
- Risk assessment

**Human-robot collaboration**
- 3D world representation
- Anomaly detection
The platform will implement horizontal collaboration among logistics stakeholders and will match demand and supply of cargo volumes.

AI-based optimization of distribution routes and improvement of empty container management.
MOSES is going for its last year...

So, what’s next?
Pilot demonstration #1

**Objective**
Showcase the automated maneuvering, docking, and mooring scheme for large ports

**Method**
- Two workboats will simulate a swarm of autonomous tugboats
- They will guide a floating vessel towards a berthing spot
- The re-engineered AutoMoor prototype will safely moor and secure the floating vessel at berth

**Location**: Denmark
Pilot demonstration #2

**Objective**
Showcase the innovative characteristics of the MOSES feeder vessel by demonstrating its seakeeping and energy performance capabilities

**Method**
Free sailing scaled ship model of selected Feeder Vessel design
- Propulsion
- Seakeeping and added resistance
- Autonomous operation

**Location:** Netherlands
Pilot demonstration #3

**Objective**
Showcase the (semi)autonomous operation for (un)loading containers from the MOSES innovative feeder with the Robotic Container-Handling System

**Method**
- A full-scale crane will be outfitted with a sensor package to enable remotely controlled and autonomous operation
- The interaction between the MOSES Robotic Container-Handling System and the Innovative Feeder will be simulated

**Location**: Sweden and the Netherlands
Paving the way towards the future of Short Sea Shipping

- The problem addressed by MOSES does not have an obvious solution!
- It will strengthen the presence of SSS within the EU supply chain by taking advantage of the benefits of automated technologies.
Thank you for your attention!

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