Autonomous sailing from port to port

Bas de Kruif
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Introduction - EU Moses project
Introduction

Aim:
• demonstrate autonomous sailing from quay to quay

Why autonomy:
• decrease in qualified personnel
• minimise risk to ship and people

Why demonstration:
• proof of concept
• investigate critical components in autonomy
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• Ship
• Simulation to experiment
• Split operation
• Steps in demonstration
### Ship

- **Lpp**: 71.0 m
- **B**: 13.0 m
- **t**: 4.5 m
- **Scale**: 1:17

- 2 azimuthing thruster, 2 bow thrusters
- Earth fixed pose, ship fixed velocities measured
Ship
Wind
- coefficients from CFD
- applied to fans
Simulation to experiment

PC - simulation model

PC - autonomy

On shore

On board
Simulation to experiment

PC - simulation model

PC - GUI

PC - autonomy
Simulation to experiment

PC - autonomy

PC - GUI
Split operation
Split operation

- (un)docking
- approaching
- transit
Demonstration - undocking

- dynamic positioning
- smooth trajectory

West
Demonstration - sailing

- Waypoint based
- Line-of-sight guidance
- Decoupled speed/heading control
Demonstration - approaching

- no waypoints → smooth trajectory
- low speed → low maneuverability
- bow thrusters active if $u < 0.5 \text{ m/s}$
Demonstration - docking

We have demonstrated the docking process.
Summary

• divided operation and project phases to sail from port to port
• proof of concept will be shown in SMB...

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Summary

• divided operation and project phases to sail from port to port
• proof of concept will be shown in SMB...

• critical elements:
  • test
  • smooth path is good
  • power makes approaching easy

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