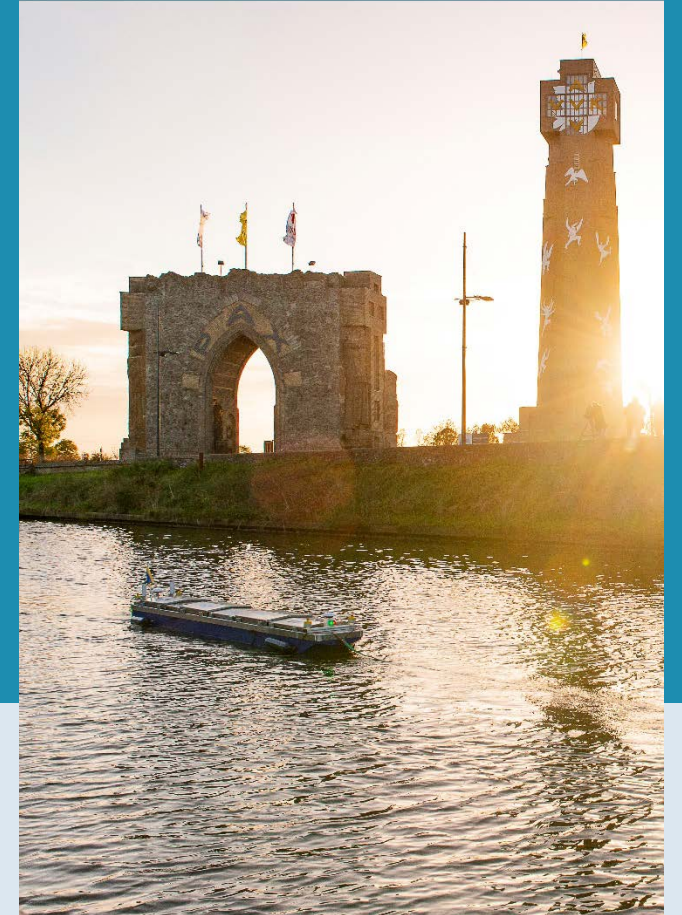


H2H

Autonomous Ship Technology Symposium June 2019

Faculty of Engineering Technology



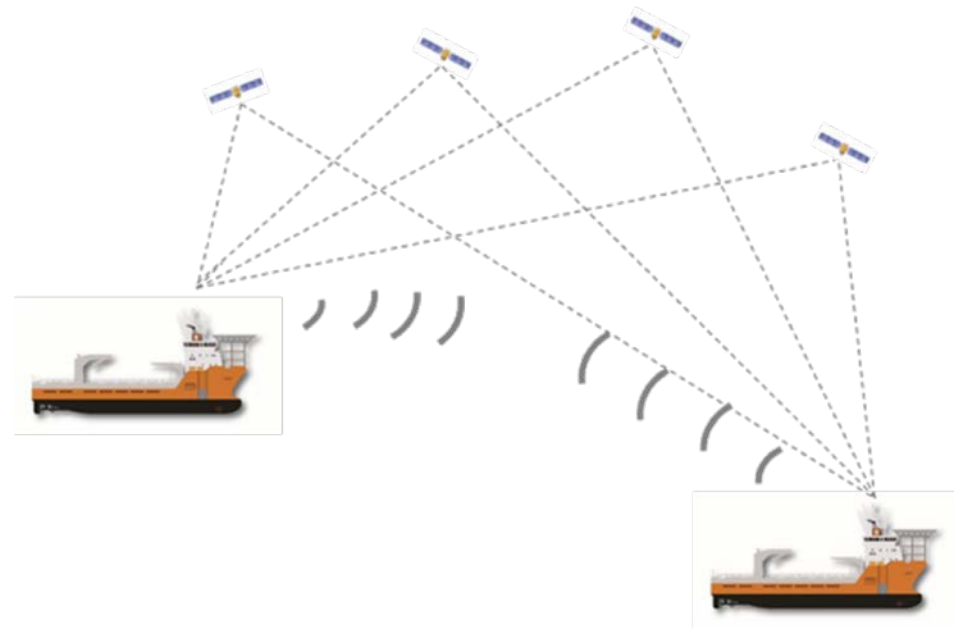
Overview

- H2H project
- W+ scale model
- H2H approach
- Future work

H2H project



- H2020-IA (2017-2020)
- GNSS based marine
- H2H module



KONGSBERG



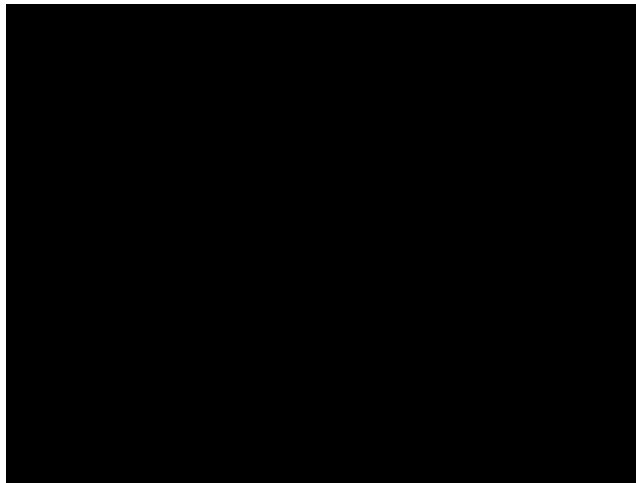
KU LEUVEN

KU Leuven use case: Inland shipping



- Single handed sailing:

Regular sailing



Docking



Lock passing



Overview

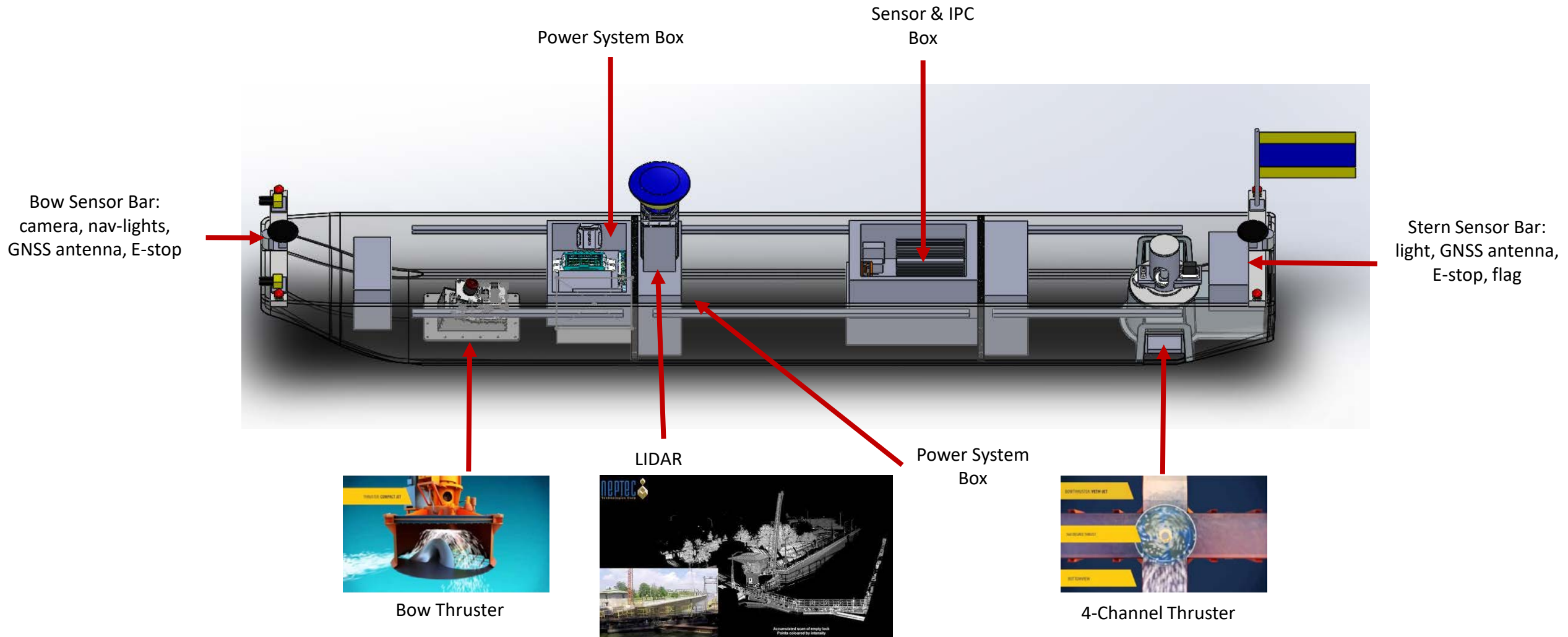
- H2H project
- W+ scale model
- H2H approach
- Future work

Scale model “Cogge”

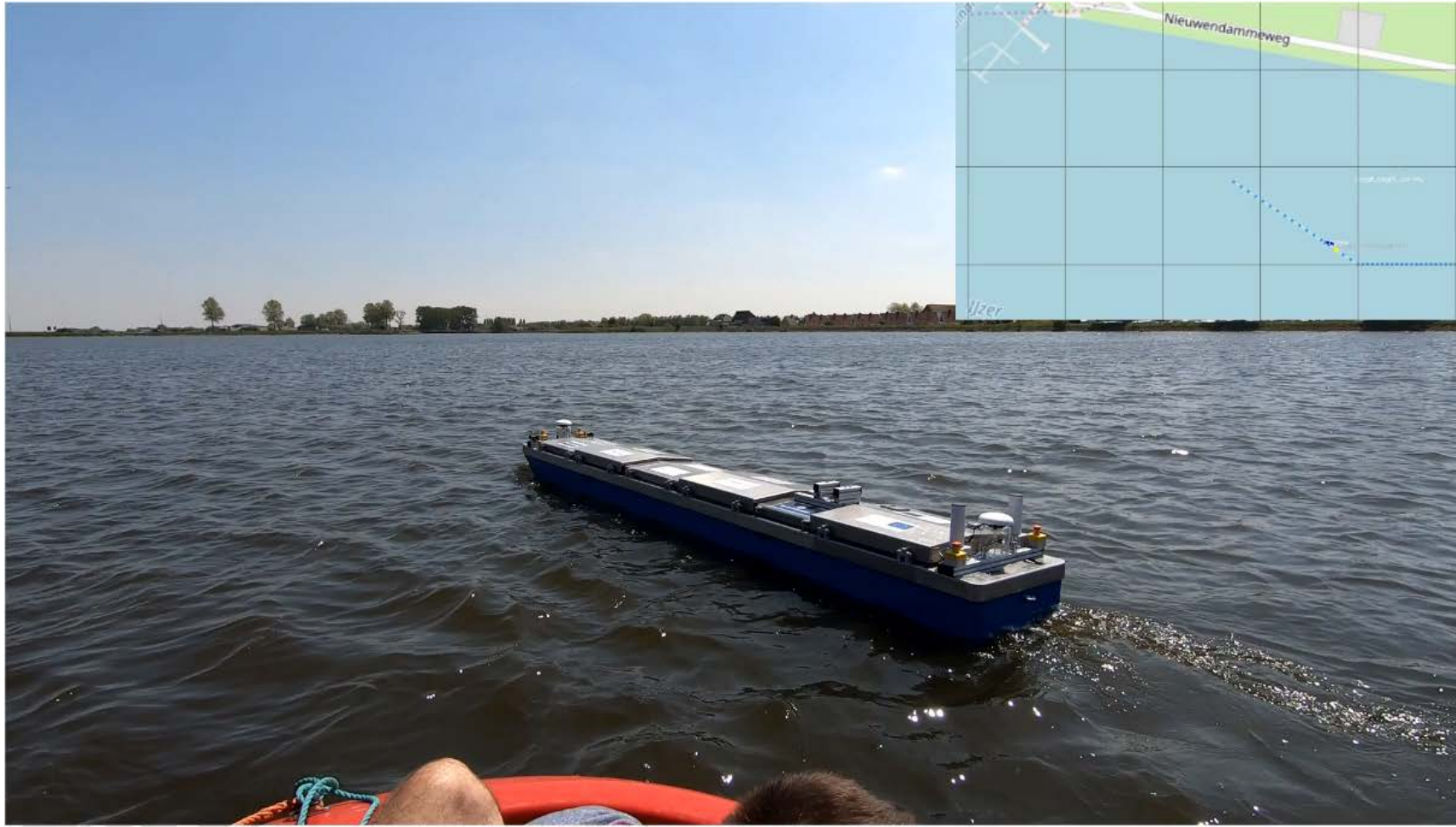
- Based on the CEMT1
- Full sized vessel: 400 – 650 tons, 38m length, 6.6m breadth.
- Scale Model: 1/8 scale, 425kg, 4.8m length. 0.64m breadth.
- Hull made of fiberglass epoxy mixture.



Scale model “Cogge”



Experiments



Overview

- H2H project
- W+ scale model
- H2H approach
- Future work



H2H Visualization Vessel Module



H2H
Shore
Module

H2H Shore Module

H2H inland visualisation

- Augmented ECDIS
- Static proximity zones (red).
 - Vessels
 - Shore - obstacles
- Dynamic Operational zones
 - Tracking zone (green)
 - Danger zone

*H2H Vessel

**Non H2H Vessel



Should the vessel leave the waypoint PZ and be in the proximity of an obstacle, a major warning will sound.

Shore PZ

WP2

WP1

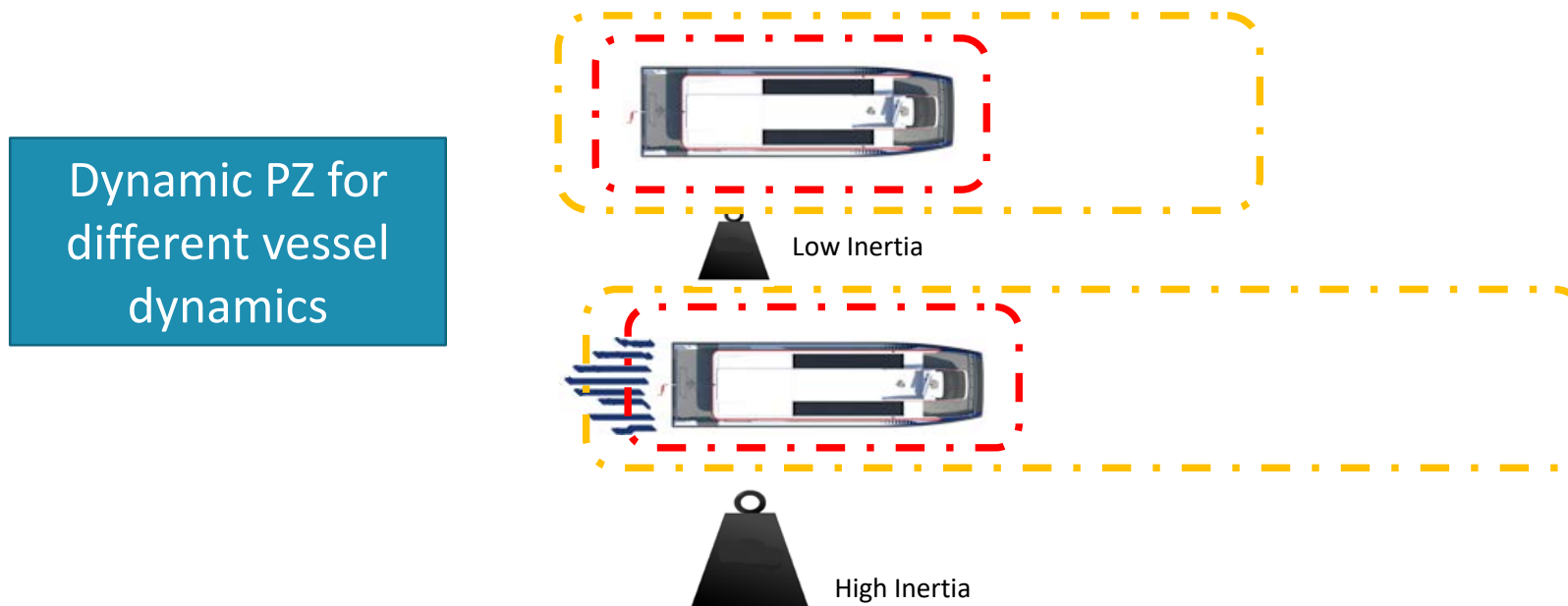
Waypoint PZ

Should the vessel red PZ leave the waypoint PZ but not be in the proximity of an obstacle, a warning will sound.

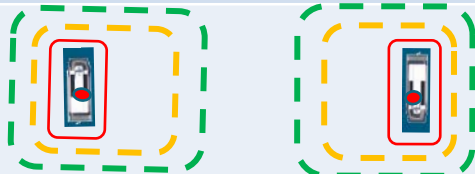
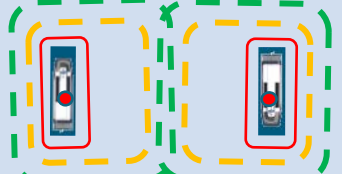
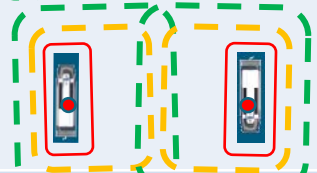
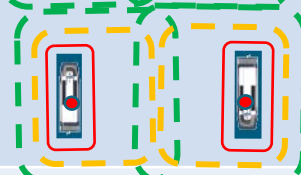
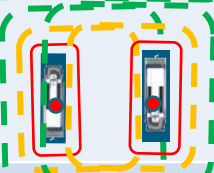
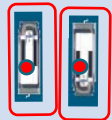
Waypoint PZ suggests an obstacle free path for the vessel.

Proximity Zones

- Vessel dynamics, sensor and map accuracy, which will predict large stopping distance (high speed, large mass), will generate a larger PZ and vice versa.
- In the diagram below, it is assumed that the vessels are travelling in a straight line, hence the box-shaped proximity zone. Should the vessel be turning, the proximity zone will change shape accordingly based on the rate of turn.



PZ Procedure for Sailing

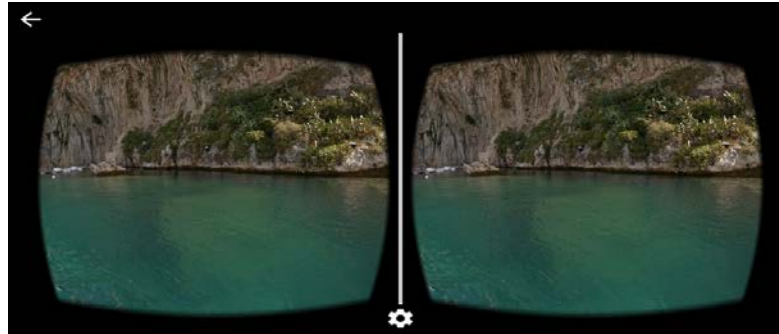
Warnings H2H module	PZ Intersection	PZ Situation
1. No warning	None	
2. Start tracking the object in the green zone	Green – Green	
3. Raise L1 warning and suggest evasive maneuver	Green – Orange	
4. Raise L2 warning for collision if no action is taken	Orange – Orange	
5. Raise L3 warning for collision is imminent if no action taken by both vessels	Orange – Red	
6. Collision has happenend	Red – Red	

PZ Procedure for Docking/Lock Passing*

Warnings H2H module	PZ Intersection	PZ Situation
1. No warning	None	
2. Velocity and heading suggestions for efficient docking	Green – Red	
3. Suggest gradual deceleration	Orange – Red	
4. Docking complete (Contact sequence)	Red – Red	

*Similar conventions for lock passing

Use case scenarios



Realistic View from Camera System in
VR Glasses

SCENARIO 1



H2H Visualization on the Screen

SCENARIO 2

SCENARIO 3



Remote Control for the Vessel

Overview

- H2H project
- W+ scale model
- H2H approach
- Future work

Future work



- Setup remote control center
- Test remote control center
- Perform H2H experiments with different users



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