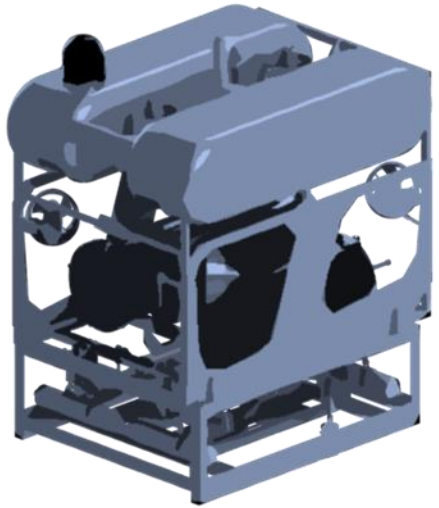
CONGRESO INTERNACIONAL DE

V DISEÑO E INGENIERÍA NAVAL

Marzo 15 - 17 de 2017

On the use of time-domain simulation in the design of Remotely Operated Vehicles



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Visor3

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CONTEXT: THE PROJECT

Name:

Strategic Program for the Development of Robotic Technology for Offshore Exploration of the Colombian Sea Bed

Main goal:

To develop a robotic system including an ROV and its auxiliary systems, for assisting offshore exploration tasks

Purposes:

Increase innovation and technology development capacities through qualification of students and researchers on topics related to underwater robotics.

Support M.Sc. and Ph.D. theses on underwater robotics related subjects.

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OUR CURRENT QUESTIONS

- How to conduct the design process?
- How to plan the mission?
- How to solve engineering specifics?

THIS PAPER'S QUESTIONS

- How to use time-domain simulation (TDS) as a tool during the design process?
- What questions could TDS answer?
- What simulation scenarios are relevant?

DESIGN PROBLEM

- Focus on questions about the propulsion system after component distribution information is available, aiming to evaluate operational envelope.
- Test different propeller parameters and thrusters spatial configuration.
- Evaluate efficiency, power consumption, and operating speed.

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COOPERATION WITH MARIN

- MARIN: Maritime Research Institute Netherlands
  - Location (main): Wageningen, The Netherlands
  - Founded: 1929
  - Business units: Offshore, Ships, Maritime Simulation & Software Group, Nautical Centre, R&D, and Trials and Monitoring
  - Web: marin.nl
- Cooperation since 2015:
  - 2 tools: ReFRESCO CFD and aNySIM TDS codes
  - 1 internship
  - 3 papers (including this work)

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aNySIM

- Time-domain simulation software based on rigid body dynamics.
- To study time-domain transient behavior such as dynamic response and control.
- Object-oriented programming.

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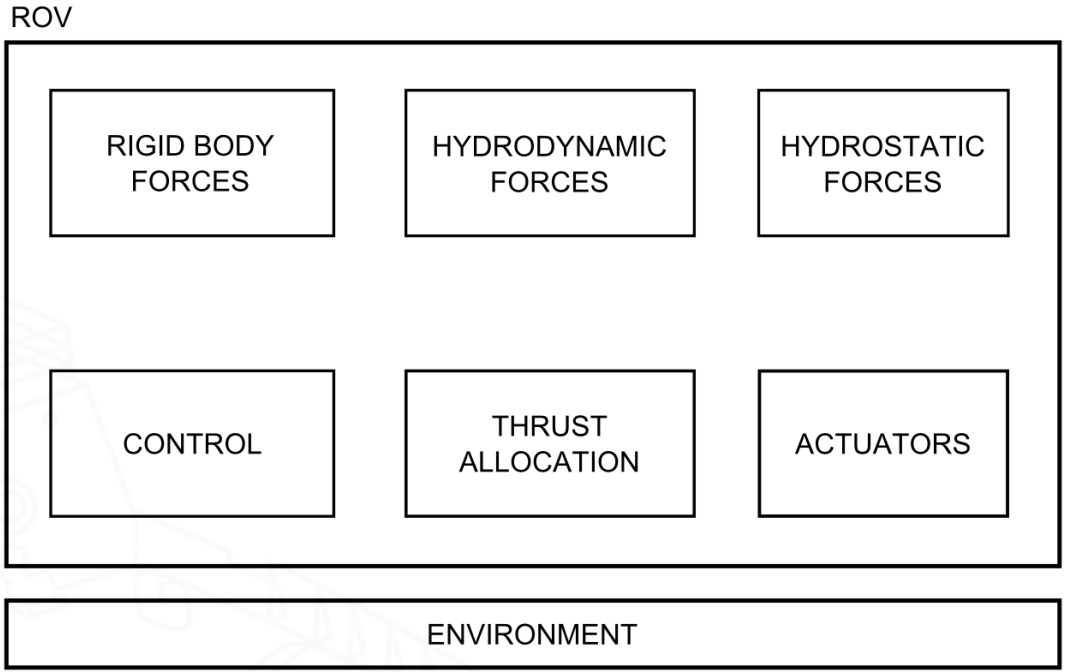
SIMULATION FRAMEWORK



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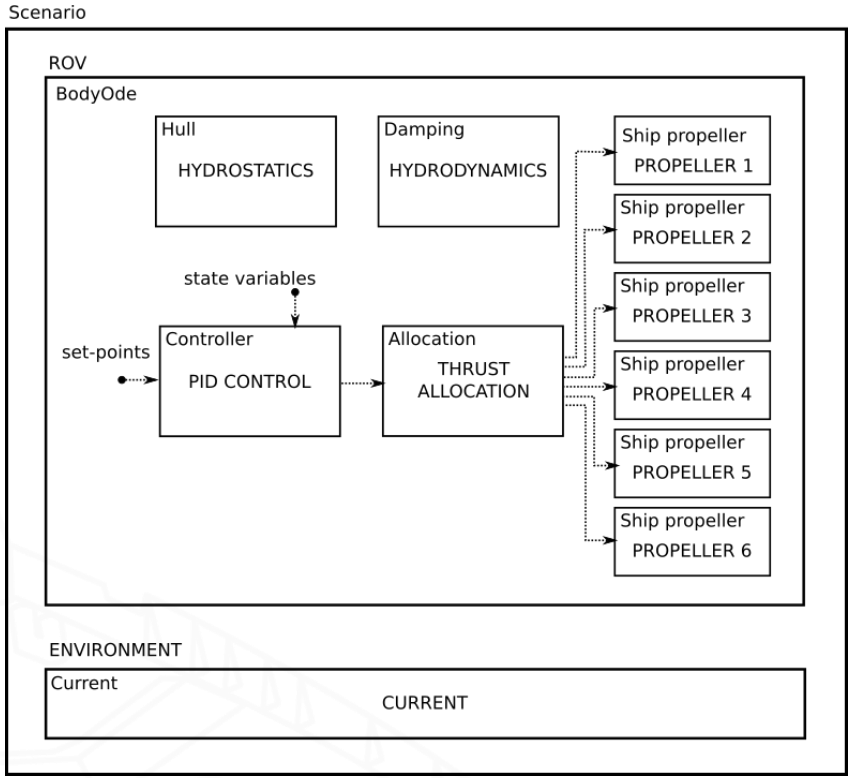

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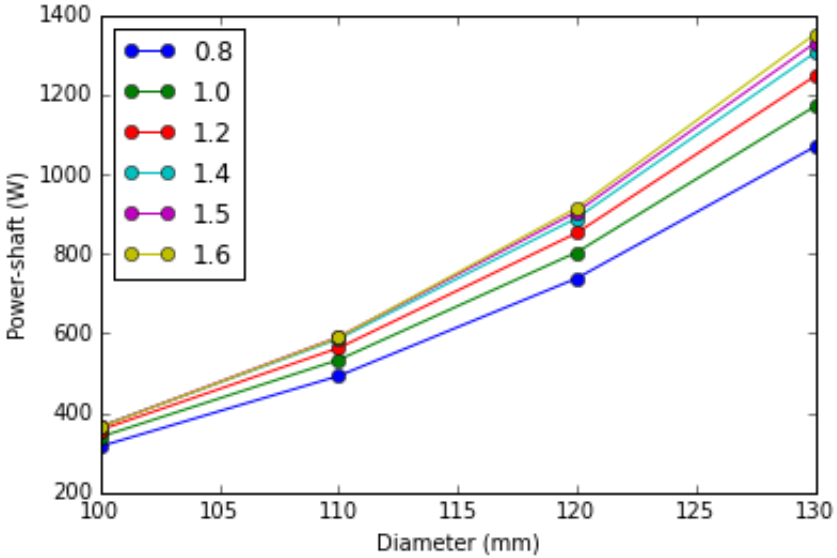
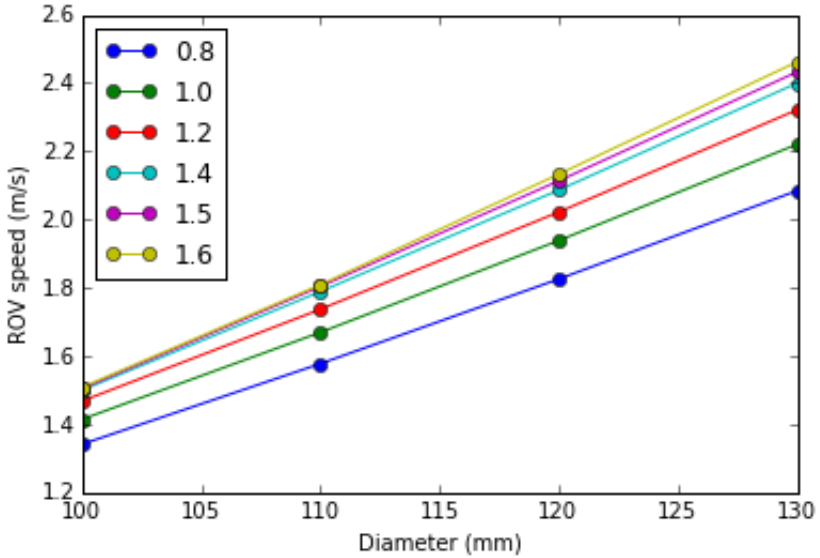
SIMULATION SCENARIOS

Evaluate full thrust and test the performance of the ROV in terms of efficiency, power consumption, and operation speed.

- Propeller parameters: diameter, pitch-diameter ratio, and number of blades.
- Propeller configuration:
  1. three thrusters for horizontal and three for vertical motion, and
  2. four thrusters for horizontal and two for vertical motion.

RESULTS - PROPELLER





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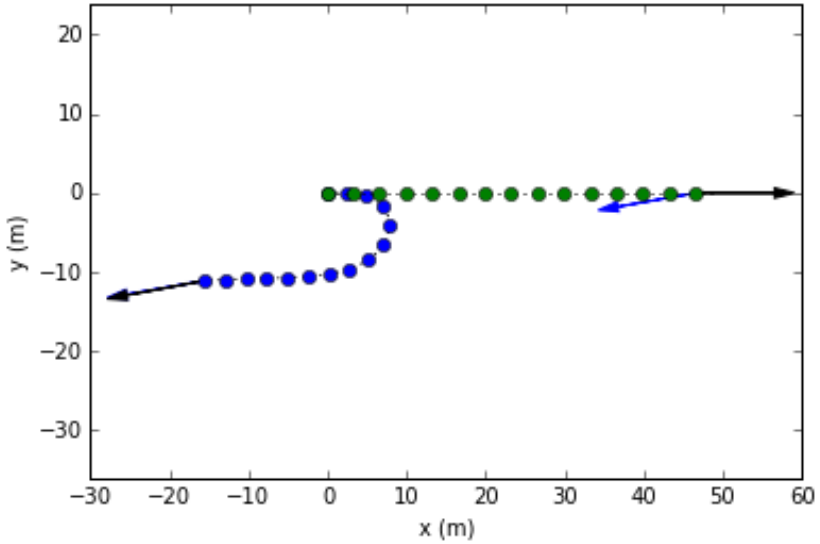
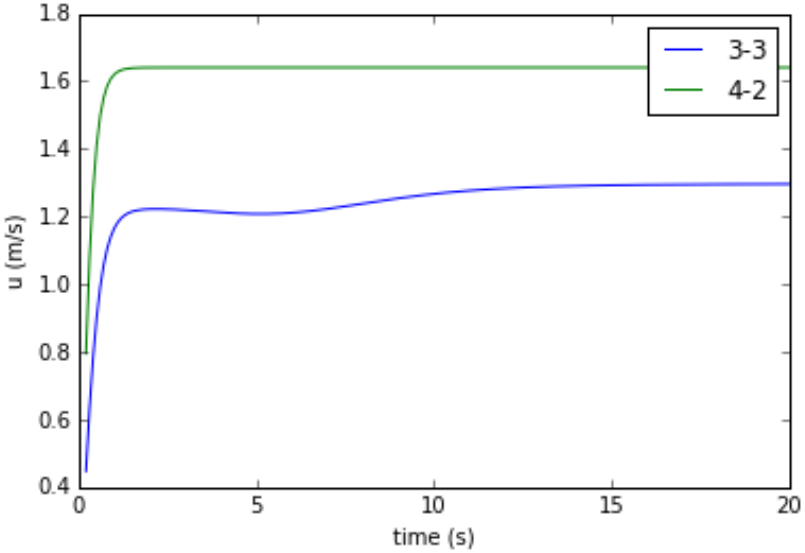
RESULTS – THRUSTER CONFIGURATION





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CONCLUSIONS

- Use of a multibody time-domain simulation tool aNySIM for the design process of an ROV was addressed.
- Different scenarios to evaluate full thrust in different directions in order to test the performance of the ROV in terms of efficiency, power consumption, and operation speed were considered.
- The proposed scenarios allowed the designers to evaluate different design propeller parameters, as well as different propeller configurations.
- Time-domain simulation seems and adequate tool for assisting the design process.

FURTHER ISSUES

- Modeling challenges such as hydrodynamic and cable induced loads.
- What the performance indices should be?
- What the simulation scenarios should be?
- What optimization problems are feasible to solve?

¡THANKS!
¿QUESTIONS?

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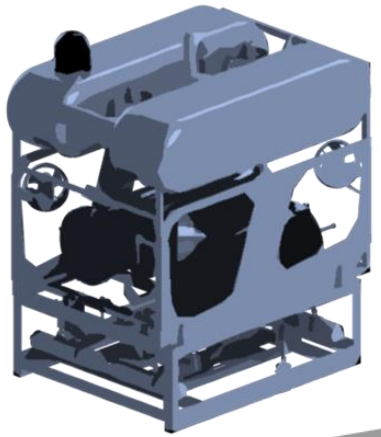

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