

“Concept Development of a Modular Test Rig for Manipulators of Underwater Robots (ROVs/AUVs/Crawlers)”

Background

Manipulator arms are key working units of ROVs, AUVs, and crawlers. They enable precise gripping, assembly, and inspection tasks under challenging underwater conditions, where variable loads, currents, and complex motion requirements act on the systems. To safely develop, compare, and optimize new manipulator solutions, a standardized and reproducible test environment that realistically simulates these conditions is still largely missing.

Objective of thesis

The objective of this thesis is the development of a flexible, modular test rig concept capable of accommodating different manipulator types while realistically simulating mechanical degrees of freedom, load cases, and hydrodynamic influences. The system should enable precise data acquisition. Beyond technical analysis, the work includes the development of an interchangeable overall concept that can serve as a basis for research and industrial development.

Tasks

Depending on the type of thesis (Bachelor, Project, Master), individual focus areas may vary. The thesis can be written in German or English. Core tasks include:

- Analysis of common manipulator architectures (1–7 DoF) for ROVs, AUVs, and crawlers
- Identification of relevant operational conditions – motion profiles, force/torque loads, and environmental influences
- Definition of testing requirements – derivation of requirements for structure, drive simulation, hydrodynamics, and instrumentation
- Development of a modular test rig concept – mechanical structure, interchangeability and adaptability of interfaces, integration of sensors and data acquisition
- Optional: Elaboration of a functional prototype, simulation of the test rig configuration, control concept, prototype study

Your Profile

- Studies in Mechanical Engineering, Mechatronics, Robotics, Marine Technology, or a related field
- Independent and structured working style
- Experience in CAD design or instrumentation

We offer

- Work on a future-oriented topic in the field of marine robotics
- Close supervision by experts from research and industry
- Creative technical work in an exciting research environment
- Access to testing facilities and technical resources

Contact

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