

“Development of a Buoyancy-Neutral Underwater Manipulator”

Background

Underwater manipulators are key components of ROVs, AUVs, and crawlers, enabling gripping, assembly, and inspection tasks. The weight and buoyancy of conventional manipulators often cause stability issues or increase the energy demand of the carrier system. A buoyancy-neutral manipulator reduces these effects, improves handling, minimizes the load on the platform, and allows more precise movements even in turbulent or fast-flowing environments.

Objective of thesis

The objective of this thesis is the conceptualization and development of a buoyancy-neutral underwater manipulator, optimizing the balance between weight, buoyancy, and functional performance. The work includes analyzing requirements, selecting suitable materials and mechanisms, and developing an initial technical design.

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 typical underwater manipulation tasks and relevant load cases
- Definition of requirements for buoyancy, stability, and force transmission
- Investigation of suitable constructions, materials, and compensation systems (ballast, foams, volume displacement)
- Development of a conceptual design for a buoyancy-neutral manipulator
- Evaluation of mobility, force transmission, and hydrodynamics
- Optional: CAD modeling, simulation, or prototype study; feasibility assessment including opportunities, risks, and limitations

Your Profile

- Studies in Mechanical Engineering, Mechatronics, Robotics, Marine Technology, or related fields
- Independent and structured working style
- Experience with CAD, fluid systems, or kinematics is advantageous

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

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