

“Concept Development of a Biomimetically Inspired Underwater Robot for Strong Currents”

Background

Underwater robotic systems (ROVs, AUVs, crawlers) are increasingly deployed in challenging maritime environments, including river mouths, coastal zones, and offshore areas with strong currents. Conventional designs often reach their limits here, as high flow forces affect stability, maneuverability, and energy efficiency. Biomimetic approaches – inspired by the shape, movement, or structure of fish, marine animals, or aquatic plants – offer potential to minimize flow effects, optimize hydrodynamics, and reduce energy consumption.

Objective of thesis

The objective of this thesis is the conceptual development of a biomimetically inspired underwater robot that operates stably, efficiently, and maneuverably in strong-flow environments. The work includes analyzing relevant flow conditions, identifying biomimetic principles, and deriving an initial technical system concept.

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 operational scenarios in flowing waters and derivation of requirements
- Investigation and evaluation of biomimetic models (fish, aquatic plants, etc.)
- Definition of design principles to reduce flow impact and increase stability
- Development of an initial concept for an underwater robot (shape, propulsion, control)
- Hydrodynamic assessment and simulation of relevant flow influences
- Optional: Creation of a CAD sketch or first prototype; evaluation of feasibility, advantages, and potential limitations

Your Profile

- Studies in Mechanical Engineering, Mechatronics, Robotics, Marine Technology, or a related field
- Independent and structured working style
- Knowledge in CAD, flow simulation, or biological analogy

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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