

Thesis Topic: Reinforcement learning based multi-modal fin actuation: manipulating and moving

What's this about?

Fin actuated robots can be flexibly controlled with a limited number of four actuators. Also, by using some fins as soft robotic arms, they have the potential to move objects, clean dirty place to be well visible, remove obstacles out of the way, punch invaders. However, such control is highly nonlinear and requires consideration of the mutual influence forces between the moving and manipulating parts of the robot. To solve this problem, we apply reinforcement learning to learn control strategies. Specifically, a strategy for tracking one manipulation target while moving with the remaining fins is learned in simulation and transferred to the actual robot (Sim2Real). This contributes to the realization of further advanced tasks, not only moving with the four fins.

Requirements

- C++ and Python skills
- Strong ROS2 experience
- Fundamental knowledge of machine learning and reinforcement learning
- Fundamental knowledge of control engineering principles

What will you learn?

- Skills to simulate robot (specially for marine robot)
- Machine learning implementation experience for actual application
- Many experiences with real robot

Why is this important?

Underwater manipulation is recently a hot topic. However, it requires additional equipment like robot arm. If fins can do both movement and manipulation, it contributes to the widespread coverage of tasks with same design.

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