

Formulas and Vehicles Introduction to Mobile Underwater Robotics

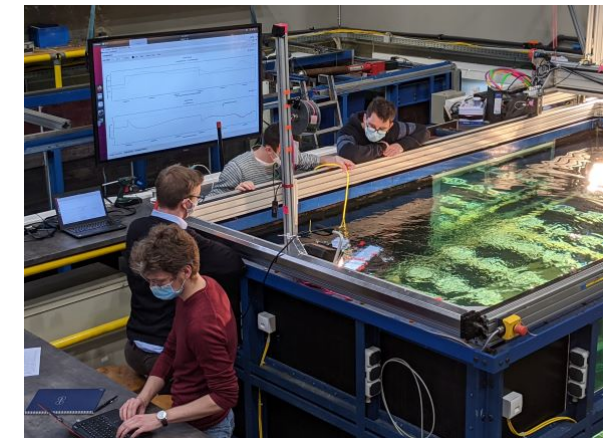
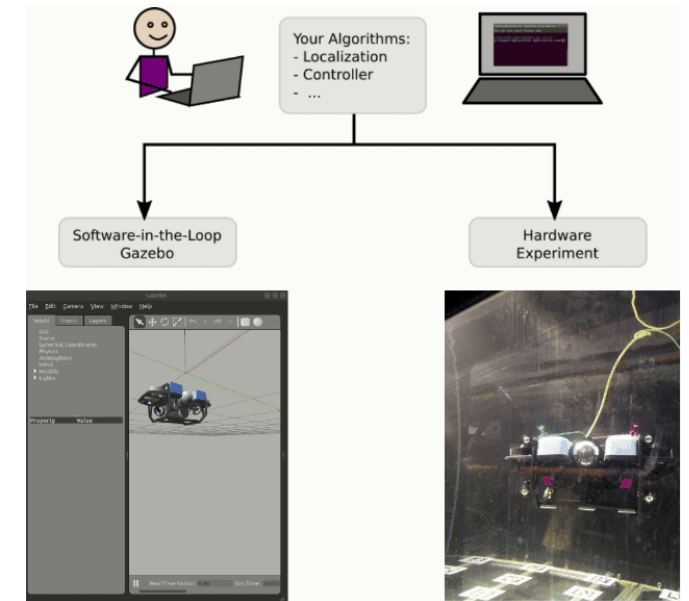
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Learning Objectives

- *Explore the field of mobile underwater robotics*
- *Get in contact with state-of-the-art Robotic Research*
- *What are key modules of the robotics pipeline?*
 - Sensing, Perception, Planning, Control,...
- *Gain practical experience in real-world experiments*
- *Learn to define, plan, and structure a robotic team project*
 - define milestones and interfaces, assign tasks

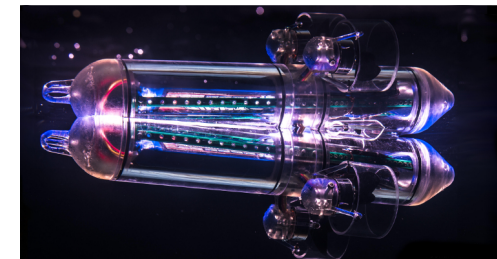
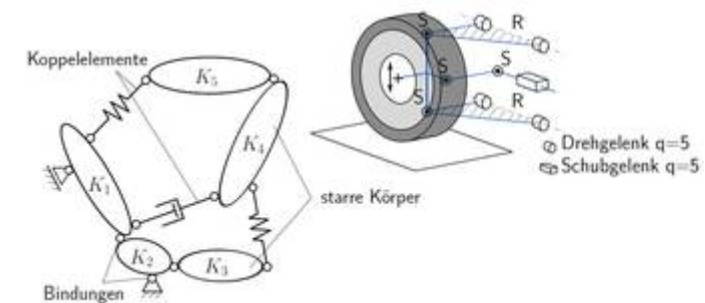


Initial Situation

- *TUHH Class (in German):*
 - Formulas & Vehicles – Math and Mechanics of Autonomous – with lab experiments
 - Awarded by Claussen Simon Foundation 2017
 - Focus: Control, Vehicle Dynamics , Math
- *Institute's Research on Underwater Robotics*



CLAUSSEN SIMON | STIFTUNG



DFG Deutsche Forschungsgemeinschaft

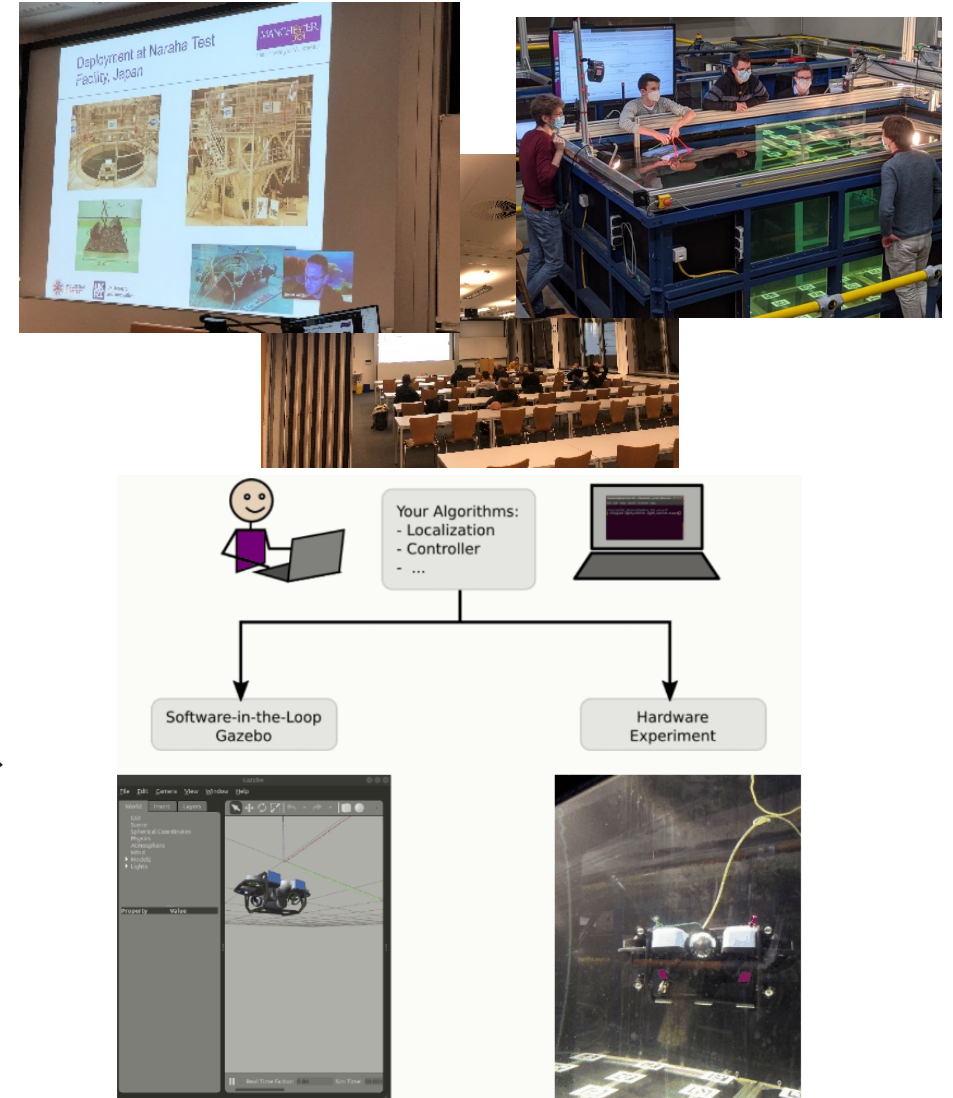
DAAD
Deutscher Akademischer Austausch Dienst
German Academic Exchange Service

wissenschaft • im dialog

I3 Junior Project @ TUHH

Focus of Innovation

- *CBL-based “Introduction to Mobile Robotics”*
- *Exposure to the Robotics Research Community*
- *Interdisciplinary Student Teams & Remote Lab*
- *Learn in Open Projects about Key Elements of Robotics*
- *Use State-of-the-Art Tooling and Software*



Class' Software Framework

Structure

- *CBL: Engage Phase (Week 1)*

- Guest Lecture „Robots in Hazardous Environments“
- Visit of virtual IEEE Robotics Conference

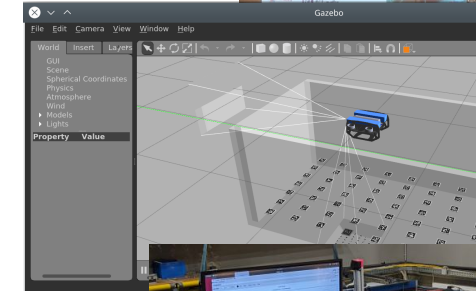


- *CBL: Investigate Phase (Week 2-7)*

- Keynote-Talks on Topics in Mobile Robotics

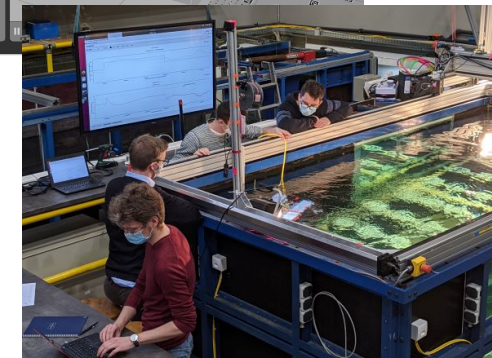


- Experiments in Underwater Remote-Lab



- *CBL: Act Phase (Week 7-12)*

- Work on self-defined Final Group-Project
- Students peer-review their reports (double-blind)
- Final Presentation



Lab Experiments

Engage

Investigate

Act

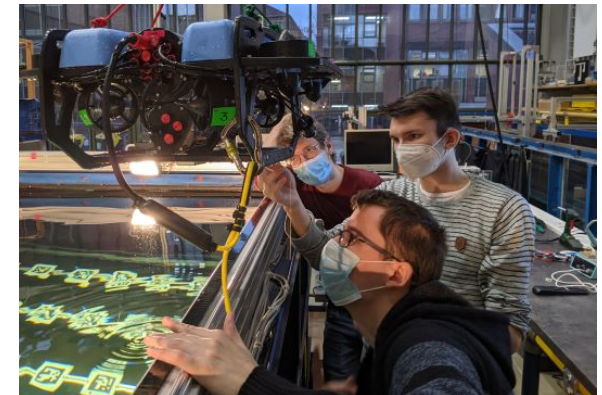
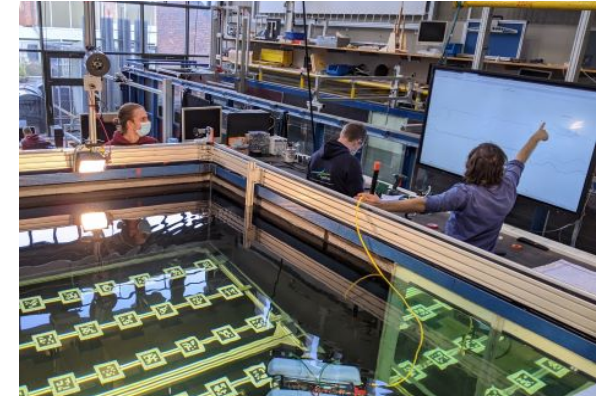
Feedback and Future Improvements

Teaching Staff:

- Fun teaching, but high effort in this first cycle
- Communicate timeline and effort more clearly to students
- Provide more input on how to work in teams effectively
- Remote-Lab experiments work smoothly with Student team members at home (due to Covid-19)
- Successful proof-of-concept to become a full ECIU course in 2021!

Students: [TUHH-Checking Eval 2021]

- „One of the best modules I took during my studies. Mentoring was outstanding“
- „That we were able to choose what we want to learn“
- „Too much time pressure...“
- „Interdisciplinary Groups contributed to [learning]“
- „Hands on Experience“



Youtube-Clips of Student Projects