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Prof. Dr.-Ing. André Borrmann,

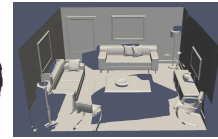
[Chair of Civil and Environmental Engineering](#)



GAZEBO



ROS 2



Overview

Develop a modular code base for our Husky mobile robot equipped with a manipulator. This project integrates simulation, sensor modeling, SLAM-based mapping, and motion planning—bridging theory and practical implementation.

Part 1: Robot Simulation Set-Up and Manipulation

- **URDF/XACRO Modeling and Sensor Integration**
 - Gazebo & RViz visualization.
- **Manipulation:** Integrate state-of-the-art motion planners (e.g., VAMP).
 - Perform model-based grasping with collision avoidance.
 - Use 6D pose estimation for objects of interest.
 - Measure grasping accuracy.
- **Real Experiments and Monitoring:**
 - Create and deploy scripts to initialize and start all system components.
 - Set up network communication (ensuring laptops and PCs are on the same network) to monitor system performance and experiment outcomes in real time.

Part 2: SLAM & Navigation

- **Mapping & Exploration:**
 - Conduct simple exploration (e.g., frontier exploration) to create maps of the environment.
 - Utilize SLAM techniques for simultaneous mapping and localization (e.g., Supereightv2, ORB-SLAM3, LVI-SAM).
- **Motion Planning & Collision Avoidance:**
 - Implement simple navigation for the mobile robot and integrate collision avoidance (e.g., Nav2).

Timeline & Application Details

- **Application Deadline: 26.03.2025**
- **Duration:** The final deadline is November 28, 2025; strong candidates may complete the project ahead of schedule.
- **Group of 2 students** (One for Part 1 and one for Part 2; collaboration is expected).
- **Active (in-person) participation in the project is required.**
- **Required Skills:**
 - Proficiency in Gazebo, C++/ROS2, and Python.
 - Good understanding of control theory, sensor fusion, Motion Planning, and SLAM.
 - Previous experience with real robots is a plus, though not mandatory.

Please send your CV along with a short paragraph explaining why you are a good candidate at panagiotis.petropoulakis@tum.de. **We value clean, maintainable code.**