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# Open Thesis / Project

## Design and Implementation of an Autonomy Stack for the Infineon Mobile Robot

### Thesis Type

Bachelor Thesis / Master Project / Master Thesis

### Motivation

Mobile robots need to reliably perceive their surroundings, understand their position, and navigate safely to achieve useful autonomous behavior in real-world environments. This requires integrating sensors, perception algorithms, localization methods, and control strategies into a coherent autonomy stack that can run in real time on the robot. The Infineon Mobile Robot (IMR) provides a flexible platform for developing and testing such autonomy stacks. By adding sensors and implementing a perception and localization pipeline, the robot can move beyond basic teleoperation toward higher levels of autonomy. The use of a motion capture system, such as the Qualisys available at our institute, further enables accurate ground-truth tracking, which is essential for validating and benchmarking the performance of the autonomy stack under different conditions.

Currently, our IMR lacks a complete, modular autonomy stack integrating perception, localization, path planning, and control, along with Qualisys ground-truth evaluation capabilities. Our goal is to develop such a framework, enabling rapid experimentation and performance benchmarking for future robotics research and student projects.

# ROS2



### Goals and Tasks

Within this context, students can perform different tasks, such as:

- Integrate sensors to the IMR platform and implement perception and localization algorithms, enabling the robot to understand its pose and environment reliably;
- Implement control and path planning algorithms, enabling navigation with basic obstacle avoidance and smooth motion execution;
- Integrate reflective markers on the robot for Qualisys motion capture compatibility, providing accurate ground-truth position data for performance validation and benchmarking;
- Validate the autonomy stack through real-world experiments, comparing on-board location estimates against the ground truth obtained using the Qualisys, in order to ensure accuracy and robustness.

### Target Group

- Students of ICE/Telematics;
- Students of Computer Science;
- Students of Electrical and Digital Engineering.

### Required Prior Knowledge

- Solid skills in Python and/or C++;
- Experience with robotics, ROS2, and Linux;
- Basic understanding of control theory, localization, perception, and planning algorithms.

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