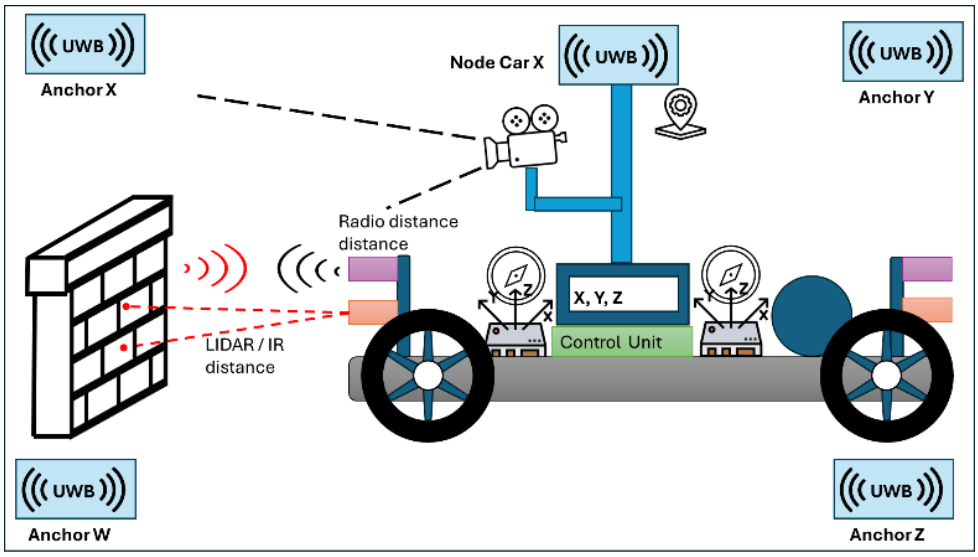
Graz University of Technology
Institute of Technical Informatics
Cognitive Products

Autonomous RC-Car with UWB Localization

In this project, the student will assist in **developing an autonomous RC car using UWB-based localization**. The goal is to create a platform for testing different localization methods and sensors, comparing and evaluating them in real-world conditions, and expanding the system with new hardware. The vehicle system should detect obstacles at higher speeds (up to 30km/h) during runtime and react accordingly, with the live parameters being sent to a backend for evaluation.

Example of an RC-Car

To achieve this, various sensors need to be evaluated and implemented or combined into an array or fused (multi-acceleration sensors) to increase reliability. A basic control algorithm for speed and steering as well as self-localization routing to avoid obstacles need to be implemented. Different UWB localization algorithms should be evaluated and tested or extended for use at higher speeds. Additionally, an interface for data acquisition should be set up to define maps and basic routes for the vehicle. To further enhance evaluation and system capabilities, a camera will be integrated for remote monitoring, live interaction to prevent accidents, or to add virtual obstacles.



Architecture of an autonomous RC-Car [Figure by Elisei Ember]

Thesis Type: Master Thesis / Bachelor Thesis / Seminar / Project

Goal and Tasks:

- Development of an RC-Car with a sensor platform for testing different localization and object recognition methods
- Forwarding control commands to the RC-Car and collecting runtime data.
- Building obstacle-avoidance routing capabilities and learning algorithms (ML, reinforced)
- Dynamic mapping of the environment and setting routes for the RC-Car (also in real-time)
- Implementing Control systems (PID)
- Integration and Testing of Sensor Fusion Techniques (e.g. Kalman filter)

Recommended Prior Knowledge:

- Basic programming skills, such as Python, C, or C++.
- Experience in robotic applications.
- Experience in sensor hardware, as well es embedded systems.

Start: a.s.a.p.

Duration: 6-12 months

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