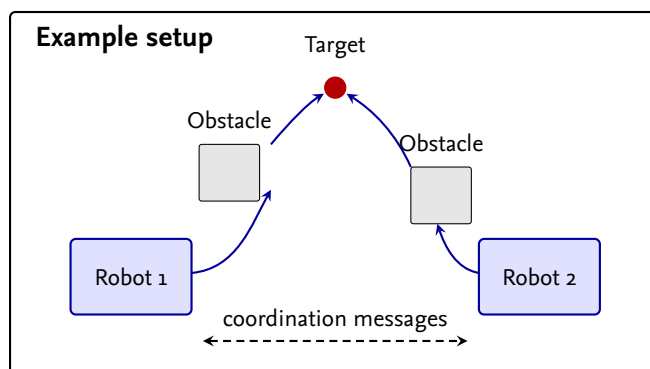


Title: Cooperative Vision-Based Object Tracking and Obstacle Avoidance for Resource-Constrained Multi-Robot Systems

Small mobile robots have limited computing power, memory, and battery. Because of this, they cannot use heavy algorithms or process large amounts of data like more powerful systems. This makes tasks such as object tracking, obstacle avoidance, and coordination between multiple robots more challenging on embedded platforms.

This thesis studies a two-robot system that detects a target object, estimates its position, follows it, avoids obstacles, and exchanges the small amount of information needed for coordination in an indoor test area. Each robot should mainly rely on its own sensing and processing, while communication is used only for simple coordination tasks such as sharing basic target information, reporting target loss, or helping the other robot continue the task. The vision part is expected to focus on lightweight on-device learning methods, while still leaving room for simpler alternatives if needed. The goal is to integrate perception, motion control, obstacle avoidance, and robot-to-robot coordination into one embedded system. A valid outcome of the thesis is a working prototype together with an evaluation of its tracking behavior, coordination quality, delay, and the main practical challenges on a provided ready-made robotic platform.



Two robots track the same target, move around obstacles, and exchange simple status messages.

- Integrate a vision module (e.g., using pre-trained lightweight models) that can find the target object and estimate its position.
- Develop and test a simple coordination method for two robots based on small status messages.
- Add obstacle avoidance so that the robots can move safely while tracking the object.
- Evaluate the system and identify both its strengths and its practical limits in terms of tracking success, obstacle avoidance, delay, robustness, and resource usage.

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