

MAPR-Project: Cooperative Path Planning for UAV-teams

Mobile robots and especially quadcopters offer new possibilities in research and in commercial applications. Exemplary applications include their use as a mobile sensor platform, in search and rescue, exploration tasks and in logistics. Cooperation between robots offer additional benefits in terms of efficiency. However, the flexible coordination of potentially large robot teams is still a major challenge, especially when considering decentralized approaches. While centralized approaches are straightforward extensions of well know control methods, they scale badly in situations where the number of team members change dynamically and in additional the centralized coordination authority constitutes a single point of failure.

In this MAPR-project, methods for decentralized path planning should be developed for a team of small indoor UAVs. Within the intended framework participating UAVs are supposed to argue about their plans to end up with collision-free trajectories via a communication network. Methods from the field of Multi-Agent Reinforcement Learning constitute a promising research direction, but the often come with a lack of safety guarantees. In order to ensure the safe operation of the UAV team, additional safeguard mechanisms should also be incorporated into the path planning approach.



Figure 1: Crazyflie 2.1 Mini Quadcopter

For the development and test of the algorithms, an existing Python based simulation framework can be employed. The real-life demonstration of the final algorithms should be carried out with the Crazyflie 2.1 mini-quadcopter provided by the manufacturer bitcraze.

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