Internship/Working Student: "Integration of a Multi-Agent Path Finding Method on the Crazyflie Platform"

Coordinating many collaborative robots is very useful for search and rescue, mining, entertainment, and warehouse automation. In many of these scenarios, multiple robots must move in tight spaces filled with obstacles to reach their objectives. An essential difficulty in this domain is the multi-agent path finding (MAPF) problem, where the task is to plan paths for multiple agents. The primary constraint is that the agents can follow these paths simultaneously without colliding with each other. MAPF has several relevant applications in various research fields, including artificial intelligence, robotics, theoretical computer science, and operations research.

Different types of approaches have been developed to find solutions to the MAPF problem, ranging from detailed models with centralized online planners to decentralized, learning-based offline strategies. Combined with robust controllers, these approaches promise to solve the MAPF problem when executed on simulation environments. However, new problems often arise when translating the approaches to the real world, which is particularly difficult for multi-robot systems because not only do the interactions between the drone and the environment need to be considered, as is the case with single-robot systems, but also the interactions between the robots. An example of this is a swarm of drones flying close together and turbulence affecting the motions of other drones in the vicinity.

The goal is to evaluate several existing multi-agent pathfinding approaches and implement one on our existing Crazyflie platform. This includes, among other things, the task of getting an overview of suitable MAPF approaches from literature to find an appropriate solution for the given constraints. Another prerequisite for implementing the approach on the Crazyflie hardware is to familiarize oneself with the software framework, which consists of the open-source libraries crazyswarm2, crazlib, and crazyclient, to be capable of integrating the found solution approach.

Requirements:
- Very good programming skills (Python).
- Knowledge of multi-agent system design is helpful, but not mandatory.
- Knowledge of embedded system design is helpful, but not mandatory.

Contact:
If interested, please submit your application to **info@honda-ri.de** with reference to the title of the posting.