

Formation Control of a Drone Swarm

Bachelor's Thesis

Control of UAV drone swarms is a research area with diverse applications ranging from agriculture and environmental monitoring to search and rescue operations, and even entertaining drone shows. However, managing a large network of acting agents within these swarms is challenging. Each drone operates autonomously, only communicating with other agents via a communication network. To achieve a collective goal each agent adjusts its behavior based on the information provided through the network.

In the first part of this thesis the task is to synthesize a controller and a suitable network for formation control under idealized conditions. Thereafter, the results should be extended to handle a more challenging situation arising in real-world applications. The specific situation can be chosen based on your interest. These could for example involve communication delays, information loss, agent malfunction, non-identical agents, or imperfectly known models.

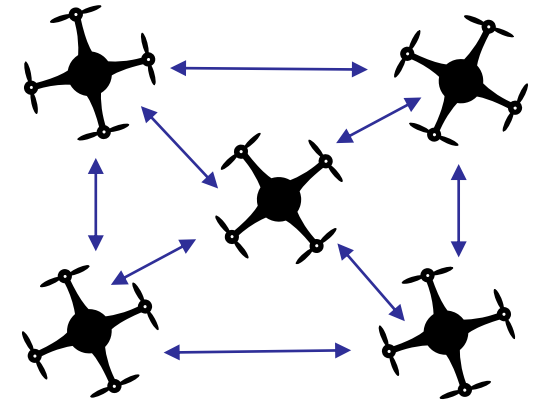
The final thesis must be written in English. Meetings during the work can be in English or German.

Requirements:

- Good programming skills (MATLAB or Python)
- Good to very good knowledge in linear control theory
- Basic knowledge in graph theory is beneficial

Tasks:

- Literature review on formation control for multi agent systems
- Design a controller for each agent and a suitable communication network
- Evaluate, compare and present the results



Resources:

- [1] J. Lunze: Networked Control of Multi-Agent Systems.
- [2] <https://www.flight.utias.utoronto.ca/fsc/index.php/autonomous-uas-for-wildfire-monitoring>

M. Sc. Alexander Rose

E-Mail: alexander.rose@iat.tu-darmstadt.de
Web: <https://www.ccps.tu-darmstadt.de>