

Setup, configuration, and programming of a swarm of autonomous UAVs for a stable and precise flight in an indoor environment

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Thesis Proposal

Quadcopter Unmanned Aerial Vehicles (UAVs) have become so widespread and advanced to be adopted in a multitude of outdoor applications beyond the only entertainment, such as parcel delivery, inspection, security, etc. However, the same cannot be said for indoor environments due to a lack of global positioning system (GPS) availability, and the high instability that the wall/ceiling effect and the flight of other close UAVs may introduce.

The goal of this thesis is to study and analyze hardware and software architecture of such quadcopters to be implemented for a stable and precise autonomous navigation in an indoor environment. Consequently, a setup, proper configuration of the UAV's parameters and programming of basic navigation trajectories for a minimal set of 2-3 small-sized UAVs in an indoor environment will be implemented.

Activity Description

- Analysis of typical hardware (boards, relevant sensors and actuators, other devices) and software (flight control firmware, navigation and collision avoidance systems, relevant libraries, etc.) architectures
- Complete hardware setup of at least 2 UAVs belonging to the swarm (starting from existing available endowment)
- Accurate analysis, understanding and setup of the proper UAV configuration parameters for a stable and precise flight in indoor environments
- Development of a basic navigation of the UAV swarm based on an optical positioning system for precise indoor localization

Required Skills

- C++ programming skills
- Python programming skills (optional)
- Experience with ROS2 (optional)