

Poster

Towards a Flexible Multi-drone System for Surveillance and Reconnaissance

Axel Bürkle, Sandro Leuchter, Florian Segor
{axel.buerkle, sandro.leuchter, florian.segor}@iitb.fraunhofer.de
Fraunhofer Institute for Information and Data Processing IITB
Karlsruhe, Germany

The use of miniature Unmanned Aerial Vehicles (UAVs), e.g. quadrocopters, has gained great popularity over the last years. The advantages over bigger drones like MALE or HALE range UAVs for several task environments are obvious: They are easier to transport, can be deployed in shorter time and can access narrow areas that are inaccessible to large drones, especially in urban terrain. Another advantage of quadrocopters is their ability to hover above a point of interest.

However, due to their limited size, those miniature UAVs can usually only be equipped with a single sensor. Which sensor is best suited for a specific mission has to be planned beforehand. Today, quadrocopters are teleoperated through a remote control or a ground station. In both cases, the operational range is limited. Obstacles like trees or buildings between remote control and drone further reduce this range.

To overcome these limitations and to open up new application fields for UAVs, Fraunhofer IITB is currently developing a semi-autonomous swarm of co-operating quadrocopters. This self-organizing flock of miniature drones will be capable of simultaneously monitoring several targets, viewing objects from different points of view and with different modalities, realizing complex surveillance tasks and adapting to dynamic environments. Furthermore, this system features a higher reliability through redundancy.

Possible applications of a quadrocopter swarm are, among others:

- Wide-area surveillance and reconnaissance, where a defined area has to be searched in the shortest time possible
- Protection of premises against intruders; the swarm will be able to track intruders spreading in different directions
- Multi-sensorial monitoring; the swarm can monitor multiple modalities, e.g. gas, radio activity and explosives

Semi-autonomous behavior of the individual swarm members is realized by integrating a programmable camera into the quadrocopters. The software on the camera can directly control the trajectory of the drone. We are currently implementing tracking algorithms on the camera which will enable a quadrocopter to follow an intruder autonomously.