



Swarm Drones

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INTRODUCTION

Our goal is to implement a swarm drone system which can communicate together and think as a single mind and provide flight and mission assignments completely autonomously.

APPLICATION AREAS

A common purpose for drones is military use, beside that civilian use of drones increasing day by day, Low-cost drone swarms provide advantages over single drone situations.

01

I am Master Drone.
Who are you?

Communications starts and master drone asks who that drone is.

02

OK. I am Slave Drone. I'm at your command, sir.

Slave responds its' ID and says ready for command.

03

I am checking communication.

Master checks, ID and integrity of message

04

OK. Send me your data.

Master requests Slaves' data.

05

OK. Here I am sending data.

Slave sends its' data.
(Lat, Lng, Alt, Battery...)

07

06

OK. I got data about this Slave Drone

Data collection procedure of master is finished, master ask all slaves for data with this procedure.

SEARCH, RESCUE AND DISASTER MANAGEMENT

Finding people who are lost or under wreck, deliver them a first aid kit and report their location to authorities. Surrounding the fire and preventing it from spreading with fire extinguishing material.

SECURITY

Swarms can autonomously patrol the border, prevent illegal immigration and can backup security personnel for area search.

MONITORING & SURVEILLANCE

Police can use swarm for traffic monitoring, suspect tracking.

ENVIRONMENTAL MAPPING

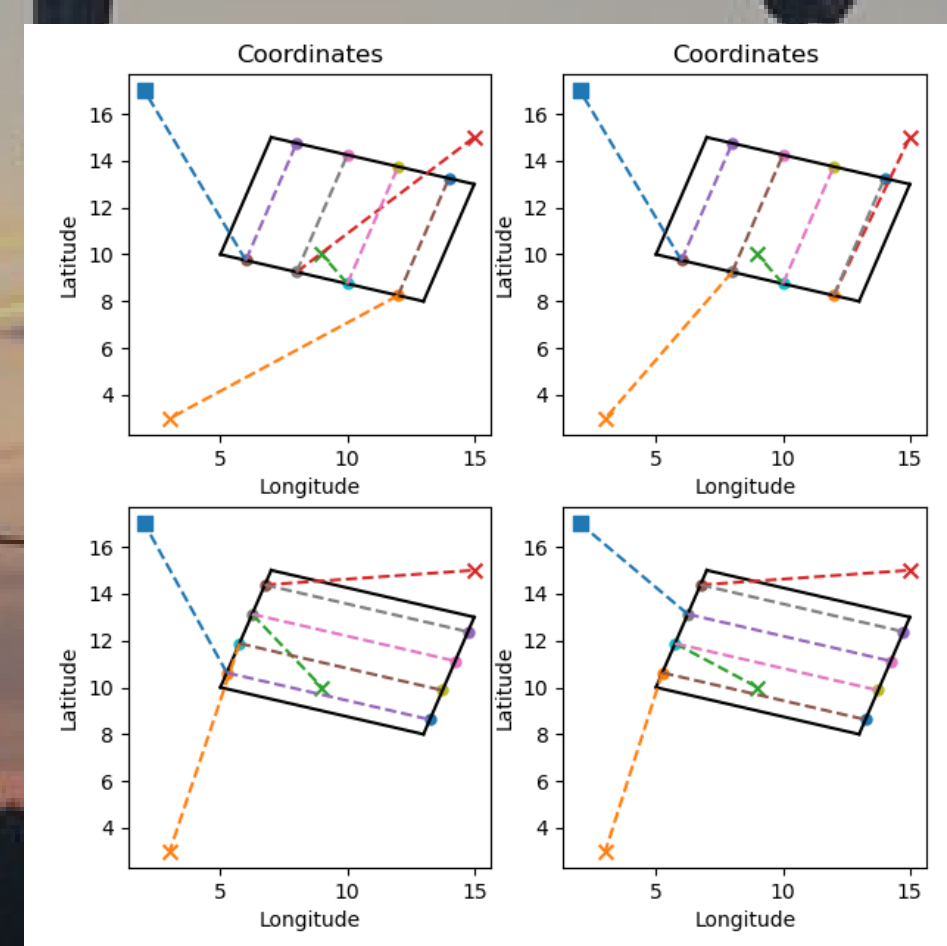
Swarm drones maps large areas at high level of detail and short amount of time.

AGRICULTURE

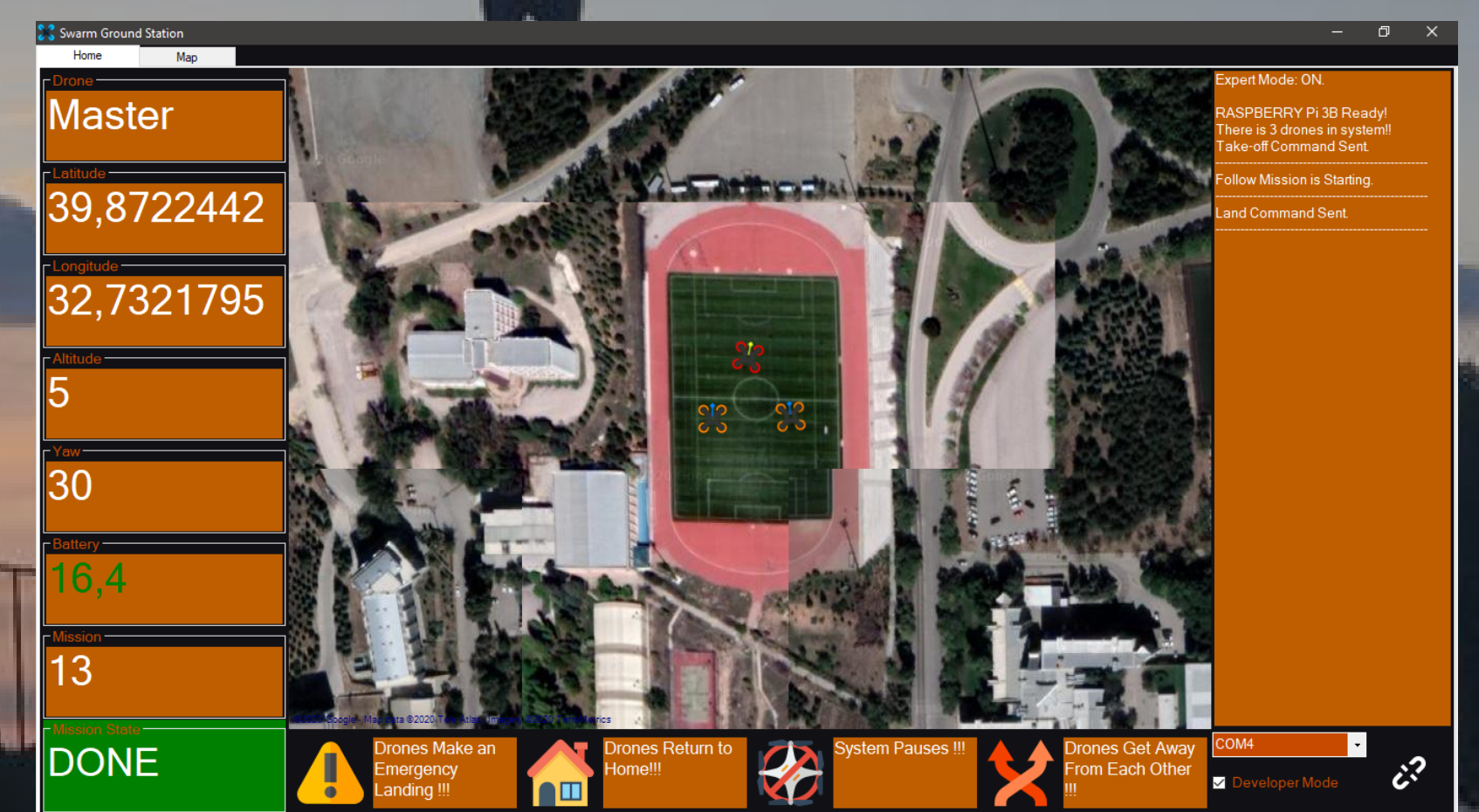
It can save time and cost in spraying, taking measurements, surveillance and detection applications in large areas.

METHODOLOGY

Ground station assigns a task to master drone, master evaluates the task and informs ground station, master drone then makes necessary planning, and communicates with slave drones and assigns tasks to each of them, in case of an unexpected situation master choose a backup master among slaves, then the task starts synchronously by the drones, and the master drone checks the status of the task by querying all the drones at each step of the task at regular intervals master drone informs the ground station about the current state of each drone including itself. For any emergency ground station has emergency buttons and with them user can intervene the flow. Among various tasks we have been on Scan Mission as always task is assigned by ground station and master decides, how to approach to selected area without collision there is a scoring algorithm for that. Collaboration between drones is very important for swarm system and that is provided by strong communication between drones, in our system communication never stops, each drone knows what other drones do. Swarm system is independent from hardware to show that master and slaves' flight controllers are different, on master there is OMNIBUSF4 Pro and Raspberry Pi Zero, on slaves there is Pixhawk flight controller and Raspberry Pi 3 B+, on ground station there is Raspberry Pi. Ground station and each drone has RF module to communicate.



Area Scanning simulation results



Ground station software

DRONE HARDWARE

Pixhawk PX4 or OMNIBUS F4v3
Raspberry Pi 3B+(or Zero)
RF Module

GROUND STATION HARDWARE

Raspberry Pi 3B+(or Zero)
RF Module



Special Thanks to
HU UAV Society

Special Thanks to ALP DEMİREL