

D.R.D.O. SASE's UAV Fleet Challenge

Mid-Evaluation Report

IIT ROPAR



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Objective

To design and make an autonomously flying and landing UAV fleet which can spot a target amongst a clutter of different objects spread randomly over a grassy land and subsequently communicate the location of the target to their remaining two drones using swarm technology.

Features enabled to Drones:

1. Wireless Communication
2. Self-location (GPS)
3. Capacity to return the coordinates of the current location
4. Target sensing technology
5. Data acquiring capability
6. Self-defense from obstacles (airflow)

Outline describing the working:

First of all, the power supply to the drones is switched on and confirmed whether the drones are working properly or not. Then we elevate the drones at a specified height using Altitude control and make them fly in programmed directions at that height. Each drone starts scanning its path for the features of the targets. When it senses a required percentage of data about the features of the target, it communicates with the other drones and sends the stimulated (digitalized) pheromones. Once the target is sensed, the drone communicates with the ground station sending its current coordinates. Then continue to scan for the remaining targets.

Explanation of idea:

The dimensions of the given boxes are 15cm x 15cm x 15cm and are of green color.

It is first required to check the dimensions of the boxes which can be implemented using open cv with the help of contour analysis.

Each contour is looped over; if it doesn't extend to a large enough size it is ignored. We also compute the bounding box around the large contoured mass and draw a point in the top left, top right, bottom left and bottom right of the mass. We finally compute the center point of the box.

Here without the use of any reference object, we will take the leftmost object as a reference and find distance with it by which we can calculate the size of the box.

The color of the box can also be detected by using open cv.

Here we will be defining the boundaries in the RGB color space using tuple and use the inbuilt function to return a binary mask which will give us the results whether the color of the object falls in our range or not.

After detection by the use of transmitters, the coordinates will be sent to all remaining drones.

Setting up the drone :

Components used -

- Pixhawk Autopilot
- 3DR radio telemetry
- Radio transmitter/receiver
- GPS
- Drone Kit

Procedure:

- Uploaded the PX4 stack to the Pixhawk flight controller using the ArduPilot Mission planner.
- Calibrated sensors mounted on the drone-like accelerometer, gyroscope, electronic speed controllers, GPS.
- Calibrated radio transmitter and set up the flight modes
- Tested the drone in autotune mode and adjust the Kp, Kd, and Ki values of the roll, pitch, and yaw.
- Updated Objective – To achieve swarm communication between 3 models(PC here) using telemetry.
- We will send and receive data between PC following the swarm protocols.
- Components used: 3DR 433 MHz radio telemetry set, PC with ROS installed.