

Supplementary Material

Optitrack system

It is important to make sure that the motion capture system is properly calibrated. Attach three optitrack markers on top of the UAV. After the calibration, it is also important to make sure that the MOCAP package is able to read the motion capture data and is constantly publishing the pose data in the MAVROS topic. If the publish rate on MAVROS topic is above 100 Hz then it is performing well.

MOCAP package:

An open-source package named as MOCAP was used to link between the optitrack system and the ROS. The MOCAP package was receiving the position data from Optitrack and it was publishing on MAVROS topic. The MAVROS package then transfers this data to the autopilot firmware.

Data extraction:

The flight data is usually stored in the SD card provided with the autopilot. The flight data was extracted using the px4logs. At first px4logs were converted into CSV files. The CSV files were then imported in MATLAB for plotting. The Elogger data was extracted using the Elogger Software. The data was then converted into CSV format after which it was imported in MATLAB for plotting and further analysis.

Experiment steps:

1. To make the experiments quicker, we will attach payload before the takeoff and there is no need for the drones to go and pick up the object.
2. Calibrate the optitrack system.
3. Recharge the batteries fully for camera, drone and the remote control.
4. Verify the WIFI connectivity.
5. Define the rigid body in optitrack system, run MOCAP package, and MAVROS package in the drone.
6. Verify that the Drone is able to take MOCAP data and after filtering the local position estimations are accurate enough.
7. Start the RTDP algorithm in Simulink and run it to verify the publish rates without actual flight.
8. Takeoff using the Remote control and do a position hold at point A
9. Run the RTDP algorithm and switch from position hold to off-board mode
10. When the drone reached the point B, switch back to position hold mode and land.
11. Data to be extracted:
 1. Power consumption using Elogger.
 2. Trajectory (Velocity and position profiles) using flight data from flight controller data.
 3. Video recording

Safety steps:

1. It is important to perform the experiments within the safety net.
2. LiPo batteries related safety training is needed.
3. Safety gear such as helmet and safety goggles are necessary.
4. At-least two person should be present during the test.