Research proposal

Title:

Target-oriented UAV auto-control based on SLAM(Simultaneous localization and mapping)

Advisor: Prof. Thomas Bewley

Co-advisor: Prof. Falko Kuester

Student: Zhaoliang Zheng(Spark)

Platform: UAVs in the Drone Lab of Prof. Falko Kuester

Ultimate goal:

While UAVs working on a new and sophisticated environment, the camera on the UAV could capture image of its surroundings and simultaneously transport back to the terminal computers. On the computers, by using SLAM algorithm, we could immediately build a 3D simulation gird or particle model. In this 3D model, we could pinpoint the exact target point that we want UAV to be. After that, the terminal computers send this info back to the processer on the UAV. With the auto-control algorithm on the processer, the UAV could intelligently design an optimal path and drive itself to the target point.

Preliminary goal:

Consider the time limitation and degree of difficulty of my master graduation thesis, I think I probably do the auto-control part first and run the simulation based on the extant 3D digital map in the Drone LAB.

Steps:

1. Build a simulated UAV model.
2. Develop an auto-control algorithm which not only can it control the UAV but also design an optimal route planning.
3. Design a simple 3D digital environment model to test and debug our algorithm.
4. Loading the extant 3D digital model to run the whole thing. **(preliminary goal finish)**
5. Study and begin the SLAM part.
6. Start from the SLAM algorithm and study how image transfer into 3D model.
7. Test and debug this algorithm by using normal camera or depth camera.
8. Install camera into UAV, manually drive the UAV and test how field test run.
9. Auto-control algorithm coding into the UAV processor and run the field test.
10. Combine SLAM algorithm and auto-control (route planning) algorithm, embedding everything into UVA processor and run the field test.
11. Debug and adjust our algorithm if bad things show up.
12. Try to optimize our algorithm to make it perfect.