Path and Trajectory Planning System for Quadcopters Navigating Dense Urban Environments

Summary

I developed an integrated path and trajectory planning system for drone navigation in dense urban environments. Given an obstacle bounding box map, this system can plan trajectories between any two locations that are near-shortest distance, smooth, collision free, and conformant to a user defined average speed.The system processes obstacle data, constructs a graph, plans a coarse path using the A* algorithm, refines that path using RRT, then finally plans a trajectory through those points using a polynomial trajectory algorithm. This was a self-directed project, and I am planning on building on it as a first-semester M.Eng student in Robotics Engineering at University of Maryland, College Park.

Obstacle Definition

I define the obstacle processing subsystem. The way I implement the obstacle processing subsystem is Y. The way each of these parts works is by Z. I know the obstacle processing subsystem works is because of this.

Global Planning Subsystem

I design the global planning subsystem to achieve the goal of X. The way I implement the global planning subsystem is Y. The way each of these parts works is by Z. I know the global planning subsystem works because of this.

Local Planning Subsystem

Trajectory Planning Subsystem

System Validation

I design a system level test to achieve the goal of Y. The way I implement the test is by this. The results are this. The results show this.

Conclusion