ILR 03

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Team F

Autonomous System for Aerial Search and Rescue

Individual Deliverable Overview

The individual deliverable for this week was to implement a prototype for the localized navigation system. The goal of the localized navigation system is to accept input locations of interest as GPS coordinates and generate a set of waypoints that the drone can follow. The goal for the Spring semester is to generate waypoints at each localized interest location in a way that maximizes the sensor coverage and the resolution of the data. This results in a pattern that forms a set of concentric circles with expanding radius as shown in the figure below.

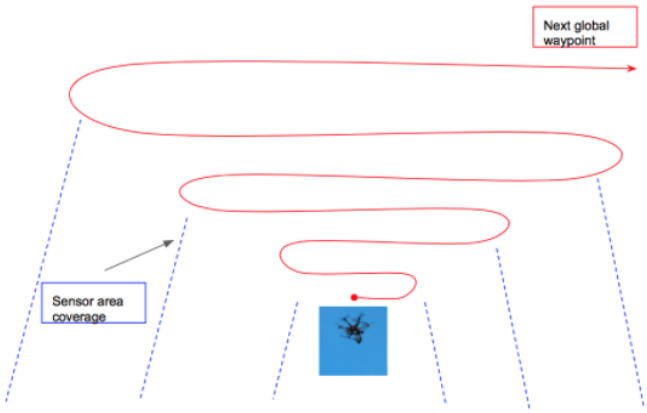


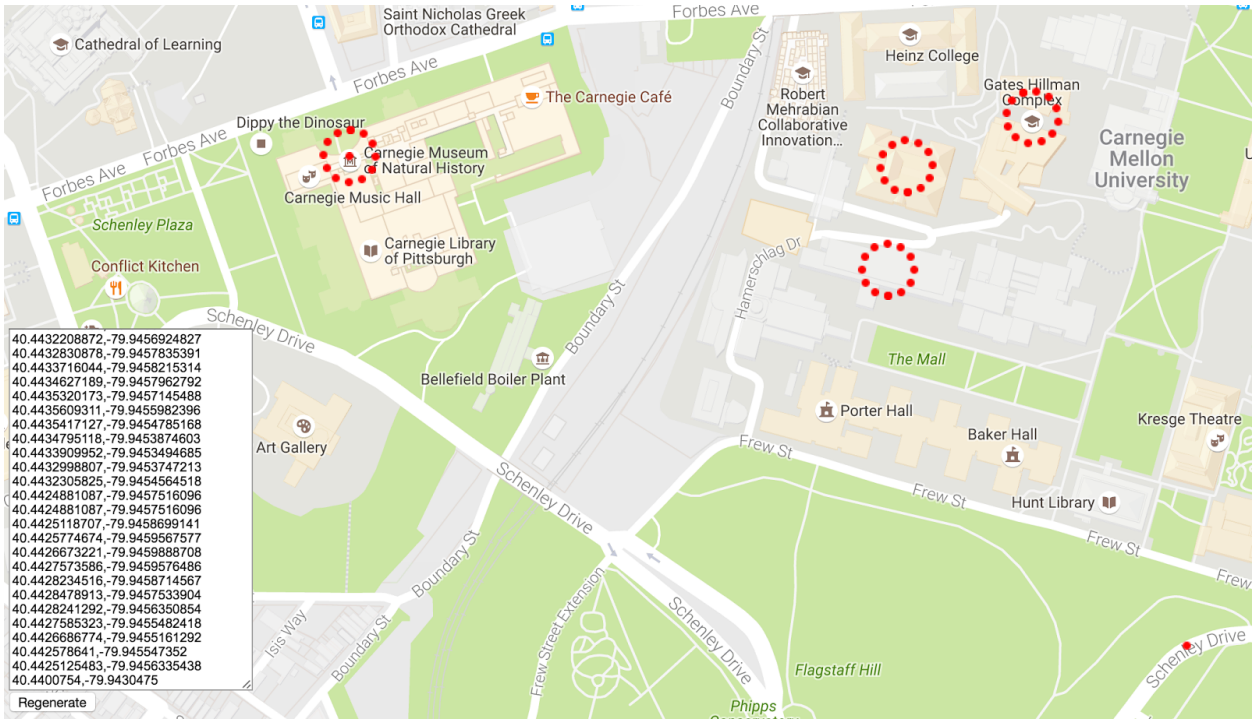
Figure 7.2. Localized navigation pattern for maximizing resolution and coverage

For the Fall validation, the goal is to generate a circular pattern at each localized location without an altitude component. The deliverable for this week implements this pattern.

Deliverable details

The software to implement the localized navigation was implemented in python and is available at https://github.com/karamach/rescue_rangers/tree/local_nav_pattern/mrsd_project/waypoint_gen

The software was tested using a set of waypoints in and around CMU. The actual waypoints on a map is shown below.



The input and output locations were the GPS coordinates for CMU Natural History museum and Schenley park and the desired interest locations were Gates Hillman complex, Wean Hall and NSH. The software generates the necessary intermediate waypoints and at each location of interest, it also generates GPS coordinates for the localized circular pattern of search as can be seen from the picture above.

Challenges

The main challenge was to implement and debug some of the GPS translation logic. Since GPS coordinates are dependent on the earth's curvature, logic had to be implemented to handle bearing/heading information and the distance. Though, for the above usecase, the distances are small enough that a simple cartesian coordinate system might have worked, the goal was to build something

that can be used in future scenarios where the area of coverage might be in miles if not more.

Future work

The individual deliverables for next Progress Review(2 weeks) would be

1. Continue on the above prototype to make it more robust in terms of accepting configurable information on the number of waypoints, radius of the circle for localized navigation, incorporating altitude in navigation and, to integrate with the component that allows users to provide locations of interest on a UI and generates GPS information from it. Sumit is working on that component
2. Rampup on Matrice 100 drone which we are hoping would arrive early next week. A simple deliverable for rampup would involve being able to power the drone and do atleast one indoor and one outdoor flight. A stretch goal would be to use the output of the above software and validate if the drone is able to fly a set of GPS coordinates reliably.
3. Do some preliminary experiments on feasibility of using sound sensor for signature detection. The goal is use an off the shelf sensor and test the hypothesis as to whether the noise from the propeller can be isolated if the microphone is 10-15 feet away from the propeller.