

Progress Review 9

Individual lab report – 08 || February 24, 2016

Team Daedalus
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Team Members:
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1. Individual Progress

- ❖ Creating a Map of the environment
- ❖ Testing waypoint navigation of the platform
- ❖ Literature Survey for the Simulation Environment

Navigation Subsystem

- **Mapping**

The map created by the ROS package GMapping is a 2D image and an associated YAML file which holds all the meta-data, i.e. parameters to interpret that map, such as image path, resolution, origin, etc. The white, black and gray colors correspond to traversable, boundary and unexplored regions respectively. The map created through ROS was noisy and required some cleanup before it could be used. The before and after state can be seen in Figure 1.

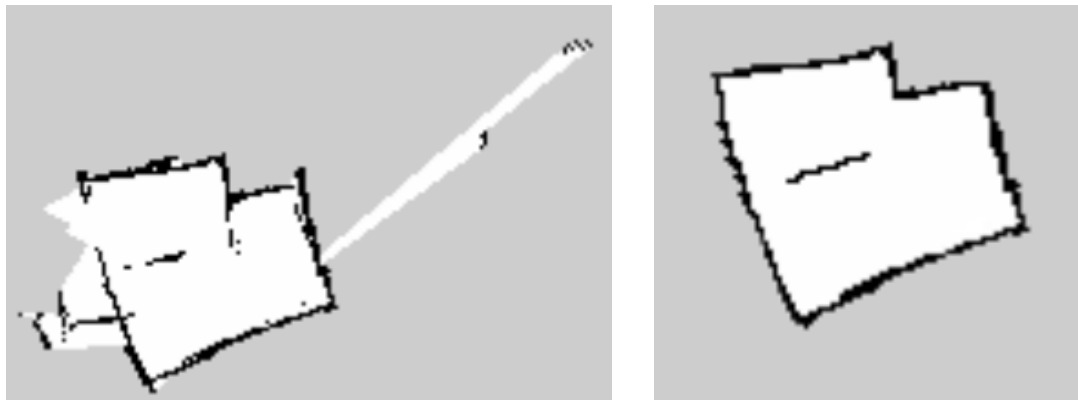


Figure 1: Map, before and after cleanup (Collaborators: Mohak, Shivam and Pranav)

- **Waypoint Navigation**

The waypoint navigation of the platform was tested on the map of mock parking lot via the web interface UI of Oculus Prime. Even though the platform was struggling to localize itself due to the inadequate arrangement of the parking lot in terms of landmarks and size, we were able to test few aspects of the Navigation Subsystem such as the setting and removing of waypoints, using the telnet stream and the accuracy of motion. The interface used to do this can be seen in Figure 2.

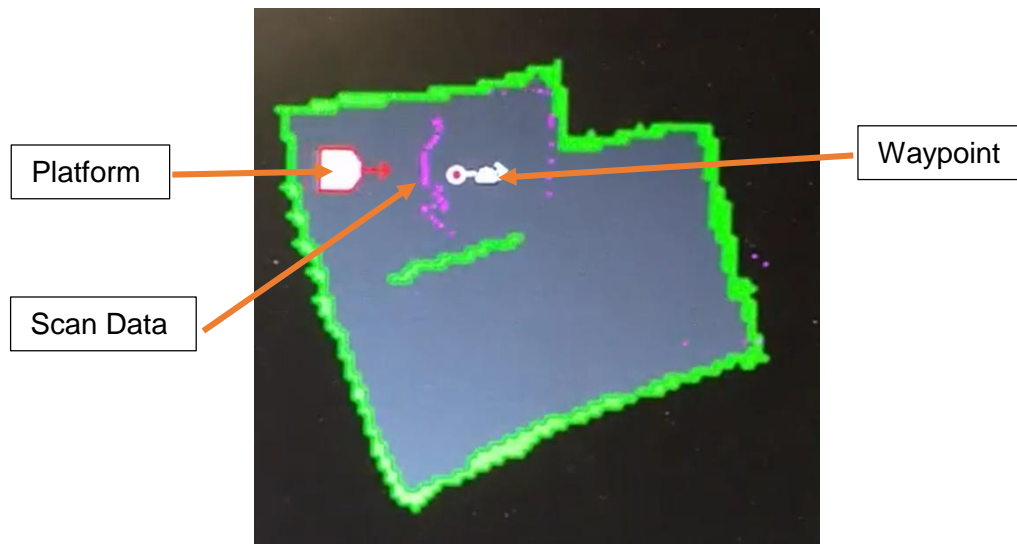


Figure 2: Oculus Prime, web interface (Collaborators: Mohak, Shivam and Pranav)

Simulation Environment

The simulation environment being developed to model a parking lot will require work on three main aspects:

- **Global Planner**
This will be responsible to rank and assign costs to parking spots based on multiple heuristics. This information will then be relayed to Path Planner and a final cost and path is calculated for the vacant spots. This information is then relayed to the simulation engine to be processed and rendered in the environment.
- **Path Planner**
It takes inputs from the Simulation Engine and the Global Planner to plan the most optimal path from any given point A to B, taking into account all the heuristics, such as path cost, vehicle density, etc.
- **Simulation Engine**
It accepts the data from other nodes to render an environment showing the state of all the vehicles in the parking lot. It will also update the other systems with the real-time updates of the lot so that planning takes the dynamic environment into account.

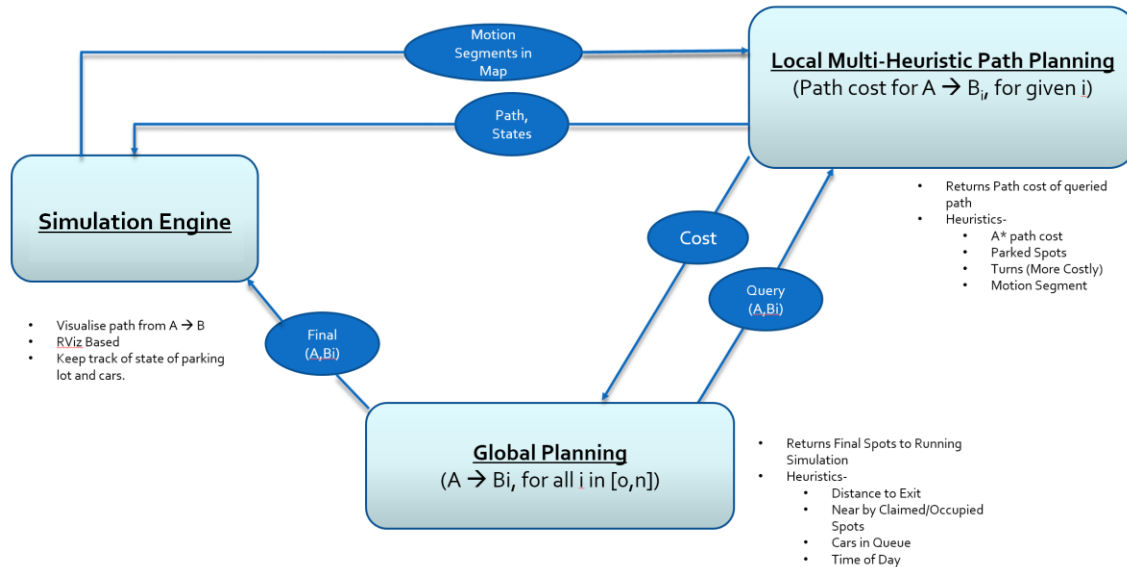


Figure 3: Architecture of the simulation environment (Graphic created by Shivam)

2. Challenges

We've had to make some major changes to our scope recently, requiring a fair bit of work redistribution and re-planning of our schedule. This has set us back a bit but we hope to cover up soon.

Getting the new platform up and running was harder than anticipated as we were not able to use the standard web interface provide by the manufacturer to carry out mapping or waypoint navigation. Working our way around this issue took a fair bit of time.

3. Teamwork

As per the task distribution, Shivam, Mohak and I worked on creating the map of the environment and testing the locomotion of the platform. I worked with Richa and Dorothy to integrate the Visualization Tool and the Communication Subsystem. Mohak and Shivam did literature survey for various aspects of the Simulation environment such as Path Planning, metrics for spot allocation, etc. Dorothy worked on creating an experimental parking lot which shall be used for initial testing. Richa is working on fixing the old platform.

4. Plans

As per the schedule, the next major task that lies ahead of us are testing and integration of all the subsystems associated with the physical platform and develop a simulation environment for our Auto-Park system. Richa and Dorothy are working on one of the platforms to have it up and running. Mohak, Shivam and I will work on bringing together different aspects of the Simulation Environment together. I shall be working on creating an environment on RViz which can be used to render different vehicles and their paths. Mohak will work on creating a script which uses multiple heuristics to assign costs to empty spots in a parking lot. Shivam will work on a path planner which uses multiple metrics to calculate the most optimal path from point A to B.