



Self Driving Vehicular Environment



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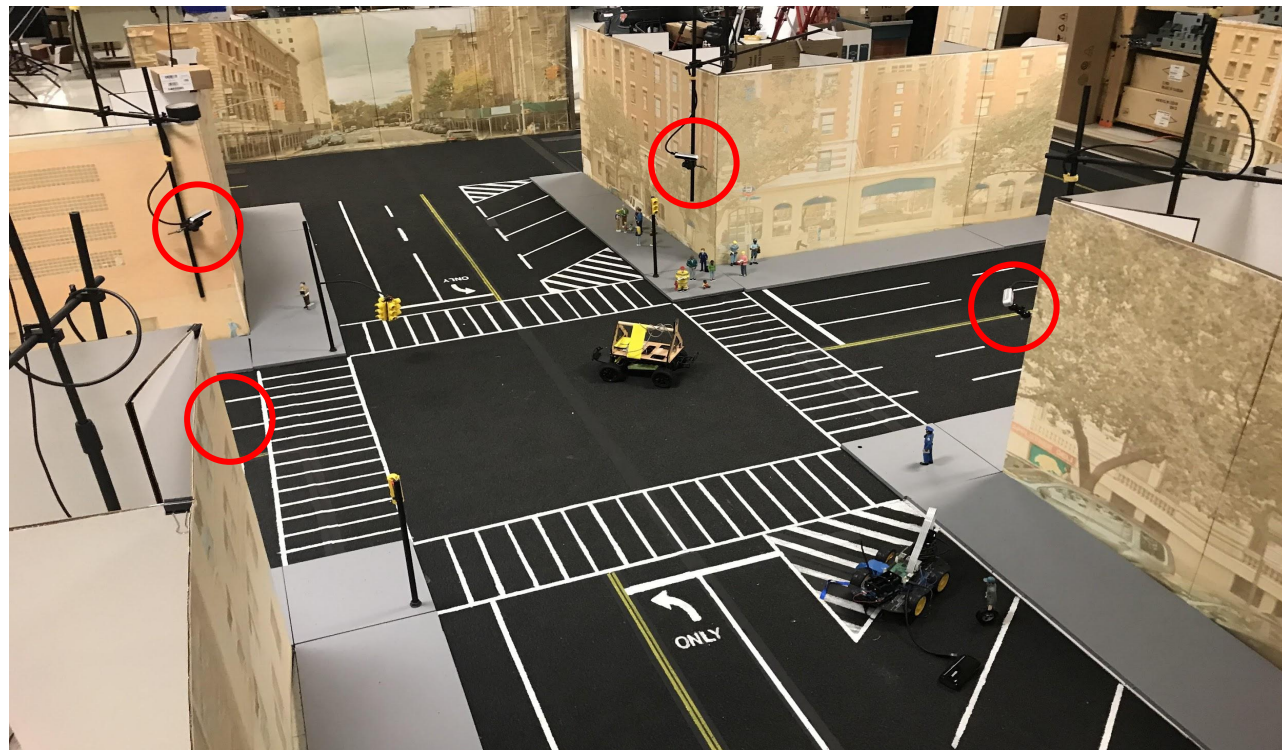
Lincoln Roth



Motivation

- Develop a model intersection that serves as a test-bed for future research opportunities:
 - Has a host of sensors to accelerate self-driving vehicle research both safely and inexpensively
 - Can deliver important information to a driver about the surroundings of the intersection via an app
- Safety for BOTH drivers and pedestrians
 - Street intersections are a major cause of traffic accidents (account for 40% of all accidents)

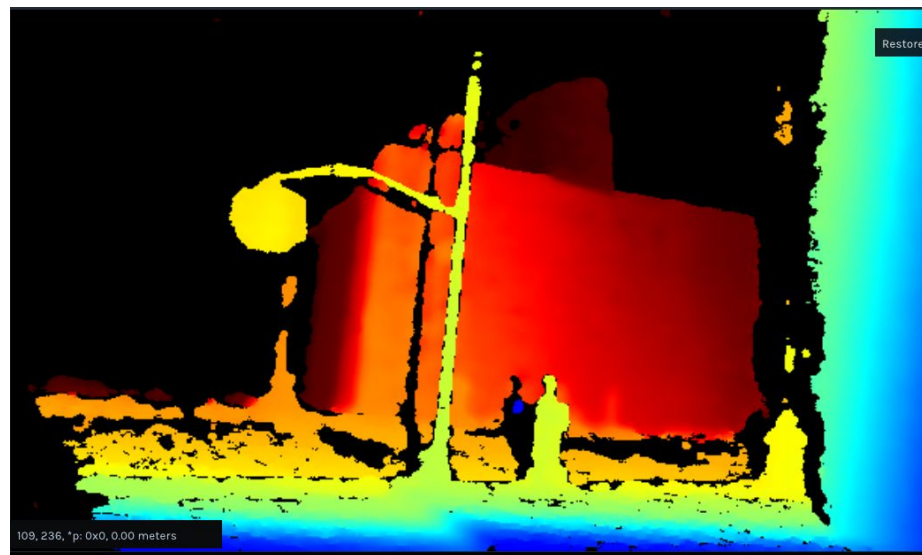
120th and Amsterdam St.



○ = Intel Realsense camera



RGB and Depth View



Point cloud unification

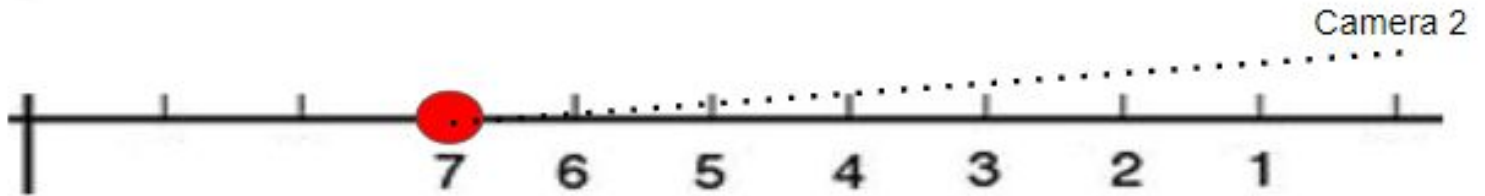
1. Calibration of pink ball for all cameras simultaneously
 - a. Output: Offset values to globalize coordinate system
 - b. Allows us to go from Step 1 to Step 2

Camera 1

Step 1a

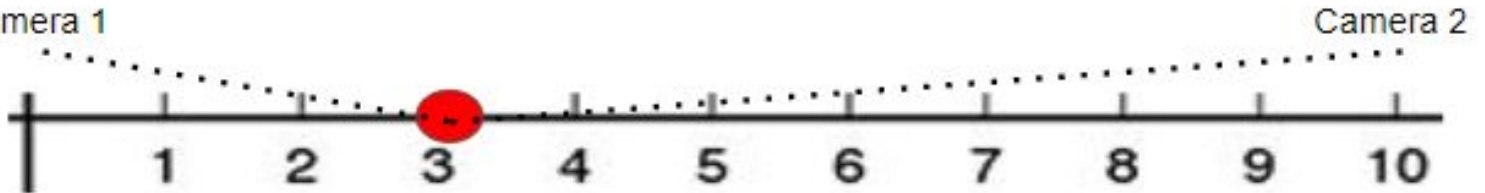


Step 1b

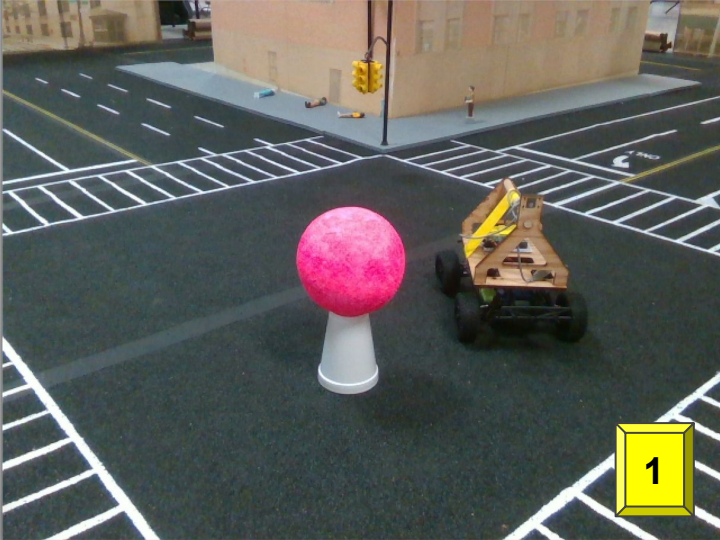


Step 2

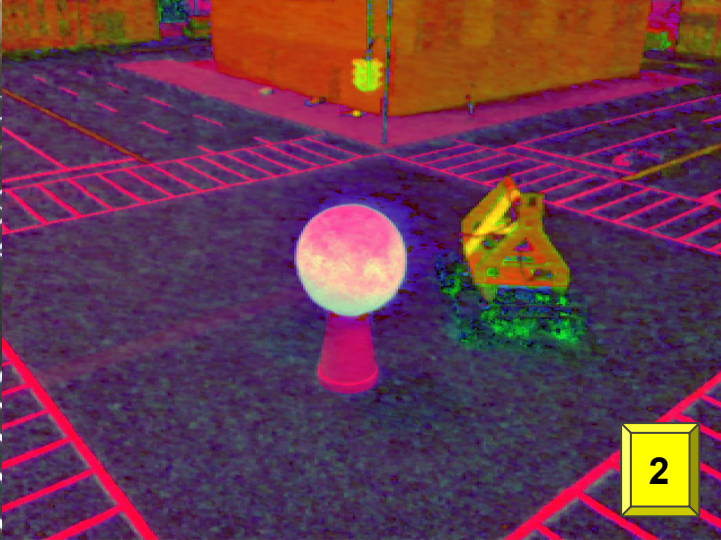
Camera 1



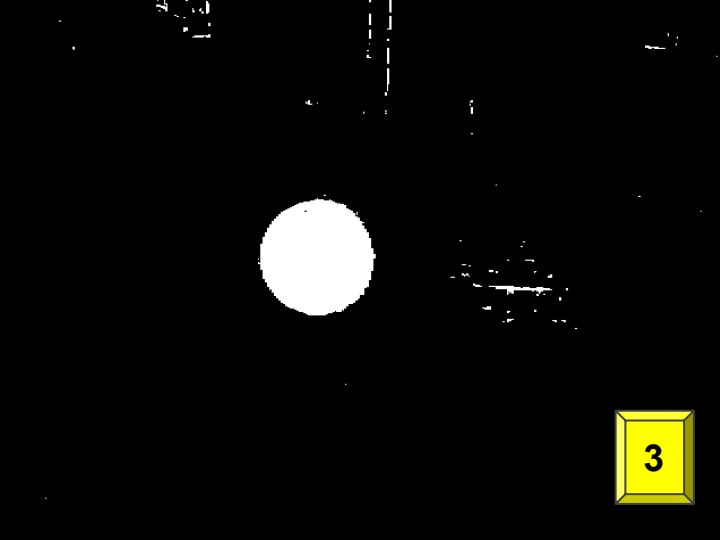




1



2



3



4

1

Original RGB Image

2

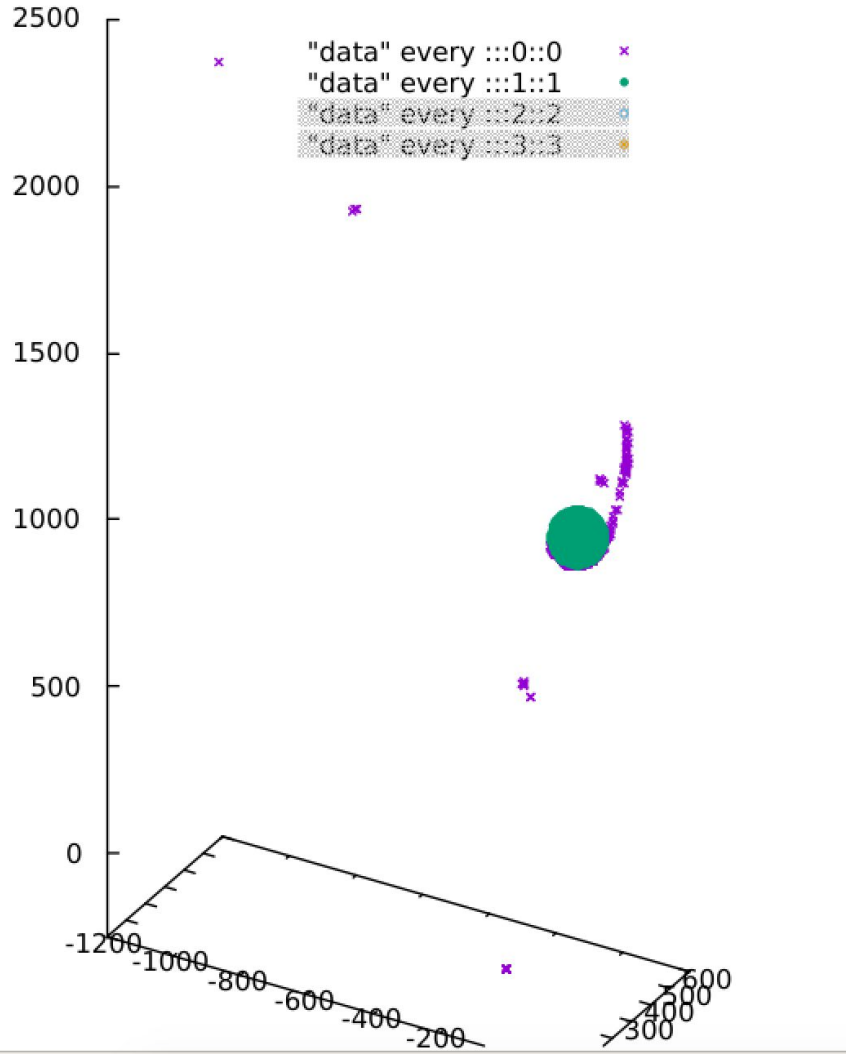
HSV Image

3



Masked Image

4

RGB Image Masked



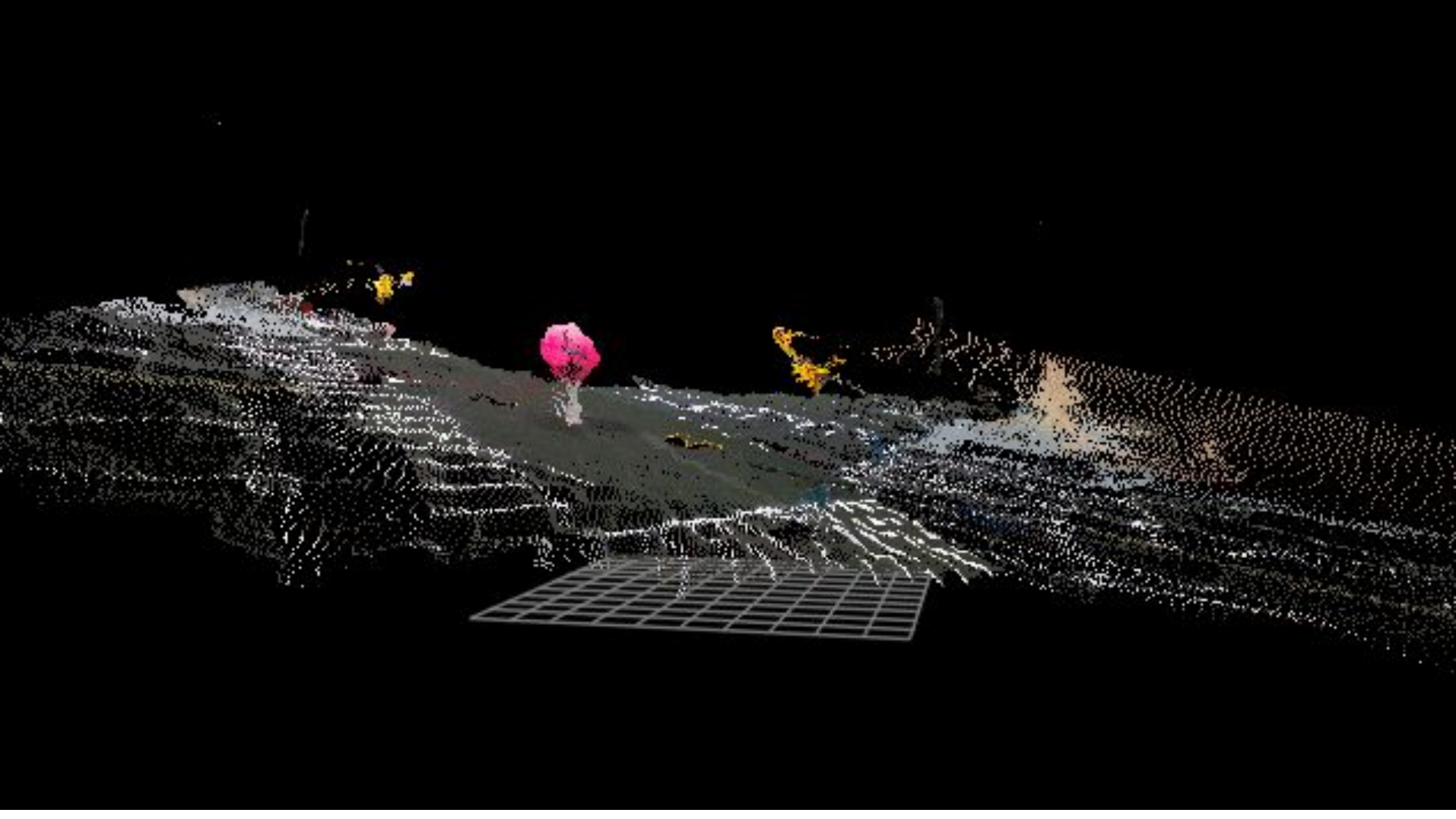
RANDOM SAMPLE CONSENSUS ALGORITHM

-  Outliers
-  Calculated Sphere



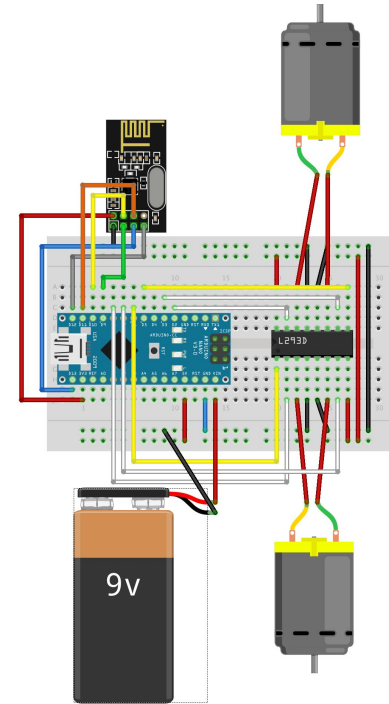
Combined Camera Views

- Use Least Squares Fitting algorithm to output a transformation matrix and translation matrix
- Use these matrices to get everything onto the same coordinate frame (unified point cloud)



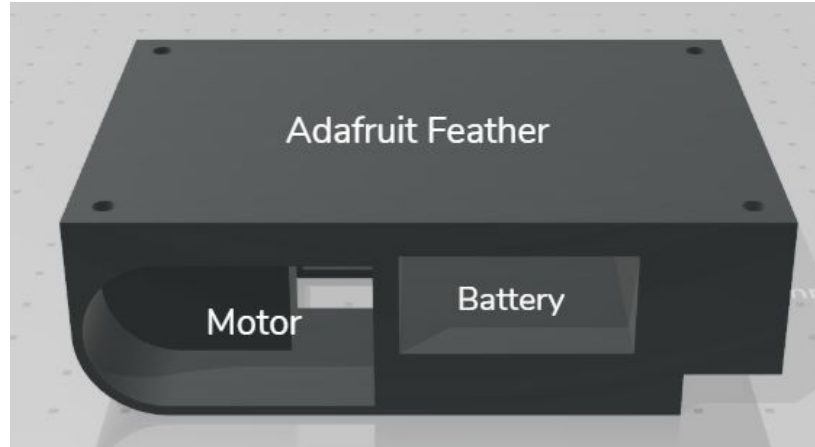
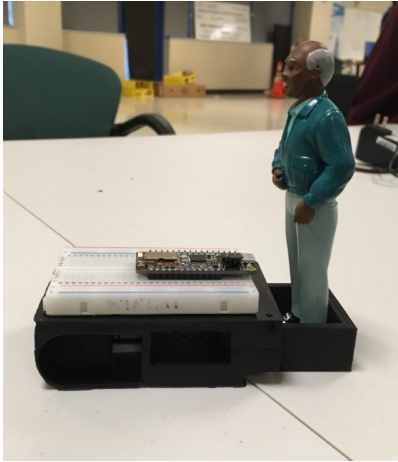
Moving Platforms For Pedestrians

- Objective: Create small moving platforms to simulate pedestrian traffic
- Localize robots using markers
- Have multiple platforms wirelessly receive pathing instructions from a single computer



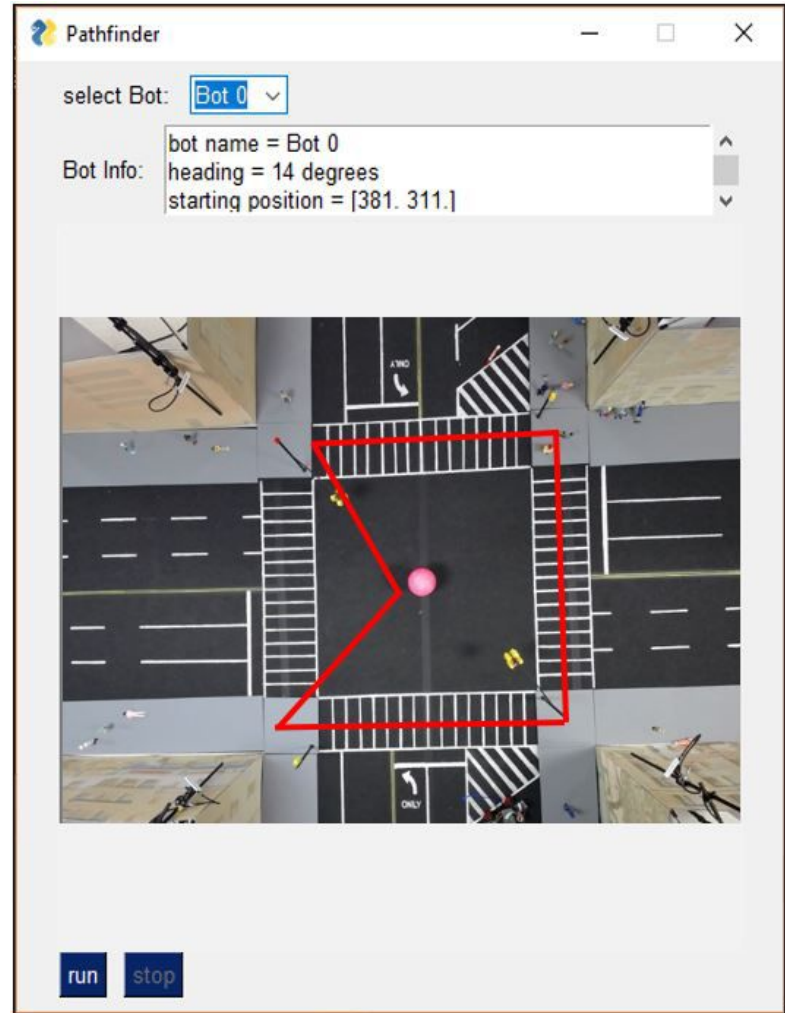


3D Printed Chassis and Circuit



Pathfinding program

- Allows the user to specify a path which the robot will follow
- Once the model of the intersection is complete, a picture of it can be included in the background





Vehicle Control

Goals:

- Have vehicles mimic the unity simulation
- Have unused vehicles queue themselves so that they can be reused and be reassigned as new vehicles

Progress:

- Multiple camera streams communicate vehicle position to main control server
- Vehicle position and velocity commands received from Unity simulation
- Vehicle queue system prototyped

THANK YOU!

