Self-Driving Neatos

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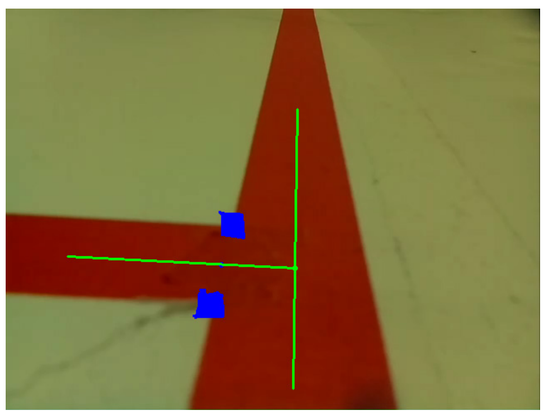
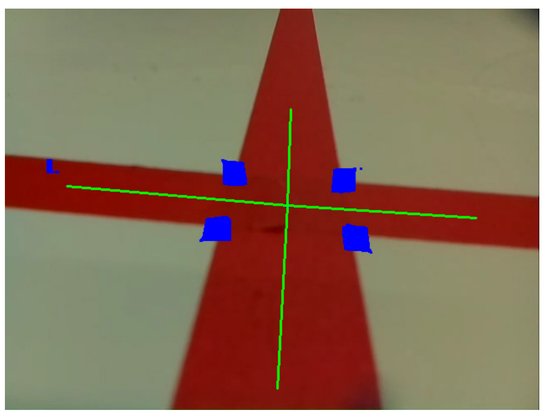
Goal:

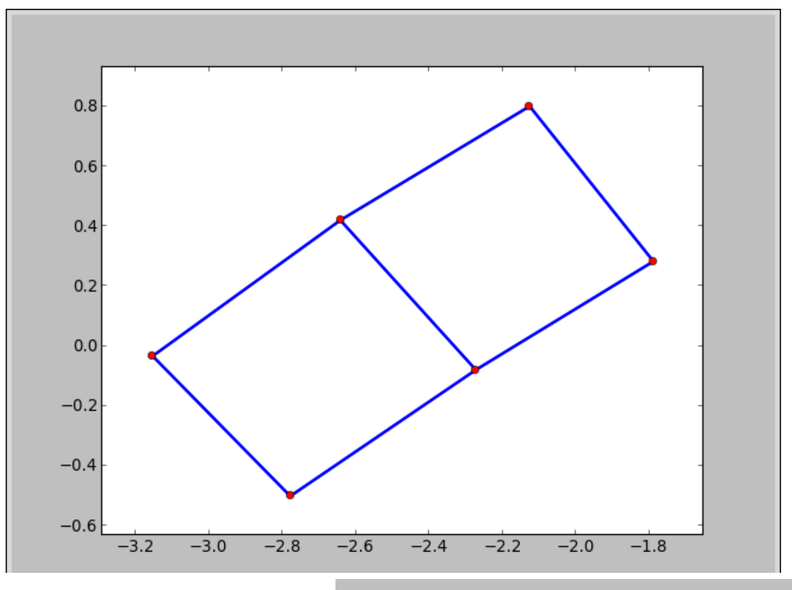
We aimed to make the Neato capable of driving around a complex track while following road signs and building a map.
Driving Beyond simply following the line, we hoped to make the Neato capable of handling intersections, more complex turns and tigher quarters.
Sign-Finding We wanted the Neato to be able to find and react to a variety of road signs even if the signs weren't in the perfect positions.
Mapping We aimed to build a map that could visualize where the Neato had travelled and that the Neato could use to navigate if it needed to.

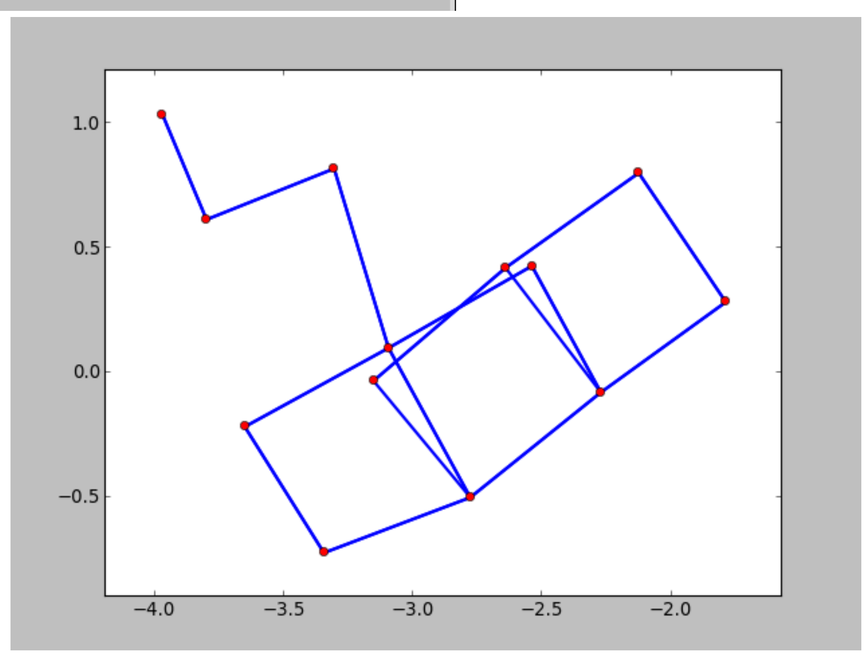
Driving:

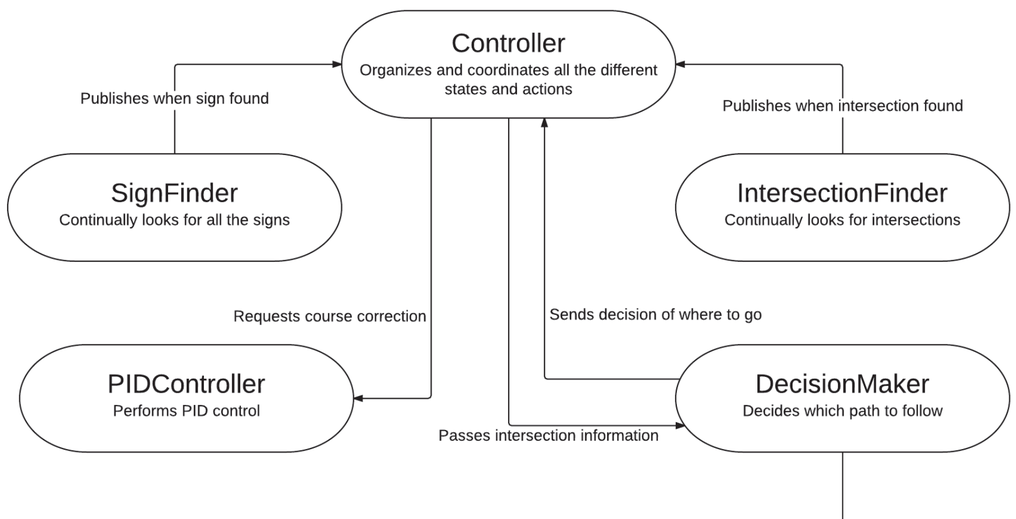
In order to navigate our map, we needed to identify and characterize its intersections. We used corner detection and contours to determine each intersection's position and geometry. This information along with odometry is used to build a representation of our entire map.





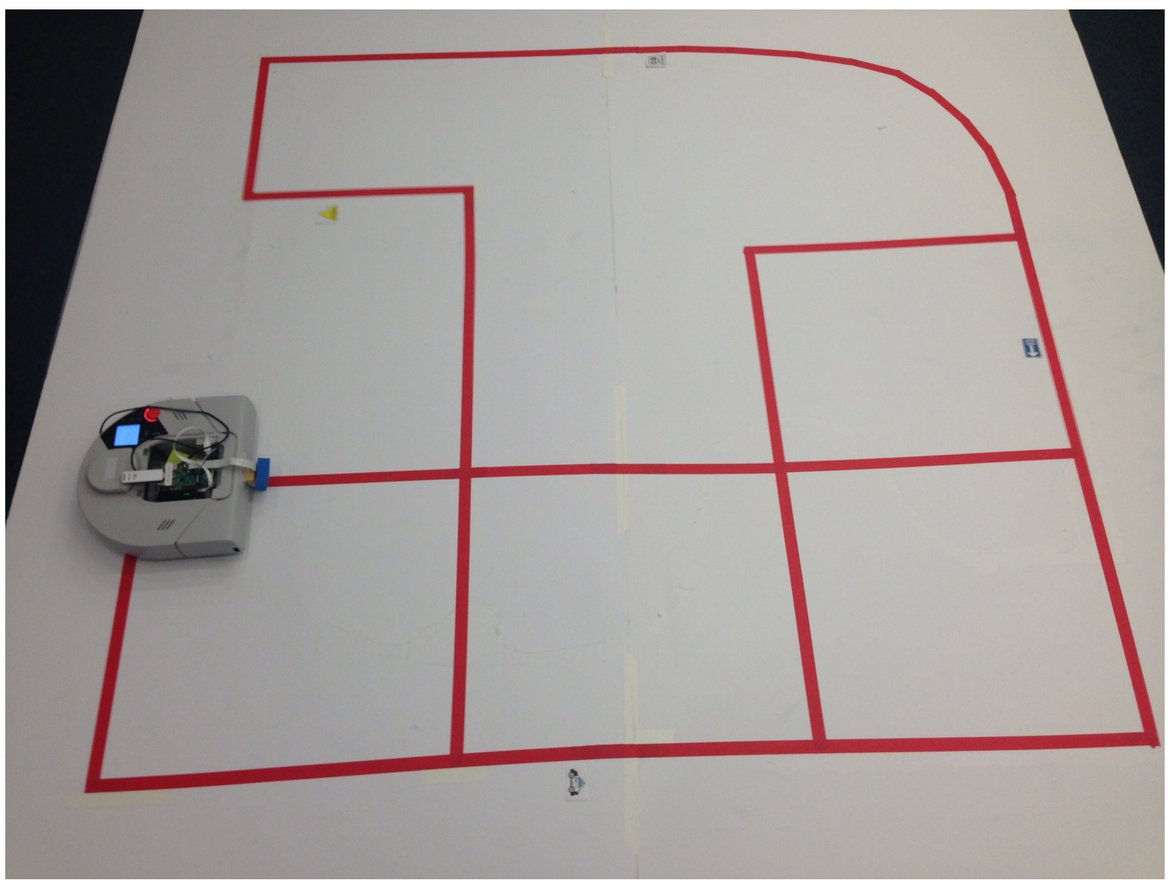






Neato:

In another life, the Neato was a robotic vacuum. Now, after some hacking and a few snazzy additions, it has become a lean, mean, Computational Robotics teaching machine. With the Neato and a Raspberry Pi, we're able to explore the Robotic Operating System (ROS) and its opportunities with cameras, Lidar and odomoetry.



Finding Signs:

To find signs, we did feature matching using OpenCV. At start, we find all the keypoints and descriptors for each sign. Each time the program receives an image from the Neato, it looks for matches within the image. If it can reliably find matches, we know we're seeing a sign. Feature matching allows us to find the sign even if some of the sign is hidden or if the sign is scaled or rotated.