Introduction: Navigation, Estimation and Control for an Autonomous Rover

AR Track, Week 1

Track Overview

- Hardware and integration focused:
  - Requires assembly, soldering, working with a physical robot
- Material covered:
  - Path planning (Dijkstra's)
  - Controls
  - Estimation (Extended Kalman Filter)
  - A lot of coordinate transformations
- Final goal:
  - Build a basic robot that can, given a map of its environment, navigate to a position while avoiding obstacles
- Coding in Python

Motivation

Autonomous ground robots are widely used in many different applications:

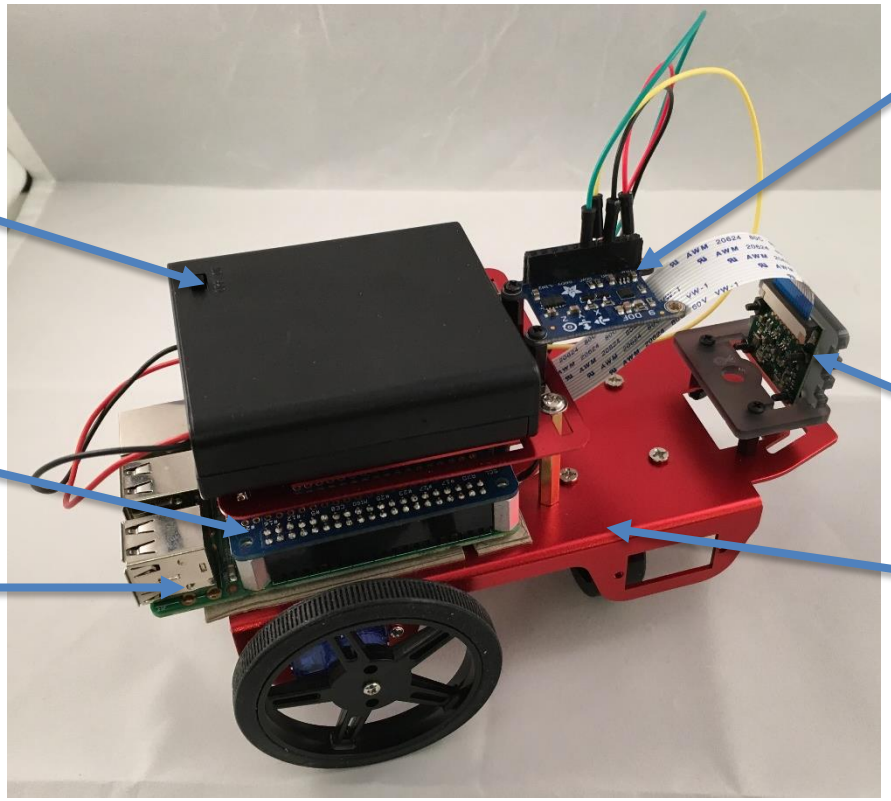
Self Driving Cars

Warehouse Systems

In home cleaning

Warming our hearts

Hardware

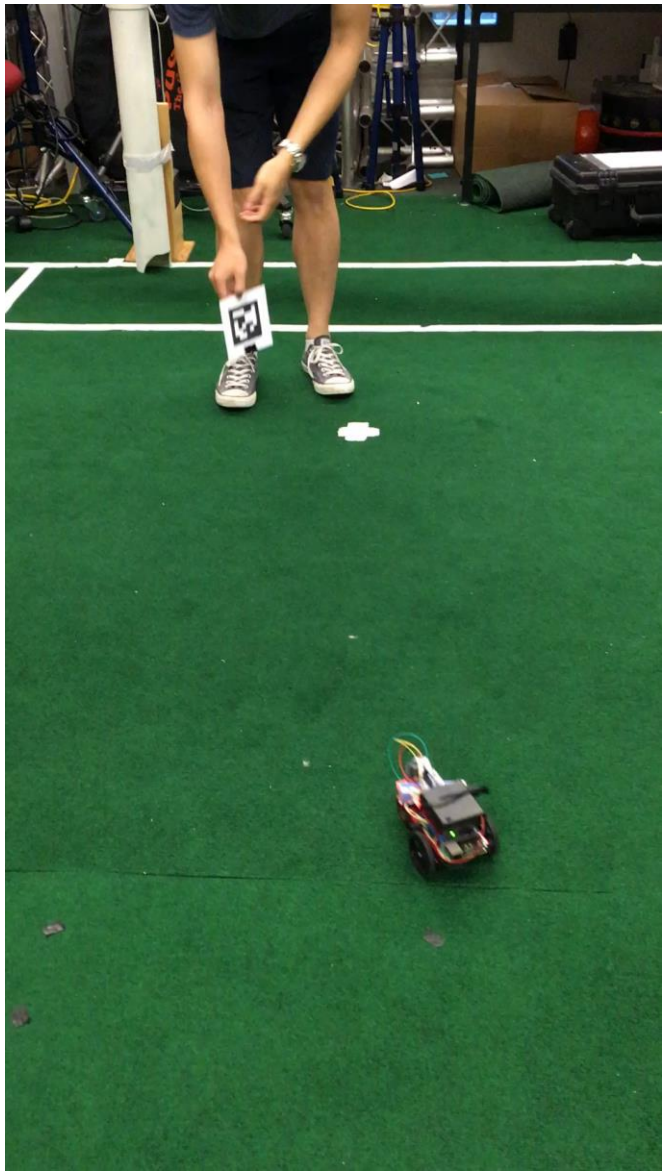


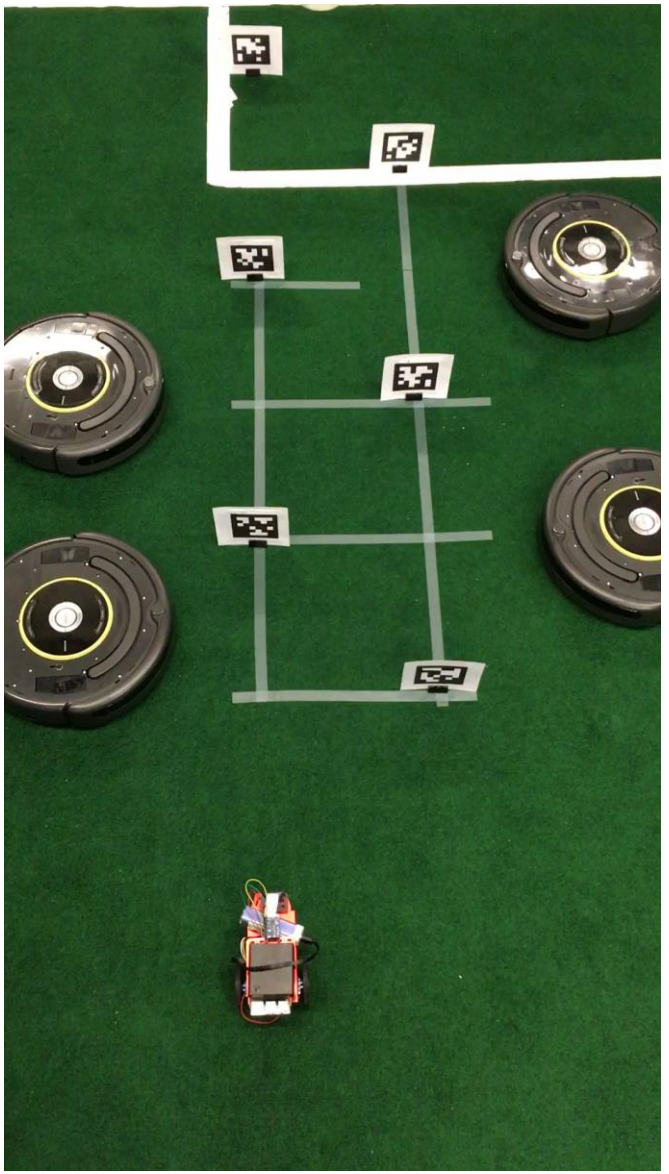
Full minimum specs can be found here:
http://www.adafruit.com/wishlists/402816

Additional Requirements

- HDMI-compatible screen, keyboard and mouse
- Access to a Wi-Fi network
- Access to a printer
- Access to a screwdriver and soldering iron

Preview of Projects





Week by Week Summary

Week 1	• Implement Dijkstra's in Python
Week 2	• Assemble the robot, get the system up and running
Week 3	• Calibrate the sensors and the robot
Week 4	• Develop a controller to allow the robot to move to a given pose and follow an AprilTag marker
Week 5	• Implement an Extended Kalman Filter to fuse the AprilTag measurements with the IMU values
Week 6	• Integration, create final video