Factory Roaming Robot

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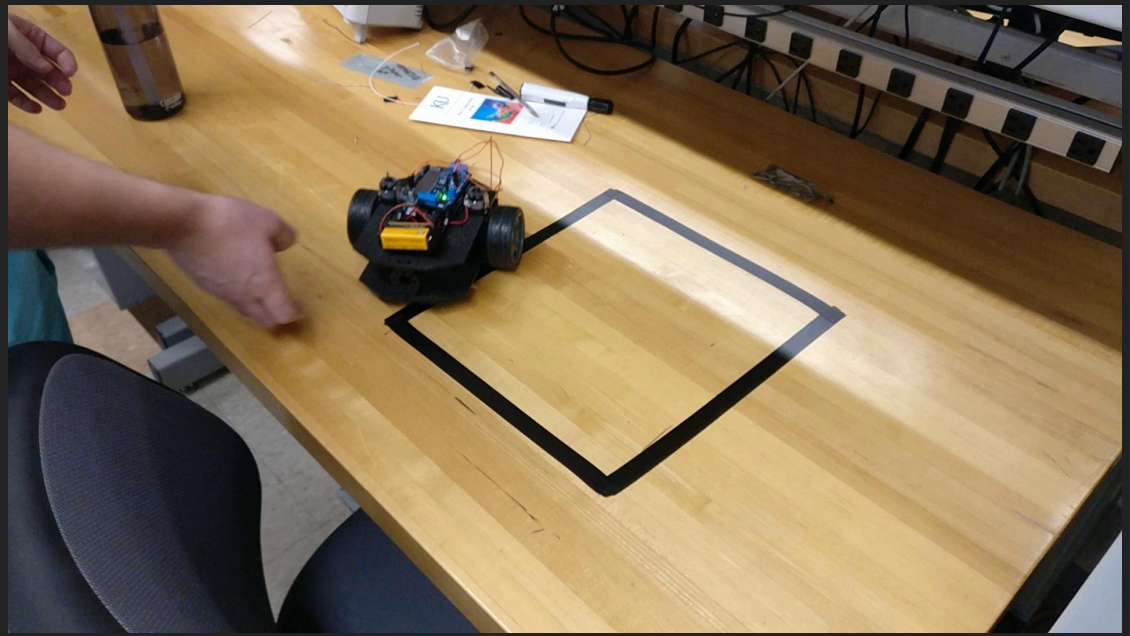
Overview

- Create a robot that “delivers parts” to a given destination
  - User specifies destination (via web application)
  - Calculates best route to take from start to finish
  - Automatically return to start point
- Runs utilizing these main components
  - Arduino Uno’s
  - Raspberry Pi
  - PiCam
  - Motors + encoders

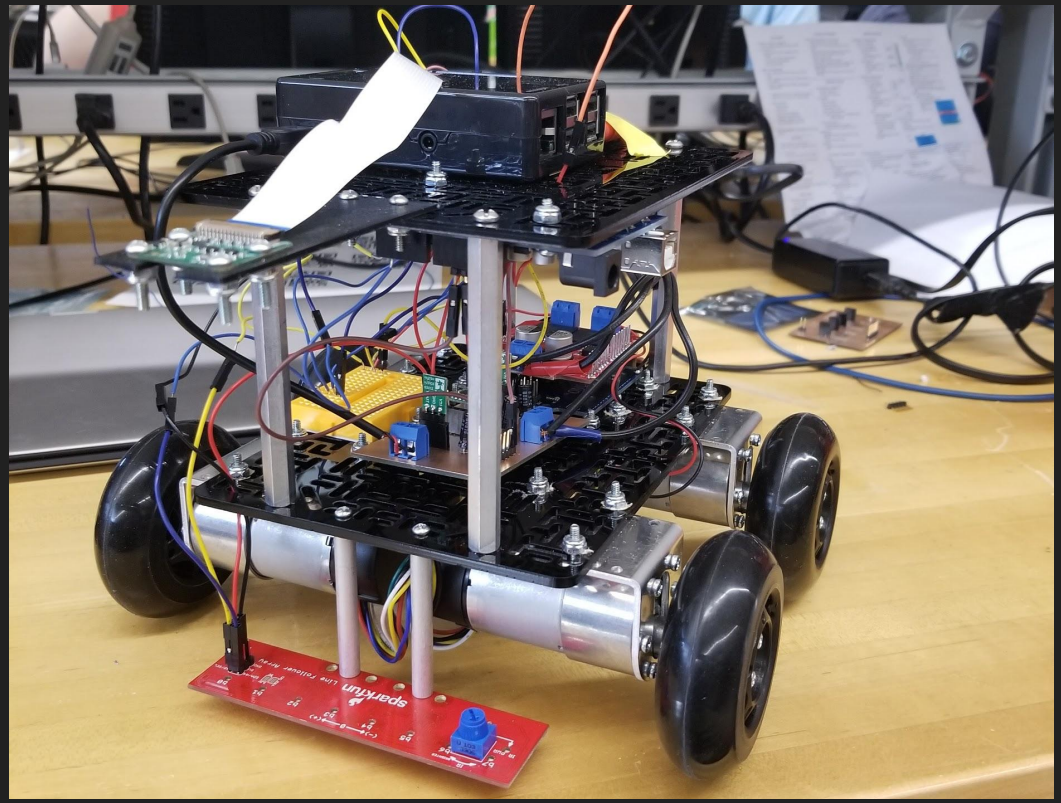
Where we started

- Robot simply followed a line and self corrected when it left the line



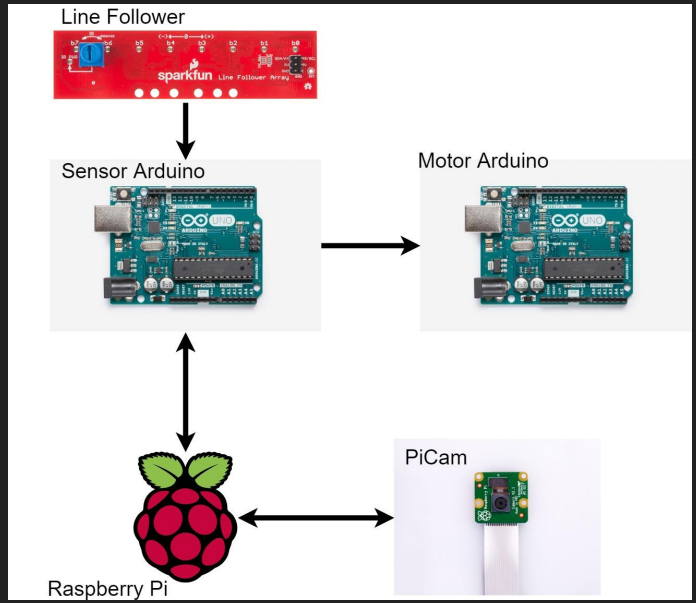
Bot Improvements

- New Chassis
- New Motors
- New Wheels
- Raspberry Pi + PiCamera
- 2x Custom PCB’s
  - Power distribution
  - Motor connections
- Additional Arduino Uno
- Custom Pi Camera Mount
- 12V LiPo Battery



How it works

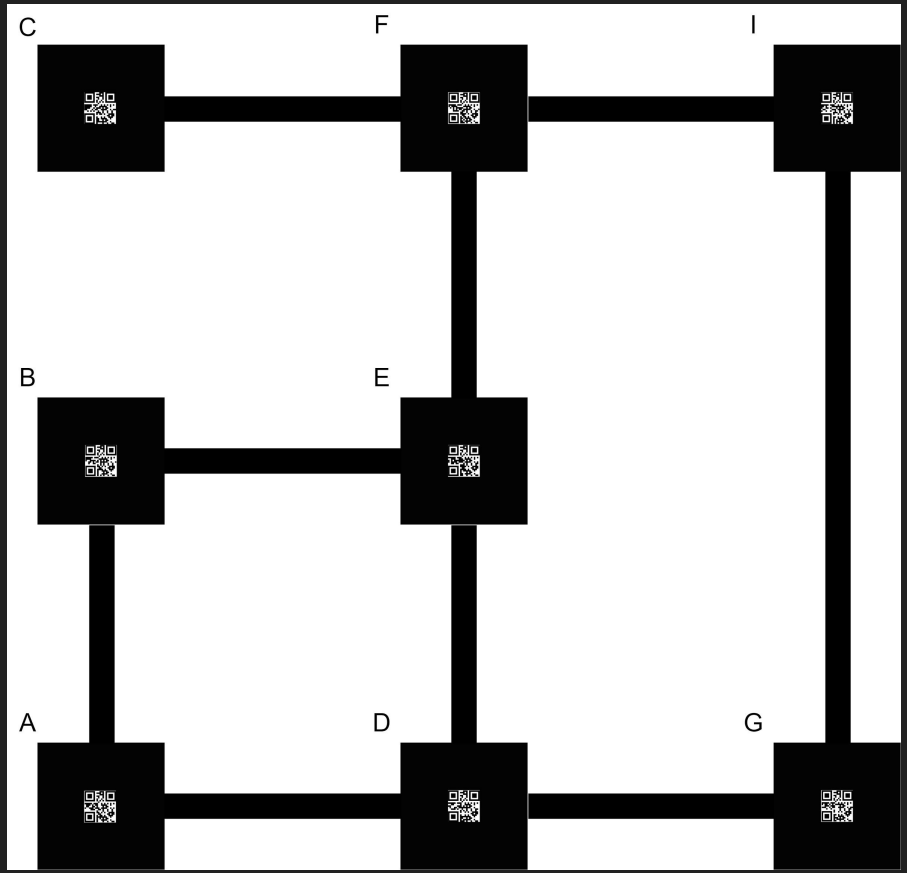
- Raspberry Pi
  - Simple Script utilizing GPIO callbacks is started with prepopulated route and destination
  - Sends start signal to sensor arduino
- Sensor Arduino
  - Receives signal to begin
    - Utilizes State Machine to send signals to the motors (left, right, etc.)
    - Also maintains positioning on line using line follower
  - When a node is detected, interrupt is sent to Pi
- Raspberry Pi (again)
  - On interrupt, the PiCam is signalled and takes a picture and decodes the QR code using the zbar library
  - Compares the code with the expected node and proceeds to send the next direction



The Map

- Each Junction is wide enough to trigger the line follower
- QR code is centered to ensure accurate camera pickup from each direction
- Robot starts and returns to A

Note: This map is a very small representation of an actual deployment.

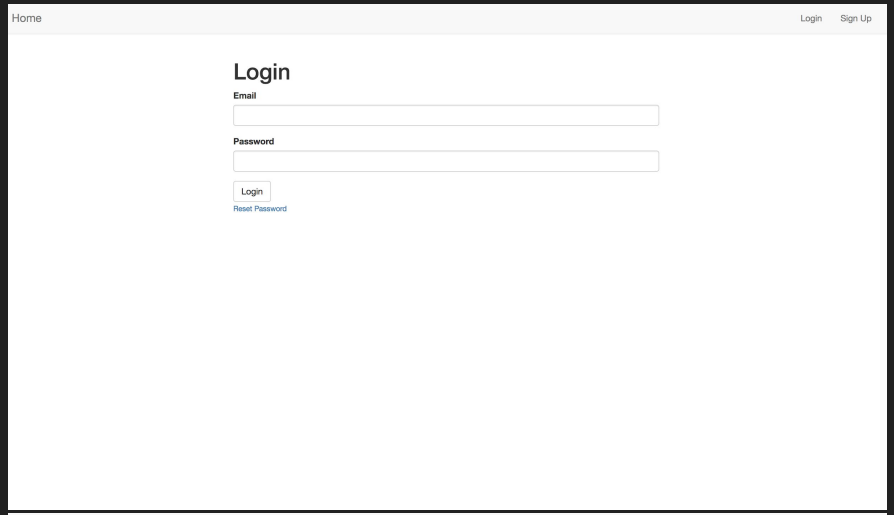


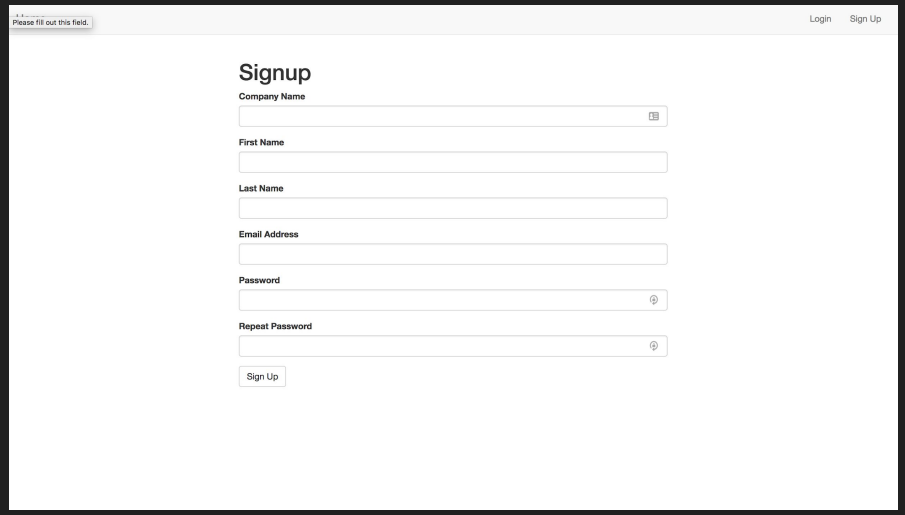
Web Features

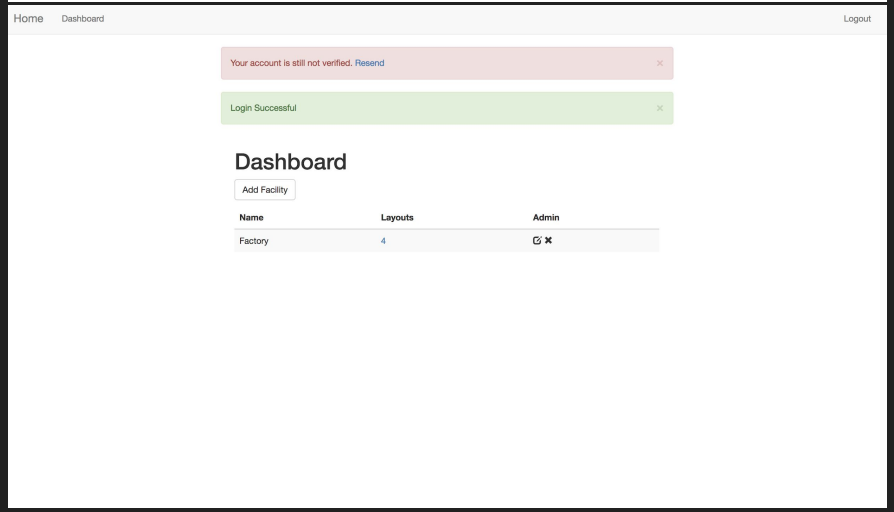
- Basic sign up and login
- Send confirmation emails to user
- Add/remove users within a company
- Add/edit/remove facilities within a company
- Add layout in a facility

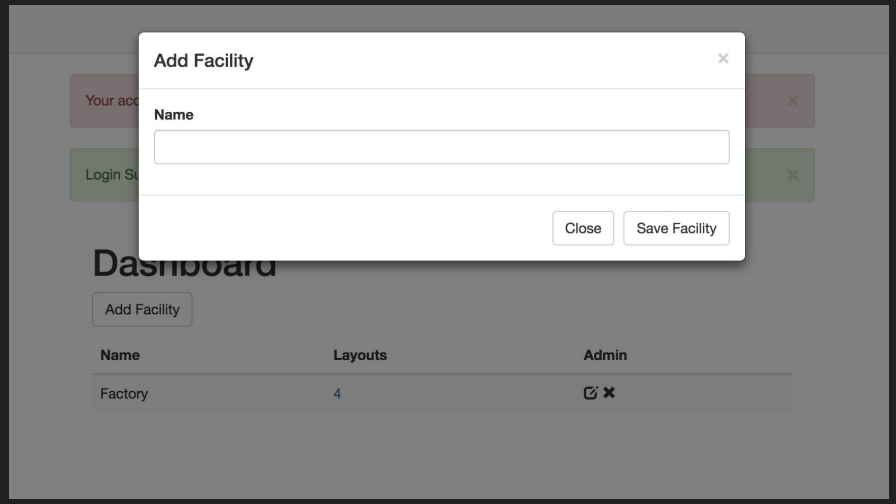
Incompletions

- Ultrasonic Sensor for Collision Detection/Avoidance
  - Setup standalone sensor
  - Code was implemented and works but impractical in our small scale test
- Web to Robot connection
  - Created independent wireless network
  - MQTT Queue base communication
  - Cloud hosted application
- Account management
  - Ability to update added users' information
  - Role-based access control system
  - Add/Edit/Delete Robots from account as well as assign/unassign bots to layouts


Home
Login
Sign Up
Login
Email
Password
Login
Reset Password


Please fill out this field.
Login
Sign Up
Signup
Company Name
First Name
Last Name
Email Address
Password
Repeat Password
Sign Up

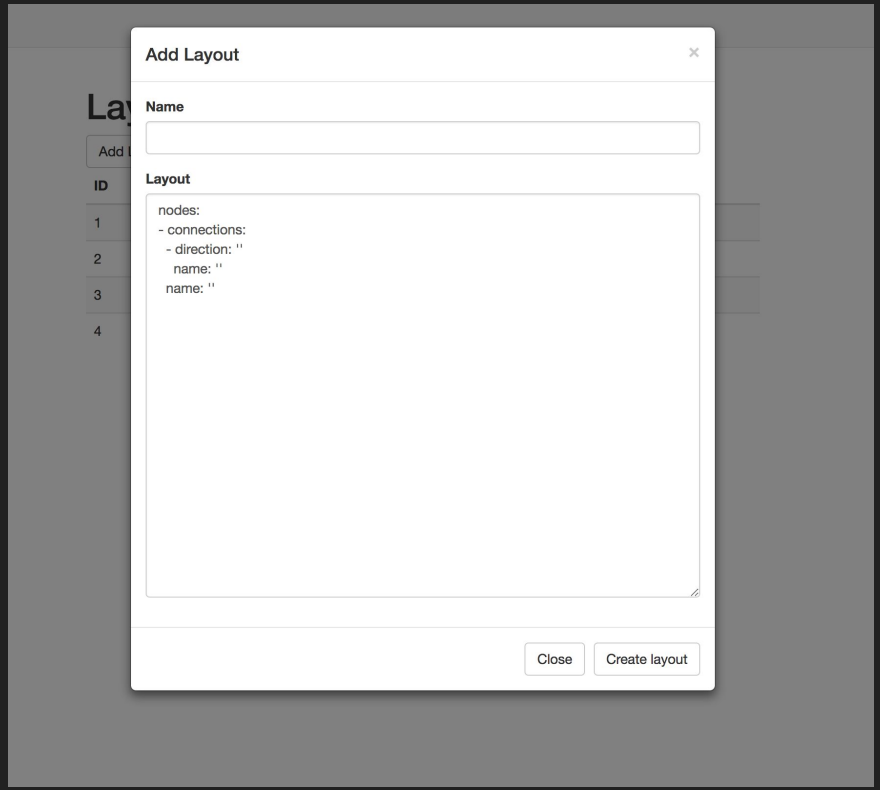

Home
Dashboard
Logout
Your account is still not verified. Resend
Login Successful
Dashboard
Add Facility
Name
Layouts
Admin
Factory
4


Add Facility
Name
Close
Save Facility
Add Facility
Name
Layouts
Admin
Factory
4

Layouts for Factory

Add Layout

ID	Name	Node Count	Admin
1	test	0	ADMIN
2	test12	1	ADMIN
3	test3	0	ADMIN
4	test5	1	ADMIN



Final Demonstration