Collaborators:

Mentor: Alex G

Keeshan P

Shawn V

Jayanth S

Jacob W

Corey H

Robotathon 2016

General Information

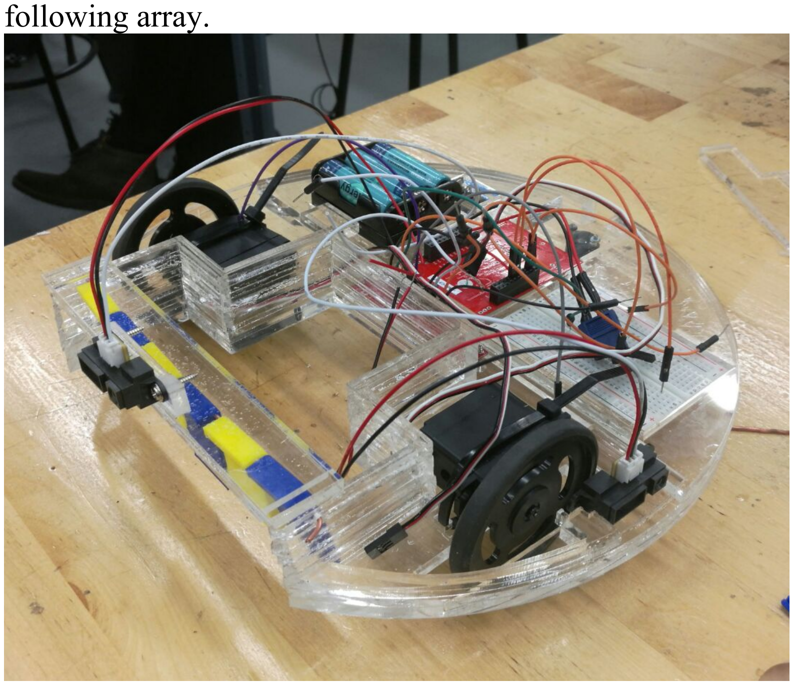
Robotathon is an annually competition aimed towards incoming freshman interested in robotics. This year's theme was Pokémon. The competition challenge was to build an autonomous robot that could pick up pokeballs and carry them to a Pokémon to capture them. The competition points were based on who got the most Pokémon and pokeballs with in a 3 minute time slot. The competition occurred on November 21st, 2016.

Link to Full Description:

https://tinyurl.com/Robotathon2016

Project Overview

The robot we designed was a robot with 2 servos, 2 IR sensors, and a line following array.

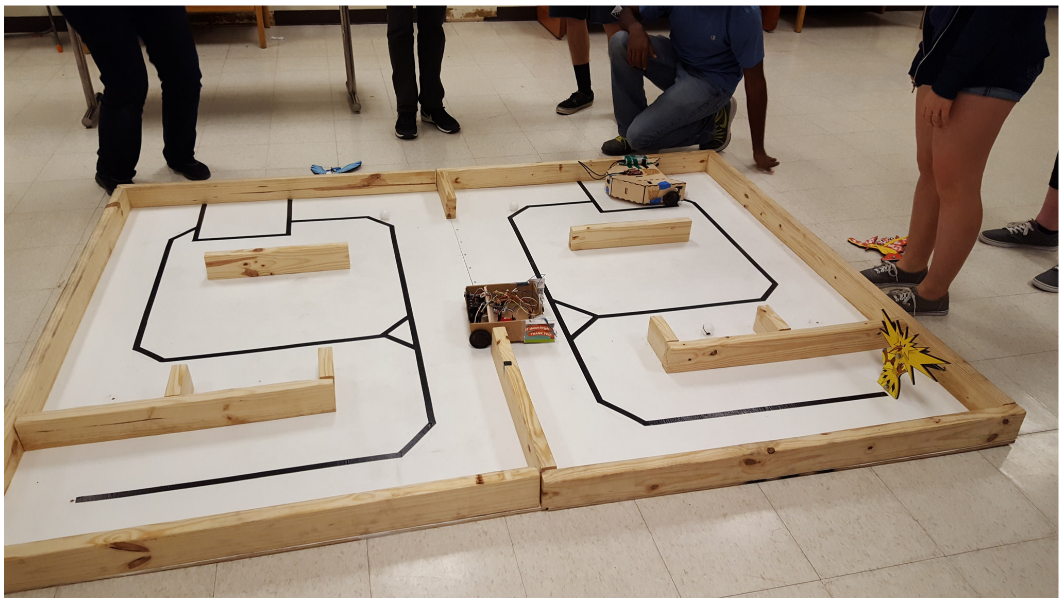


Start of Project

Official Rules

A robot is defined as including the provided launchpad and a battery pack that can be switched on with the battery's power switch. Robots must start within the 1'x1'x1' starting box. A team may not intentionally damage another team's robot or the field. A robot also cannot leave particle like substances on the field (i.e., do not drop sand, glitter, marbles, etc. behind you). In addition, do not use fire, animals, toxic chemicals, or some combination of those. Breaking any of these rules will result in disqualification from the competition. At the end of the competition, RAS will keep the robot, but teams should feel free to continue working on these throughout the year.

Competition Field



Initial Plan

Brainstorm and Initial ideas

Our initial thoughts were to create a claw that would grab the pokeball and then proceed to the Pokémon. We would use 2 IR sensors for wall tracking and the line sensor array for line following on the track.

Changes to initial plan

When we found out that the ball did not have to touch the Pokémon, rather the robot had to touch the Pokémon while in possession of the pokeball, we changed our pokeball collecting mechanism to an open collector where the pokeball would slide into the notch inside the robot and remain there while the robot proceeded towards the Pokémon.

Finalized Plan

The finalized robot consisted of 2 servos as the main driving mechanisms, a ball bearing for back stability, 2 IR distance sensors for wall following and a IR line following array chip. A flap mechanism was created to retain the Pokeball when it was within the robot's possession. It was all controlled by a Texas Instruments Launchpad TM4C Tiva C series microcontroller.

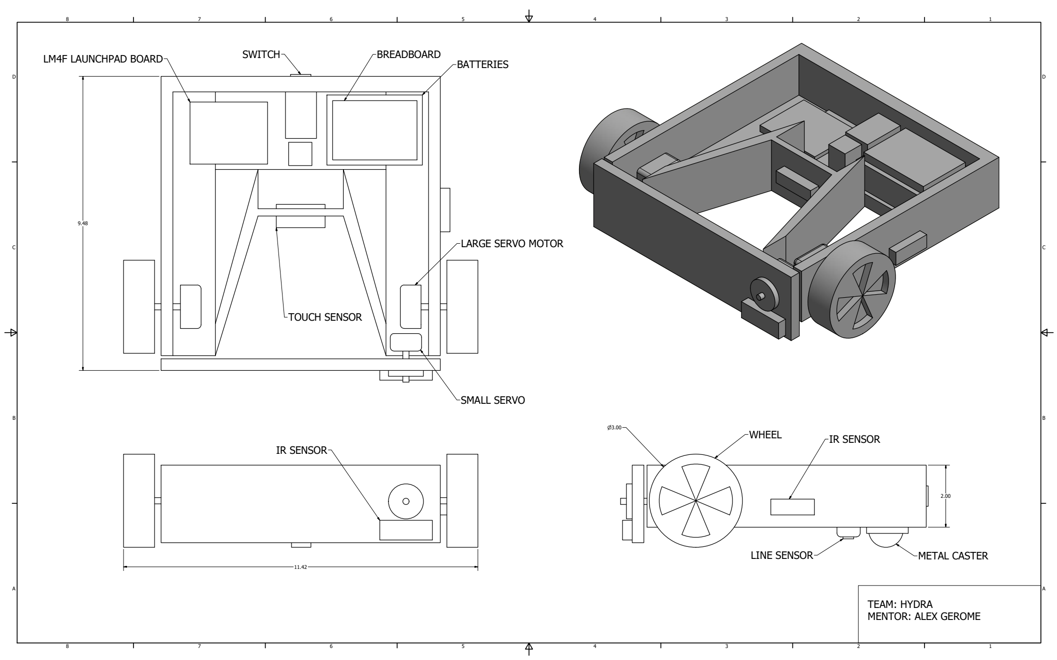
Design

Materials

- Texas Instruments Launchpad TM4C Tiva C series microcontroller
- Half size breadboard
- 2x IR distance sensor
- IR line following sensor array
- 6x rechargeable nickel hydride batteries (1.2 V each)
- Battery holder
- Recharge cable connector
- 2x continuous servo motors (large)
- 5V/5A regulator
- Header wires
- Custom 3D printed Parts
- Clear Acrylic sheets ¼" thick

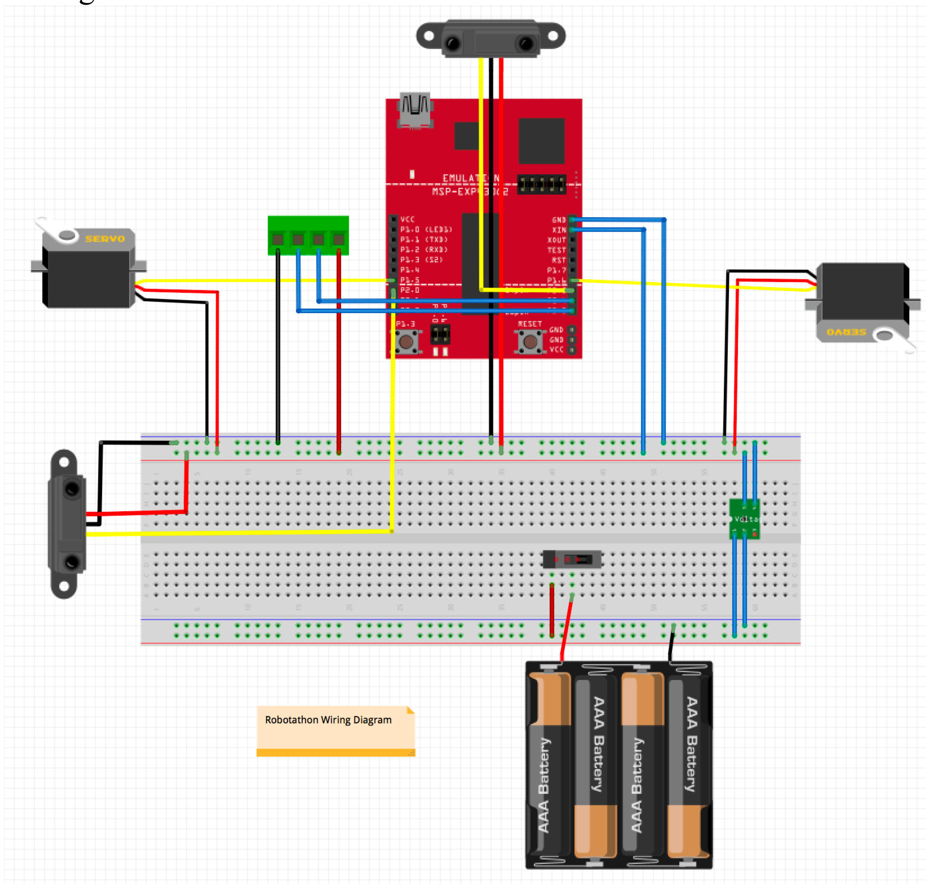
Modeling and Schematics

CAD Files:



Start of Build

Wiring Schematic:



Progress

1. The parts were measure to get an accurate vector model so that a wooden prototype could be cut out of ¼” wooden sheets.
2. The wooden prototype was glued together
3. All sensors and servos were attached to main body
4. Wiring was complete as per the wiring schematic
5. Initial testing of servos and sensors commenced
6. A finalized version of the body was made using acrylic and esthetic changes were made including a curved body shape.
7. The acrylic sheets were mended together by acrylic glue
8. All the parts were transferred from the prototype robot to the new one
9. Code testing for wall following of the final robot was done.
10. Finalized code was flashed to the TI Launchpad
11. (Throughout the duration of the build process intermediate checkpoints ensued for code involving wall following, servos testing, and line following as per the completion rules)

End of Build

Final Product and Results

Results

The wall following code was buggy as the sensors could not pick up the wall when it was near, thus the robot was spinning around constantly. As a backup plan, a time-based code was flashed to the TI Launchpad which would change the motor speeds at precise moments for turning stopping and reversing.
We placed top ten in the competition based on point totals.

What was learned

- The final body of the robot should have been made quicker for more testing with the final competition based robot
- Coding is more than ½ of the work when it comes to autonomous robots
- When making a holding mechanism for the Pokeballs, the flaps needed to be light enough to that the Pokeball could pass through

Synopsis

Overall, the hardware of the robot was very precise and all hardware components both mechanically and electrically were perfect. However, the coding was put on the short end of the priority scale and there was not enough time to finish the coding for the final robot in time for the completion. The robot moved and competed the in the competition and surpassed a couple of double eliminated bracket before it was knocked out by a competitor.