

Autonomous Infrared Following Robot

Marc Jayson Baucas • Robert Bowen • Evan Fallis



Background

Many modern innovations have been accomplished by automating tasks, essentially making them easier and convenient for the user. The proposed design is a system that will enable a robot to follow a person. This would be extended to solve tasks such as pushing a shopping cart.

Objectives

- Design the circuit from common electrical components
- Develop an algorithm to control the motor via sensor input
- Create a physical structure to bind the components together
- Implement a working prototype of the system
- Summarize the feasibility and effectiveness of the design

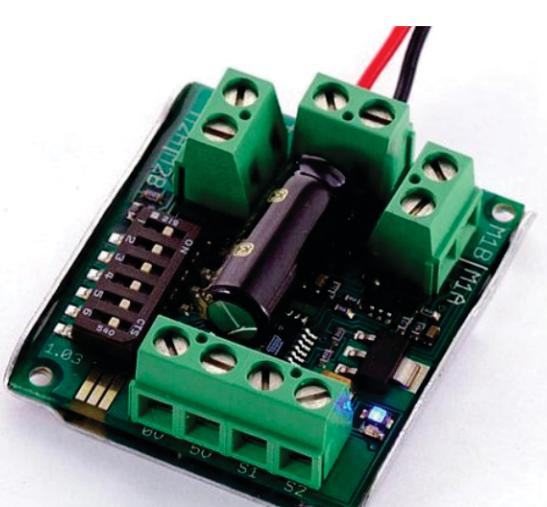
Design

Arduino



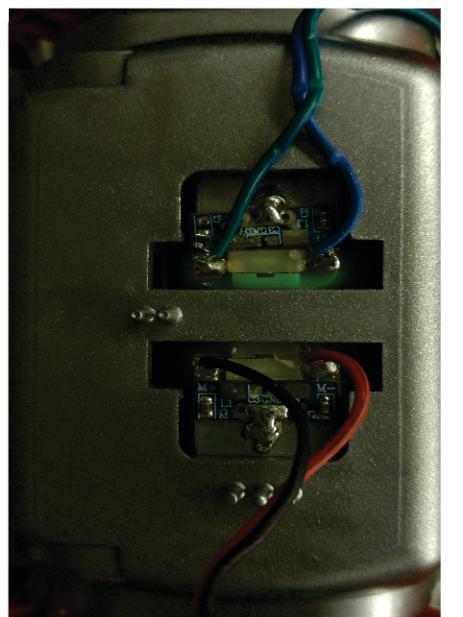
Controls logic of system, connects all components and devices. An algorithm is used to calibrate the initial thresholds based on the ambient light in the environment.

Sabertooth

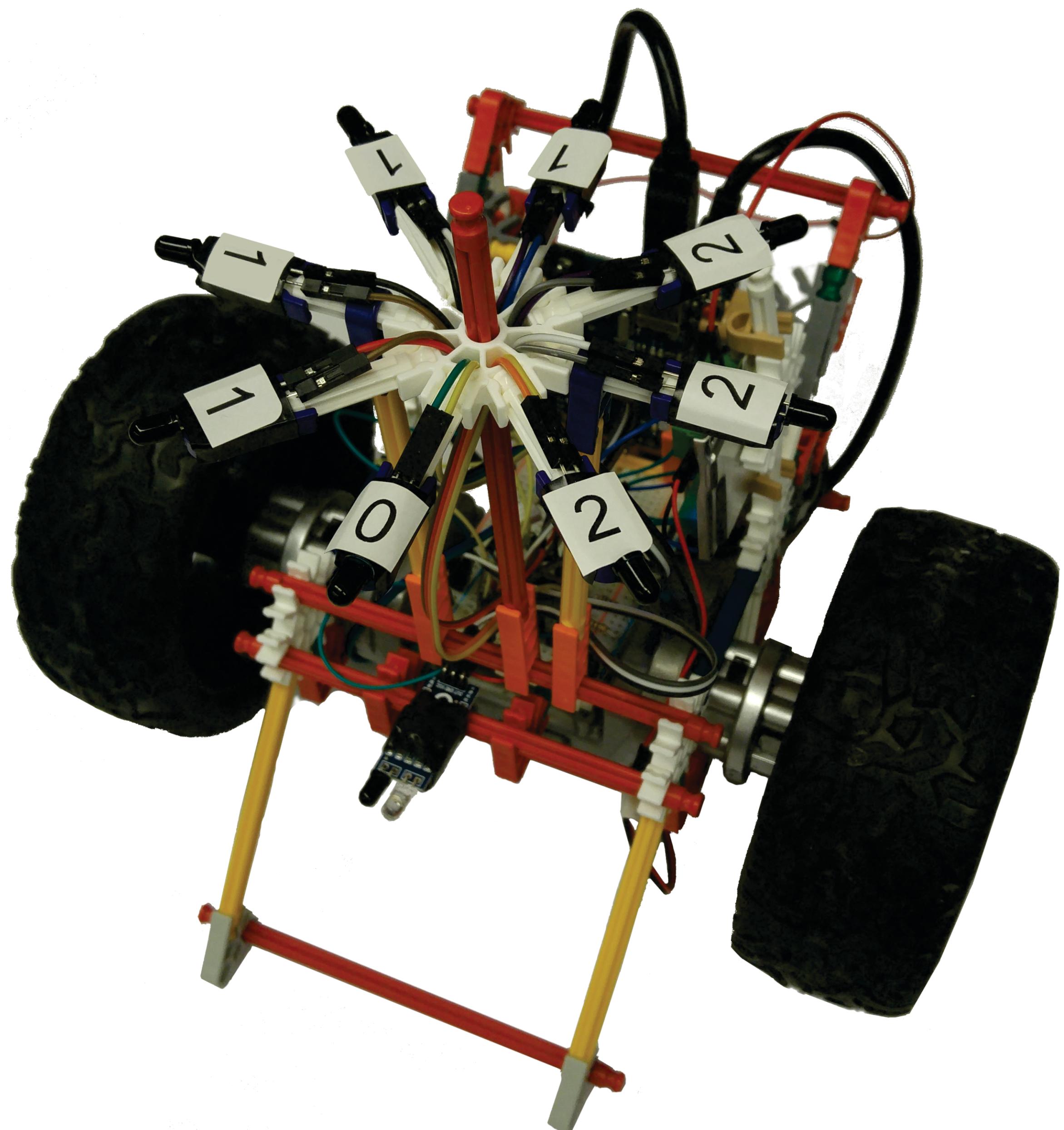


The main driver for the two motors, controlled by serial communication. A byte of data specifying the speed and orientation of each motor is written to the driver with every cycle.

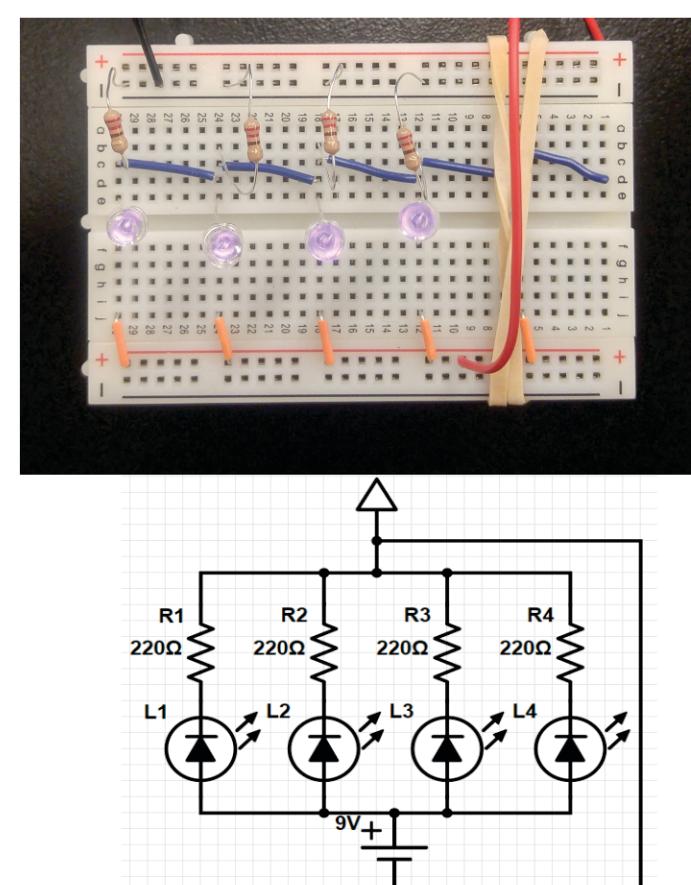
Motors



Bidirectional DC motors are used to move and orient the robot towards the infrared beacon. Capable of turning 360° in place.

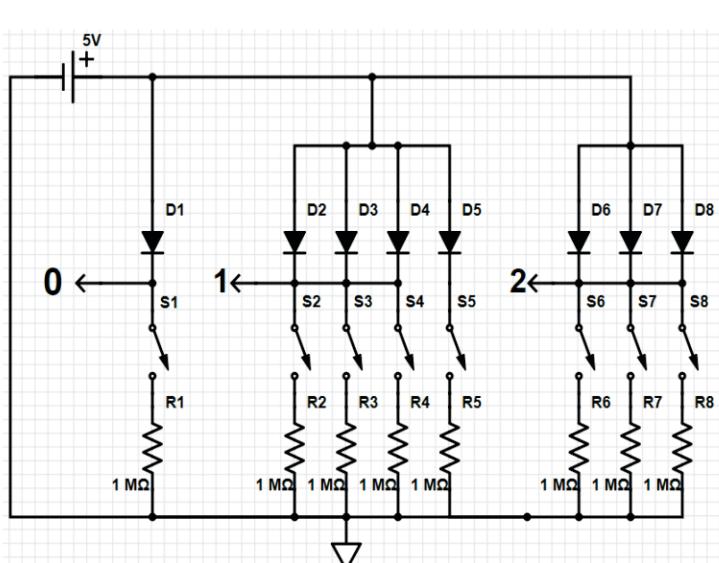


Infrared Beacon



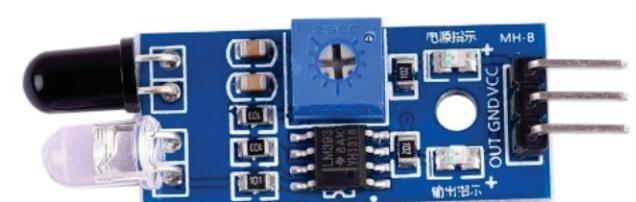
Infrared light is invisible to the human eye while also being one of the few directional signals on the light spectrum. For the prototype, four specialized LEDs were wired in parallel with corresponding resistors powered by a 9V battery.

Infrared Receivers



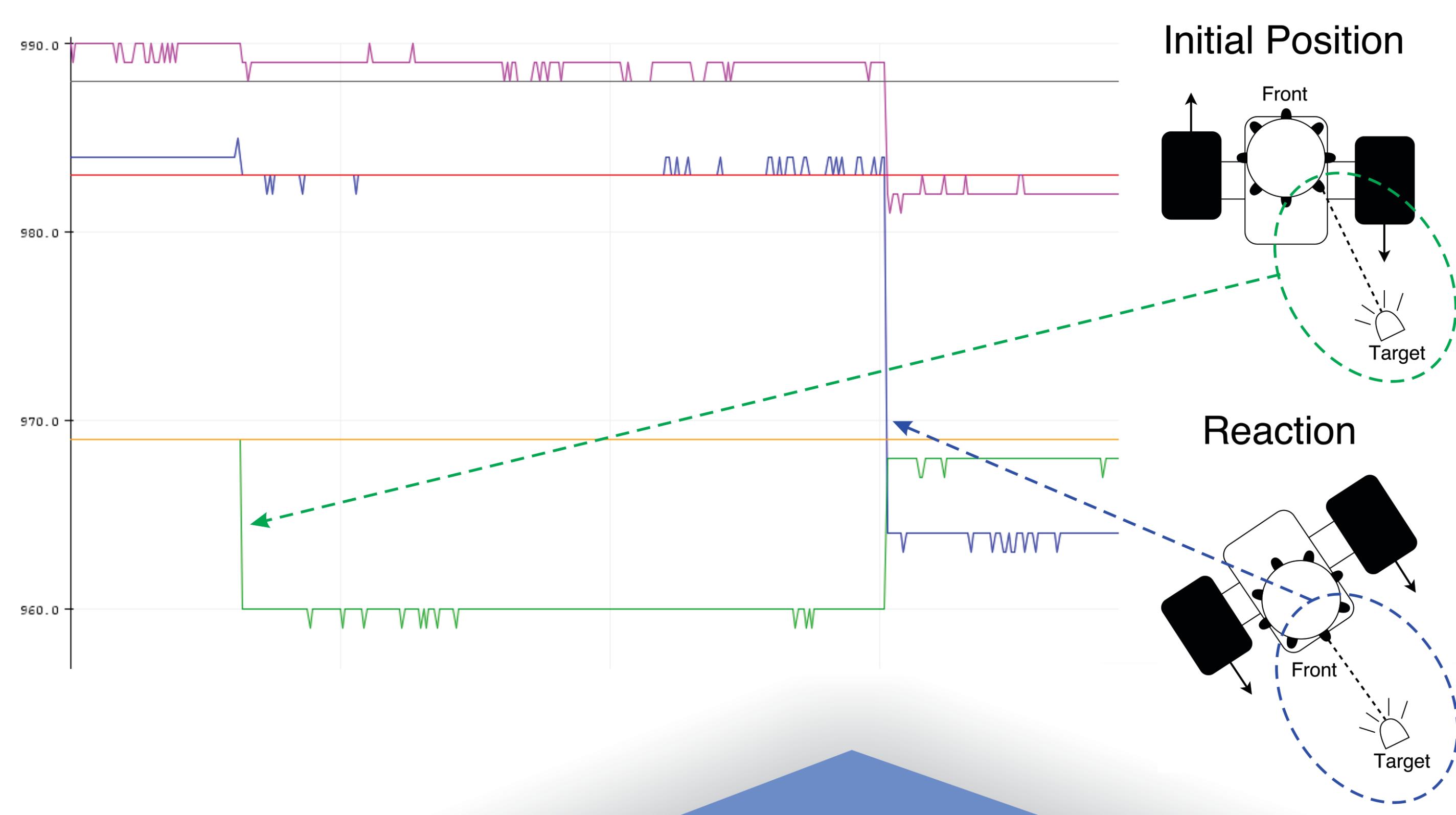
Identifies location of infrared signal. Diodes are forward biased when the emitter is visible. The number determines which direction the robot should face to move towards the beacon.

Infrared Proximity Sensor



Detects obstacles to avoid any collisions. An infrared wave reflects off of a surface and is read to determine distance.

Process



Conclusions & Recommendations

- The prototype shows the feasibility of the design through the use of minimal resources
- The driving/following system of the autonomous robot could be further extended to applications that carry objects around for users.
- Improve the range of infrared detection and robustness/usability of beacon to make it user friendly
- An application specific integrated circuit will be developed for manufacturing the electronic components of the final product