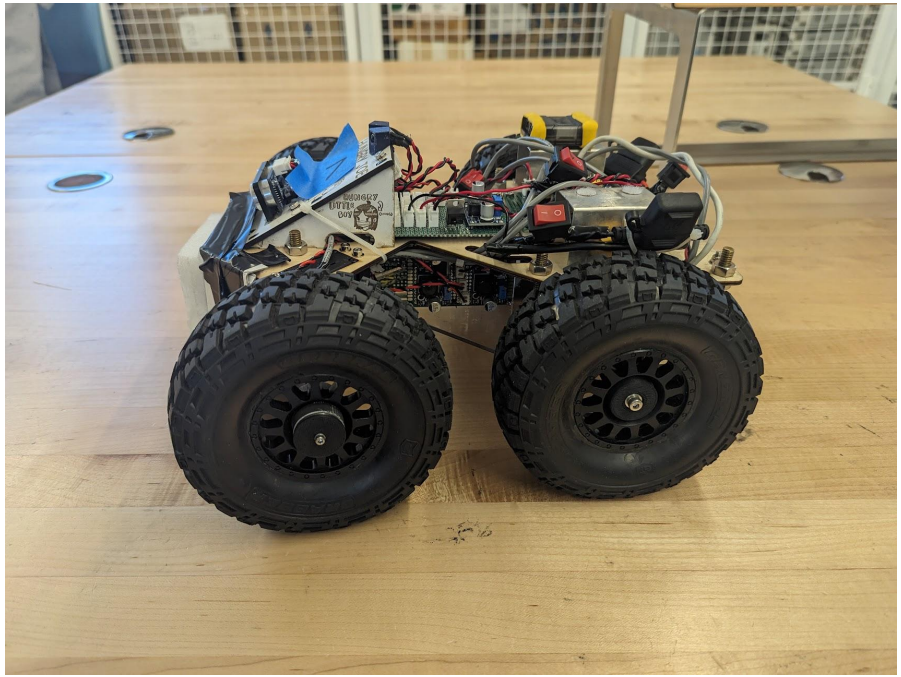
Autonomous Robot Project

Avery Wong

Overview:

- Design Prompt
- Subsystems
- Electrical
  - Sensors
- Software
  - Microcontroller
- Reflection



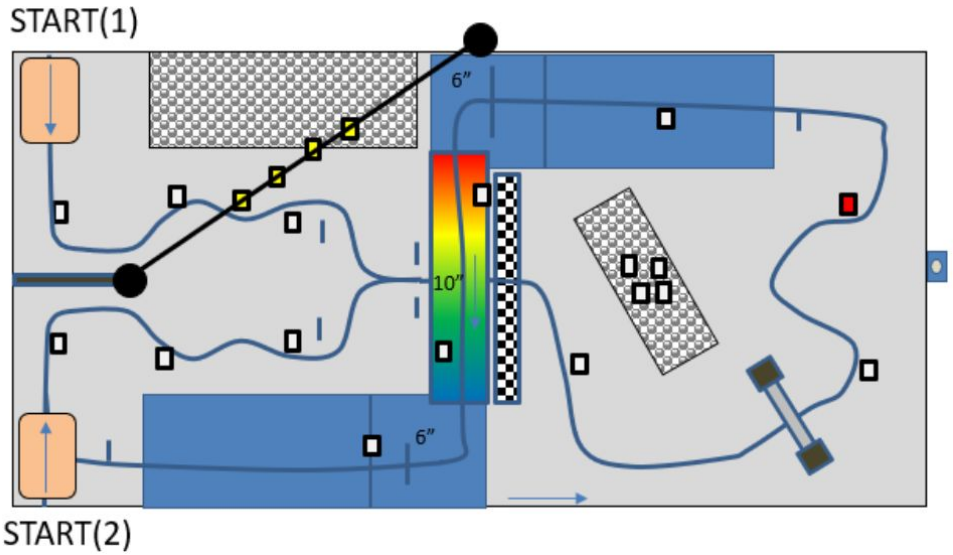
Design Prompt

Background:

- In a team of 4, design and construct a fully autonomous robot from scratch
- 6 week time period

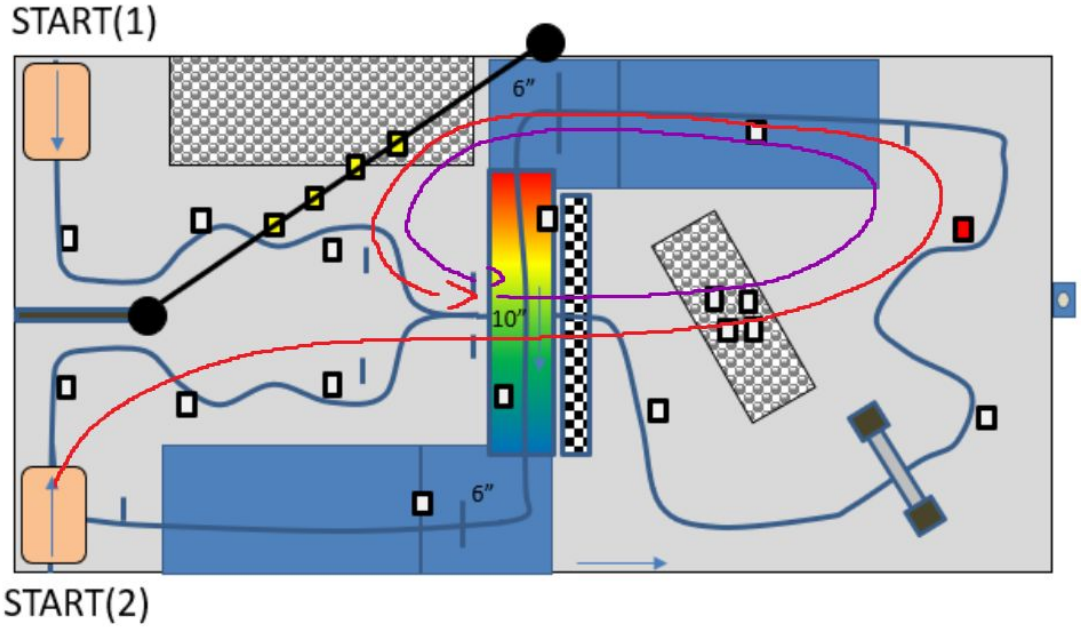
Tasks:

- Mario Kart Theme
- Race another team's robot around the course to score points



How did we approach this design challenge?

Objective: Ignore points from blocks, complete laps as fast as possible



Subsystems: How do we build the robot?

- **Electrical:**
  - Sensors
  - Power Distribution
  - Motor Control
- **Software:**
  - Microcontroller
- **Mechanical:**
  - Chassis
  - Mounting

Subsystems: How do we build the robot?

- **Electrical:**
  - Sensors
  - Power Distribution
  - Motor Control
- **Software:**
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- **Mechanical:**
  - Chassis
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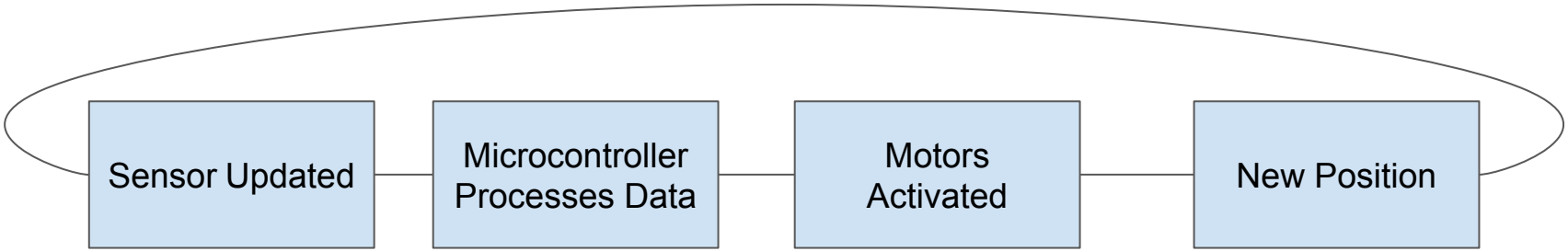
Electrical/Software:

What should these subsystems do?

- Sensors:
  - Gather information about the robot's position
- Microcontroller:
  - Interpret sensor data to control motors and navigate through the course



Sensors/Microcontroller:

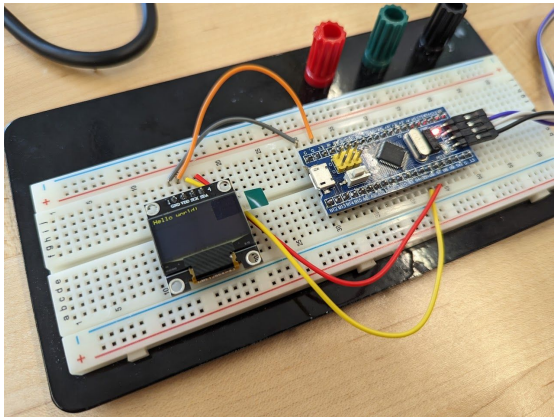
Types of sensors used:

- Reflectance sensors
- Infrared sensors (Phototransistor)
- Ultrasonic sensor (Sonar)

Microcontroller used:

- STM32 Blue Pill
- Programmed in C++

Left Side		MicroUSB		Right Side	Analog Pins
B12	LEFTRIGHT		----------	G	PWM Pins
B13			----------	G	General I/O
B14			----------	3.3	
B15				R	
A8	MOTOR_BB		SERVOB	B11	
A9	MOTOR_BF		SERVOA	B10	
A10	MOTOR_AF			B1	
A11	MOTOR_AB			B0	
A12				A7	
A15			SONAR1	A6	
B3	TRIGPIN		REFLSENSORB	A5	
B4			REFLSENSORb	A4	
B5			REFLSENSORA	A3	
B6	DISPLAY		REFLSENSORa	A2	
B7	DISPLAY		IRSENSORA	A1	
B8	BINARYSENSORA		IRSENSORB	A0	
B9	BINARYSENSORB			C15	
5	----------			C14	
G	----------			C13	
3.3	----------			VB	



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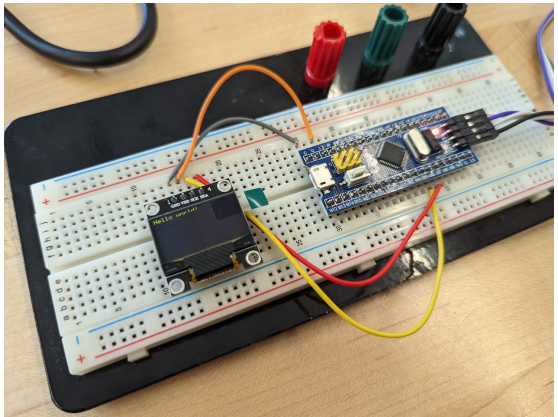
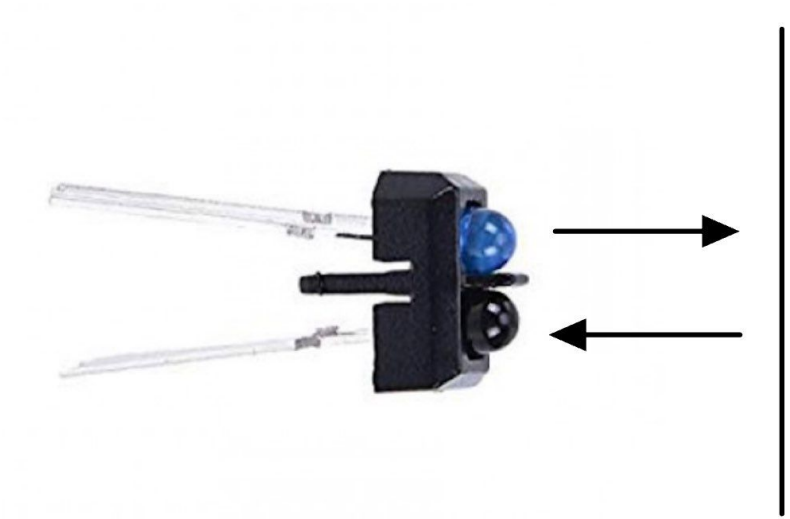
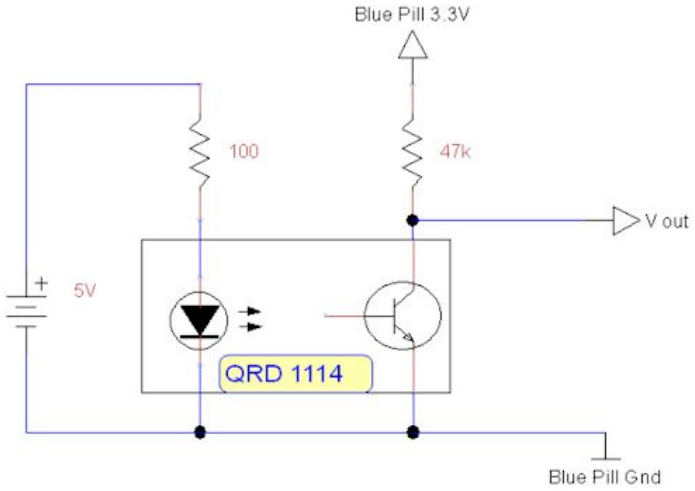


Reflectance Sensors

Usage:

- Follow black electrical tape
- Read “Binary” tape markers





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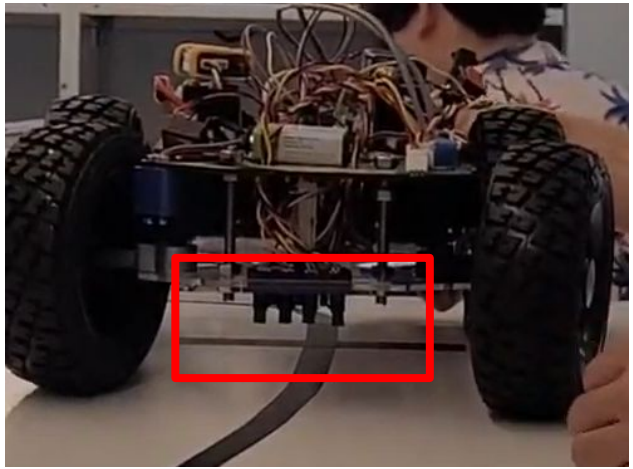
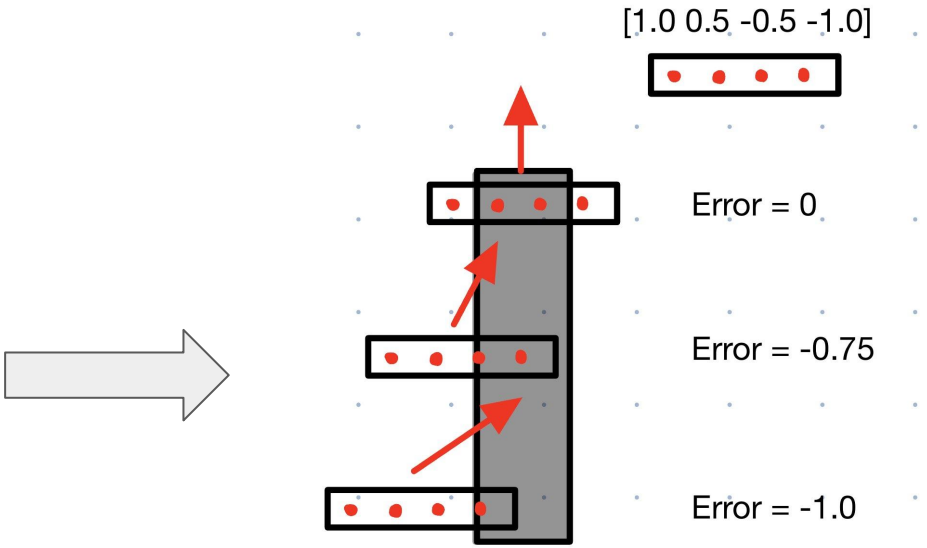
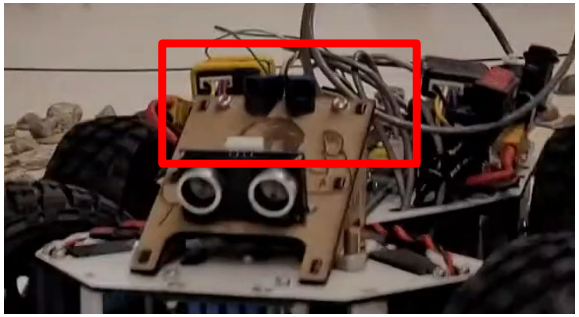
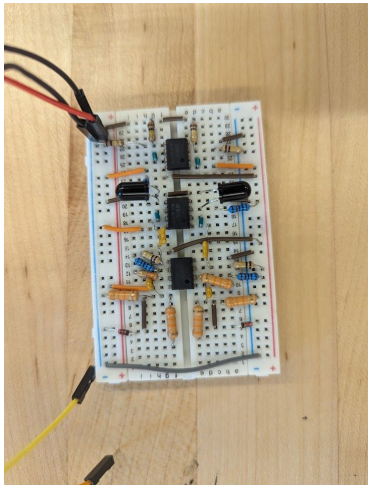
Error = (Σ sensors on) / (# of sensor on)

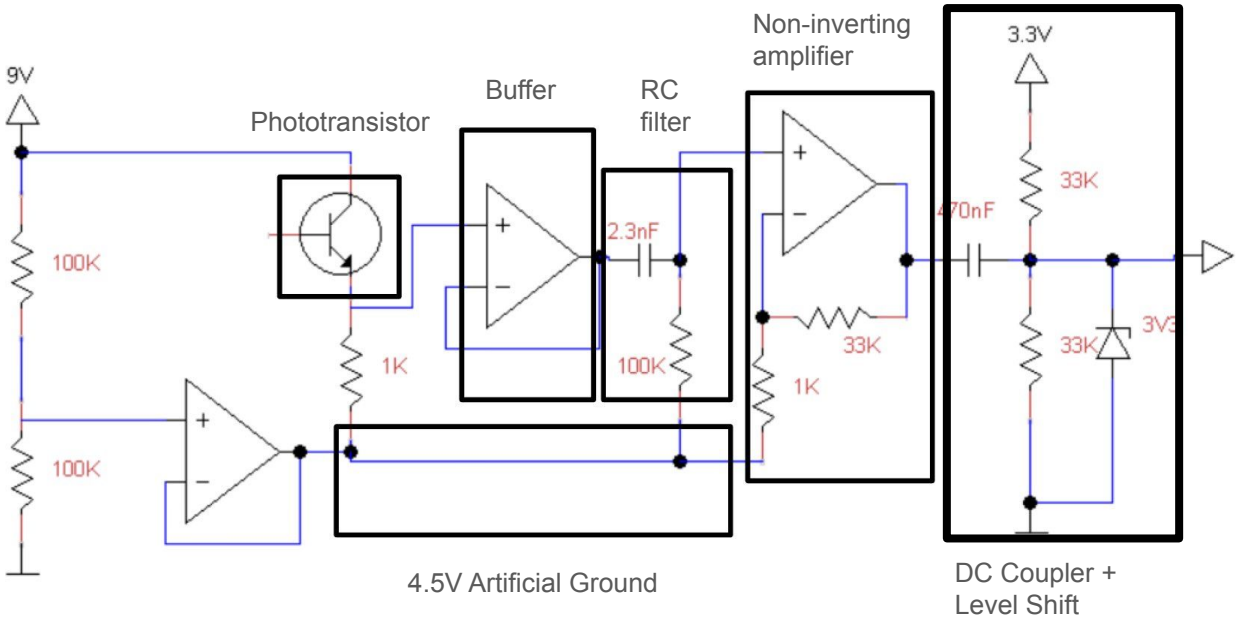




Infrared Sensor







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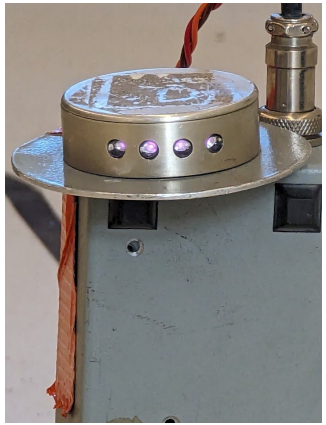

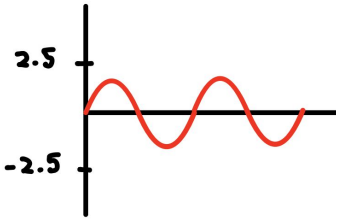

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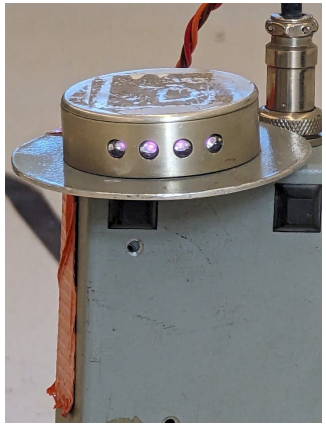

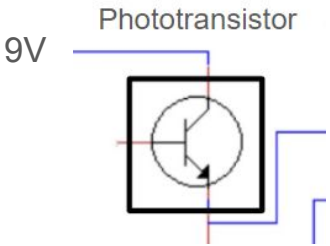

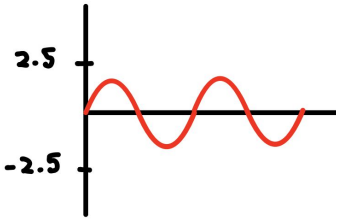

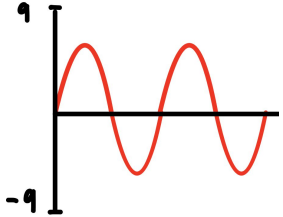

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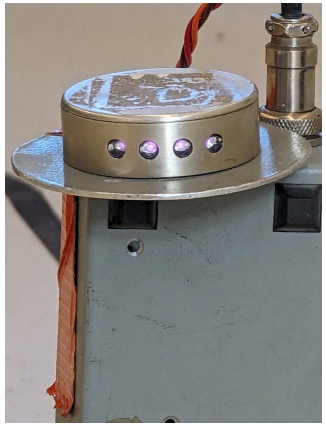

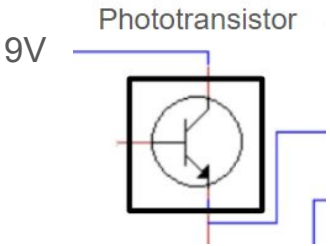

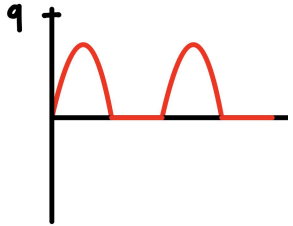

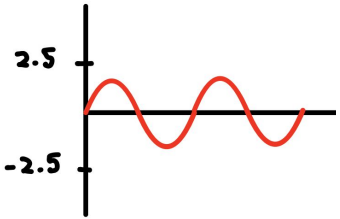

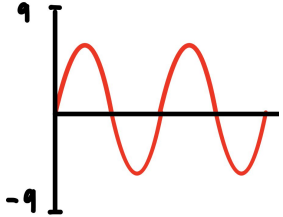

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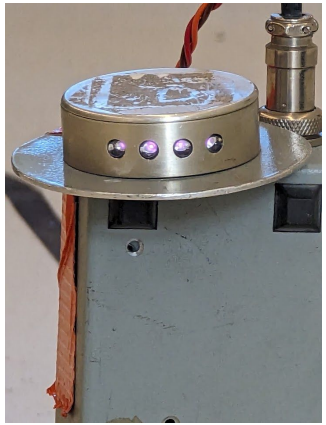

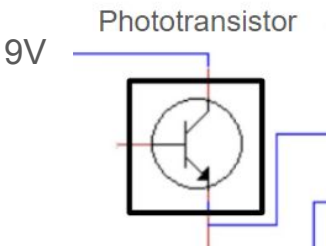

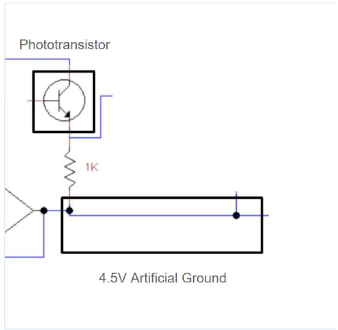

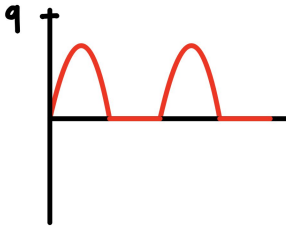

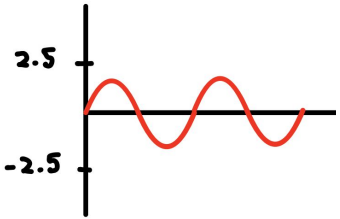

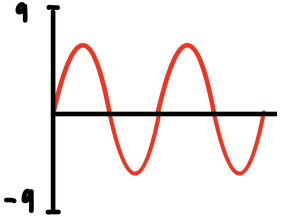

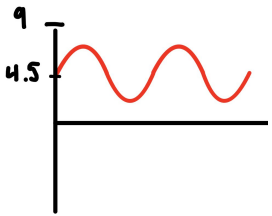

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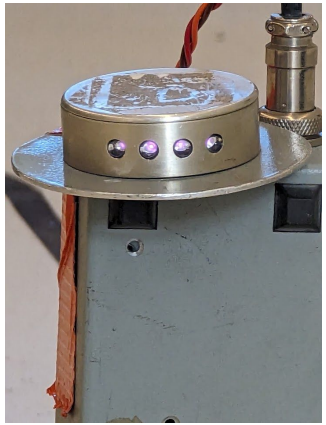

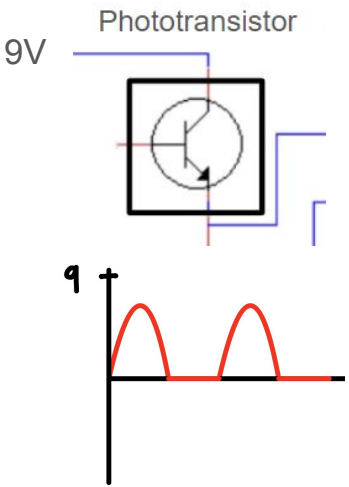

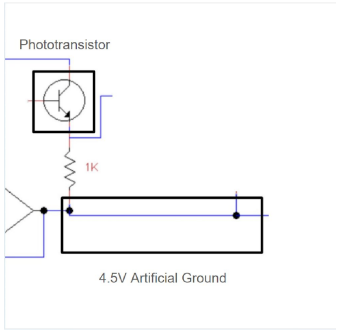

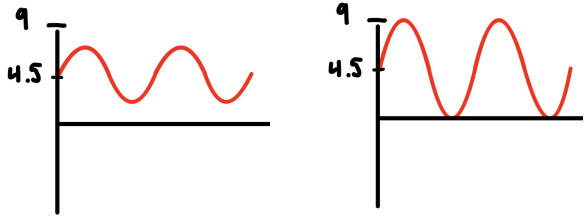

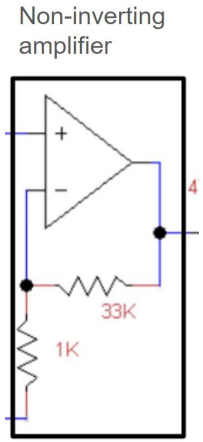

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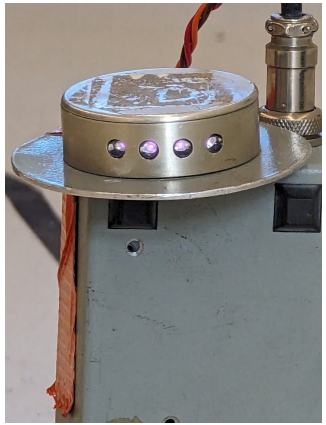
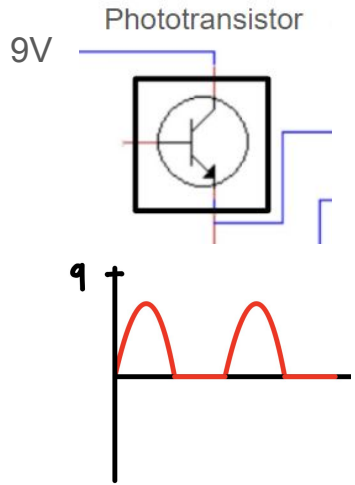
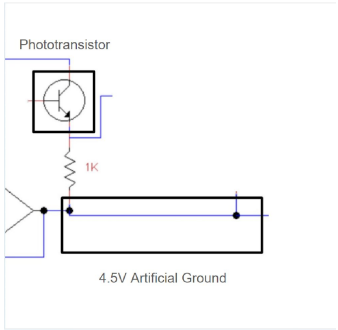
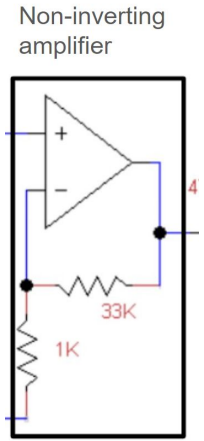
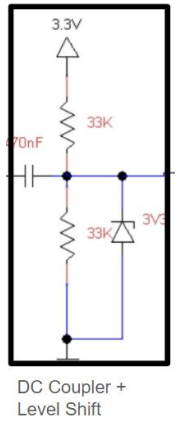
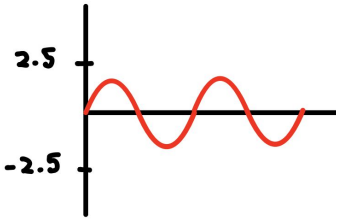


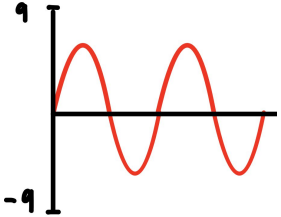


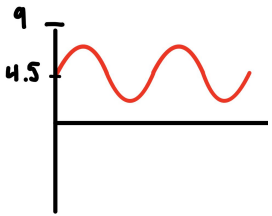


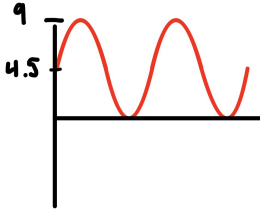


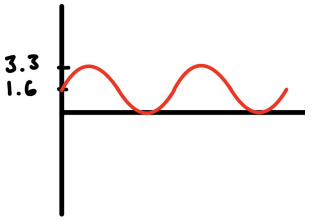








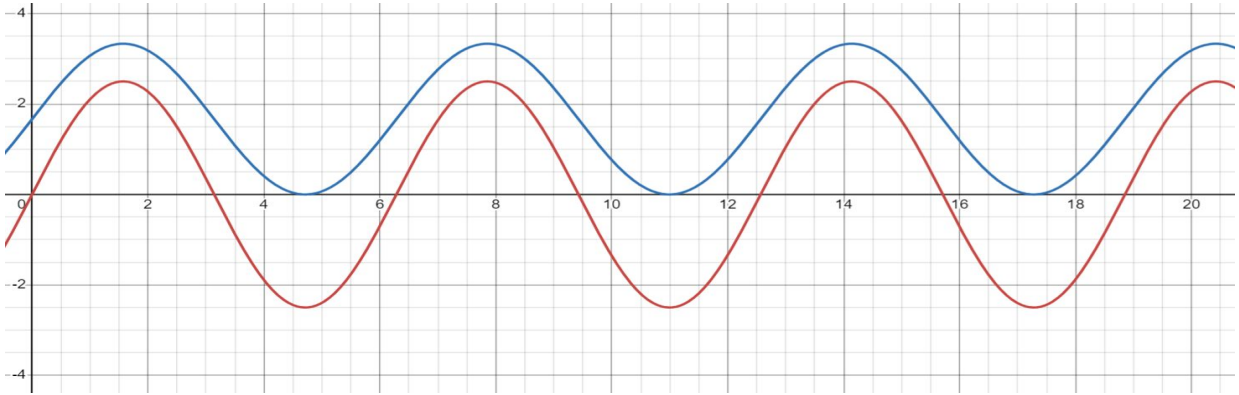




Infrared Sensor

Modified Signal

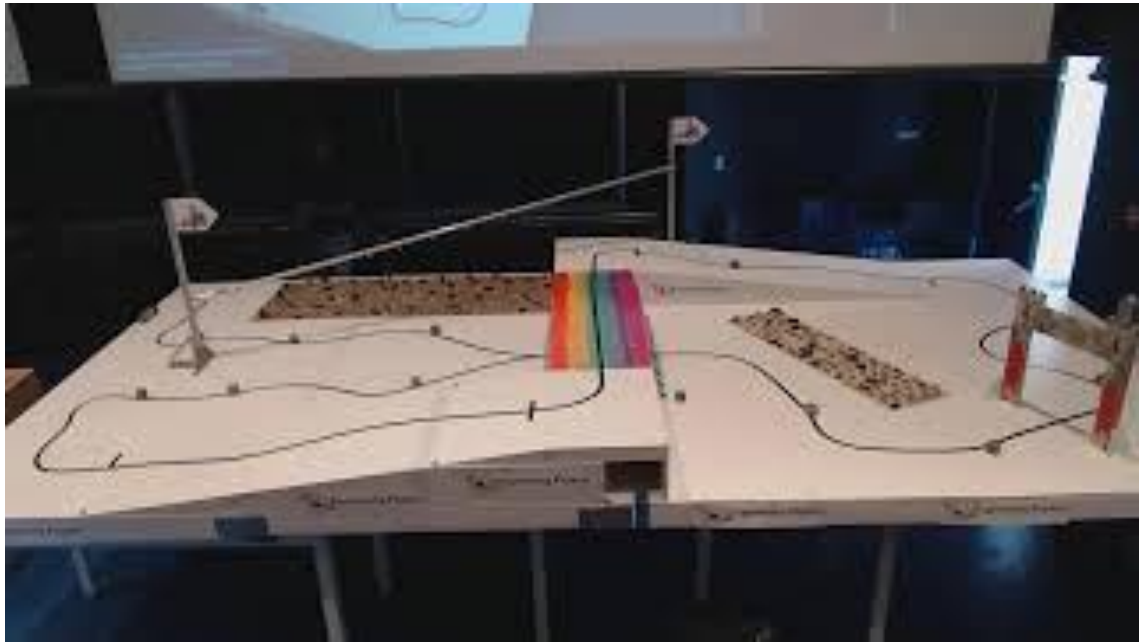
Original Signal



- Convolution - Compare signal to expected signal
- Using same concept as reflectance sensors to navigate to beacon

Reflection:

How did the competition go? (6:30:35)



Reflection

What did I learn?

- Sleep and concentration!
- Working in parallel

Changes if I were to do it again

- Simplicity in design and strategy
- Refinement of work

Thank You!