EDUCATIONAL OUTREACH
FLORIDA POLYTECHNIC UNIVERSITY

FLORIDA POLYTECHNIC

OBSTACLE AVOIDANCE

Collaborating as a Team

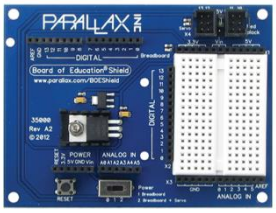
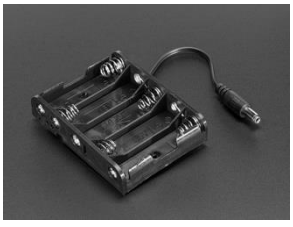
Overview:

Have you ever wondered how autonomous devices understand when an object is at its proximity? Most autonomous devices use proximity sensors using Infrared (IR) emitters and receivers to understand if there are obstacles nearby. IR sensors work much like how a bat uses sonar to determine nearby objects, however unlike sonar which uses sound, proximity sensors use Infrared radiation. The emitter is continuously emitting an IR wave, when an obstacle comes into contact the IR wave is reflected back, where the receiver picks up the reflective IR wave and determines that there is an obstacle nearby.

Learning Outcomes

- Understand how proximity sensor using IR emitters and receivers are used for obstacle avoidance.
- Understand the electronic devices used
- Understand the Arduino environment and IDE.
- Understand the importance of blueprinting and creating an efficient design
- Understand how collaboration as a team and specialization of tasks are used in developing a functional prototype.

Materials

			
(1) Arduino Uno	(1) Parallax Board	(3) IR Emitter & Sensor	(1) Ball and Paper Clip
			
(20) Popsicle Sticks	(7) 220Ω Resistor & (3) 2kΩ Resistors	(10) Jump Cables & (2) DC Motors	(1) 5 AA Battery Housing

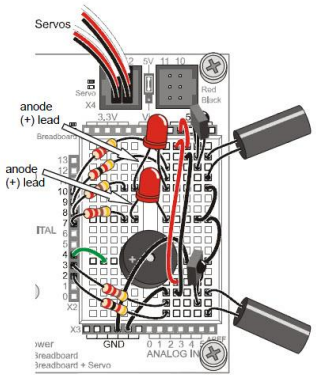
The Activity

During this activity you'll each be assign a role; Electrical and Computer Engineer (ECE), Mechanical Engineer (ME), or Computer Scientist (CS). The group's goal is to communicate with each team and work together to use the tools provided to create a vehicle capable of obstacle avoidance. Each team within the group have parts that have been specifically assigned to them, however those parts require information from the other team to complete. At the end the group will present their vehicle where it must successfully maneuver and avoid obstacles around it.

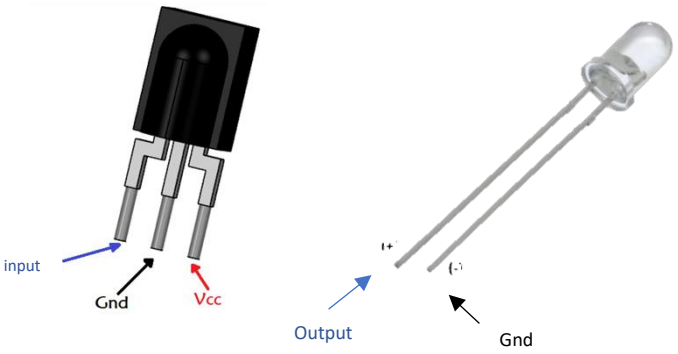
Electrical & Computer Engineering Team

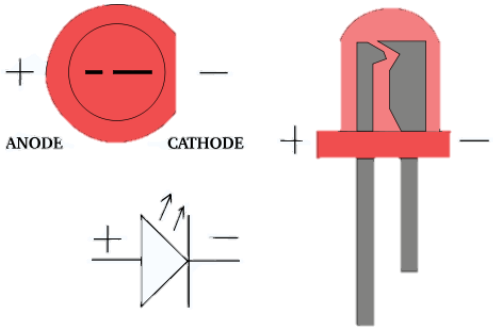
Those assign ECE will study each electrical component and connect each one in a way so that it works with the code produced by the CS team.

- The following schematic is using two proximity IR sensors, your job is to take this example and improve it so that it works with three sensors:



- Here is some helpful information on some components:

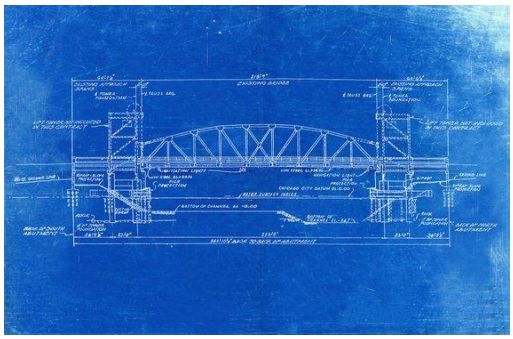


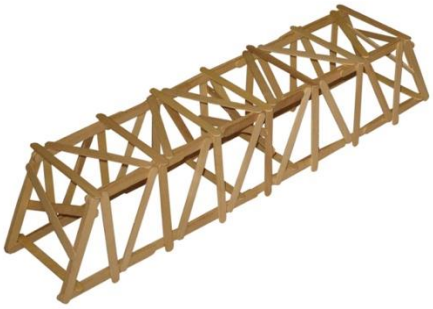


Mechanical Engineering Team

Those assign ME will use the structure panels (popsicles sticks) to create a rigid structure, where they will place the components, such as the motors, the Arduino, the Parallax Board, and the batteries.

- Here are some useful tips when creating the base of the vehicle:
    - Consider the amount of resources you have in hand; a great design focuses on using the minimal amount of resources but providing the maximum amount of functionality.
    - Creating a blueprint helps by understanding what and how things can be arrange for maximum functionality.
    - Discuss with other teams within your group to understand the other team's need and constraints that you might encounter and continue discussion to create a plan that will fulfill both your team's and the other team's goal.





Computer Science Team

Those assign CS will use Arduino IDE to fill the code pieces and compile a code that will receive the input from the Proximity IR sensors and send signals to maneuver the servo motors. This role requires a lot of communication to the ECE team.

1. void setup()

This function is used to initialize PIN layouts and assign a PIN as INPUT or OUTPUT.

2. int irDetect()

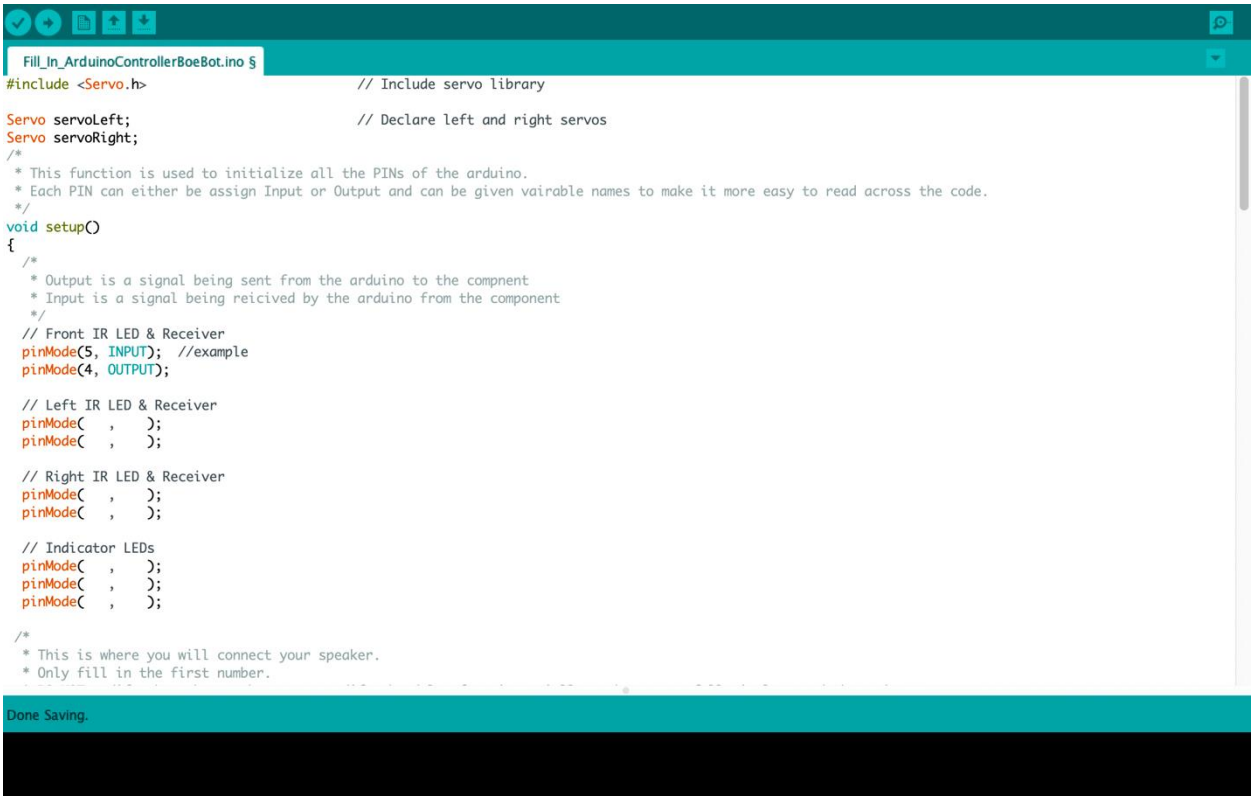
This function is used to return 1 if an object is not present or 0 if there is an object present by using the IR sensors.

3. void maneuver()

This function is used to control at which direction each servo motor will turn with relationship to the input from the IR sensors.

4. void loop()

This function is used to control the flow of the program and use all the functions create the flow.



Both a Fill-In and complete version of the code has been provided. The Fill-In version is to be used for the activity and the completed version is to be used by a teacher to determine whether the code was filled in correctly.

Assessment

1. What have you learned about the importance of working as a team? Do you think in larger projects a single person can complete the project on their own?

2. Given your assigned team (ME, ECE, or CS), what was the most challenging part of you goal? Did having other teammates help you achieve your goal? Describe any disagreements that the team had.

3. Did the following activities increase your interest of a STEM education? Do you feel that you would have perform best on anther team (ME, ECE, CS)?

Extensions or Additional Resources

1. Parallax Activity
2. Arduino
3. Arduino Servo Library

Thank you for downloading this lesson, please take a moment to complete our survey