System Overview

Our project is the sumo robot. It is meant to be able to push another 500 gram object out of a sumo ring. It uses an ultrasonic sensor to detect the other 500 gram object, an infrared sensor to detect the outer ring, two DC motors controlled by a motor driver, and an LCD to display sensor values. The enclosure is 3D printed with PLA material.

Electrical Specifications

Electronic Part	Max Voltage (V)	Minimum Voltage (V)
Battery	15V	8V
Power Supply	Recommended: 12V Absolute: 20V	Recommended: 7V Absolute: 6V
Motor Signal	5V	0V
Display Signal	5V	0V
Arduino Uno	20V	6V
PCB	9V	8.5V

User Guide

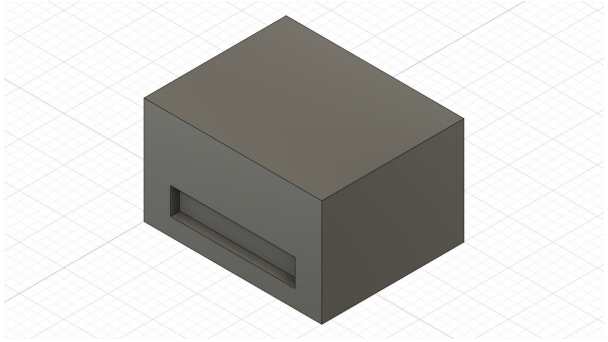
When first setting up the sumo robot, follow these steps to power the sumo robot.

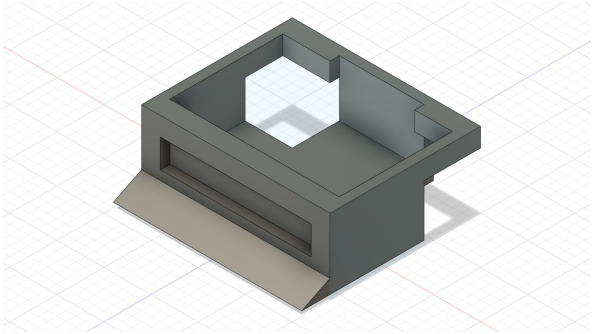
1. Ensure that the 9V battery is fit correctly in the battery pack.
2. Make sure the switch to turn on the battery pack is switched on.
3. The sumo robot should now be running at this point.
4. Place the sumo robot on the ring and it will start searching for an object to push.
5. To deactivate the sumo robot, pick it up and switch off the battery pack.

When debugging the sumo robot, the sensor positions are as follows:

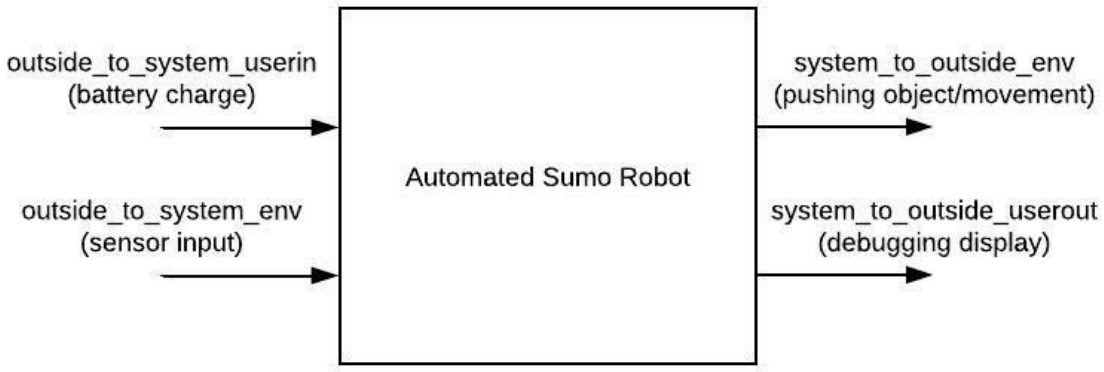
1. The top sensor value corresponds with the ultrasonic sensor.
2. The second sensor value corresponds with the infrared sensor.
3. The third sensor value corresponds with the current sensor.
4. The last sensor value does not correspond with any sensor.

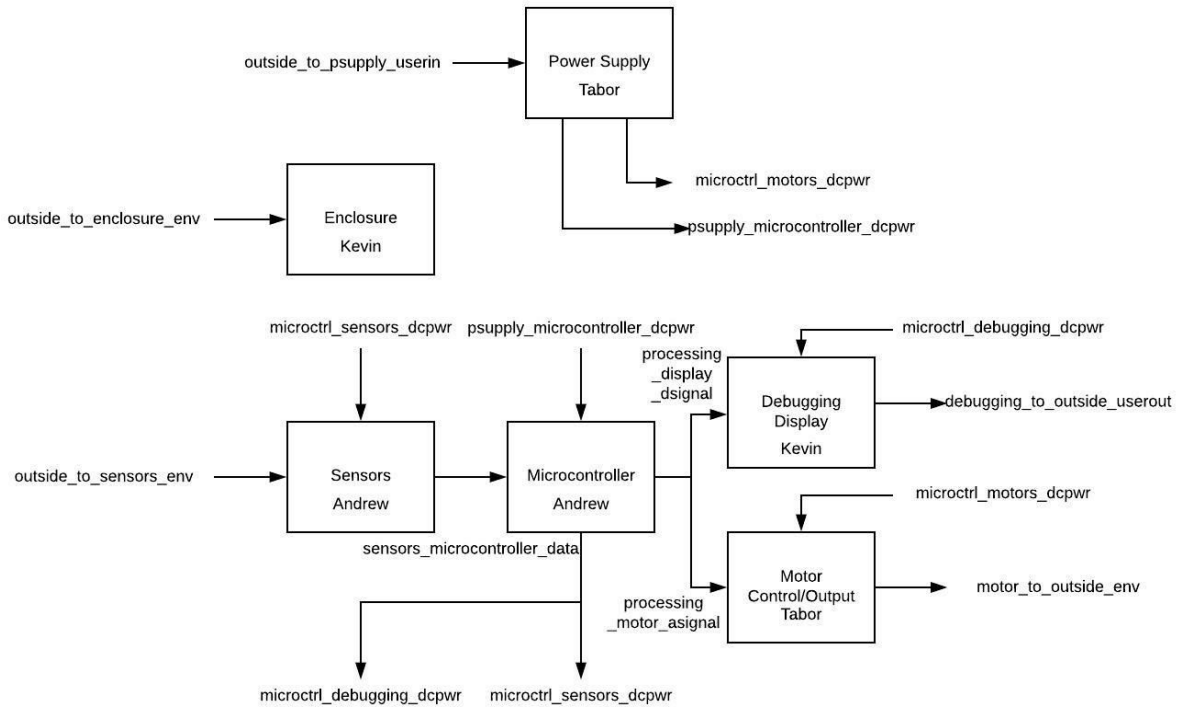
Design Artifact Figures



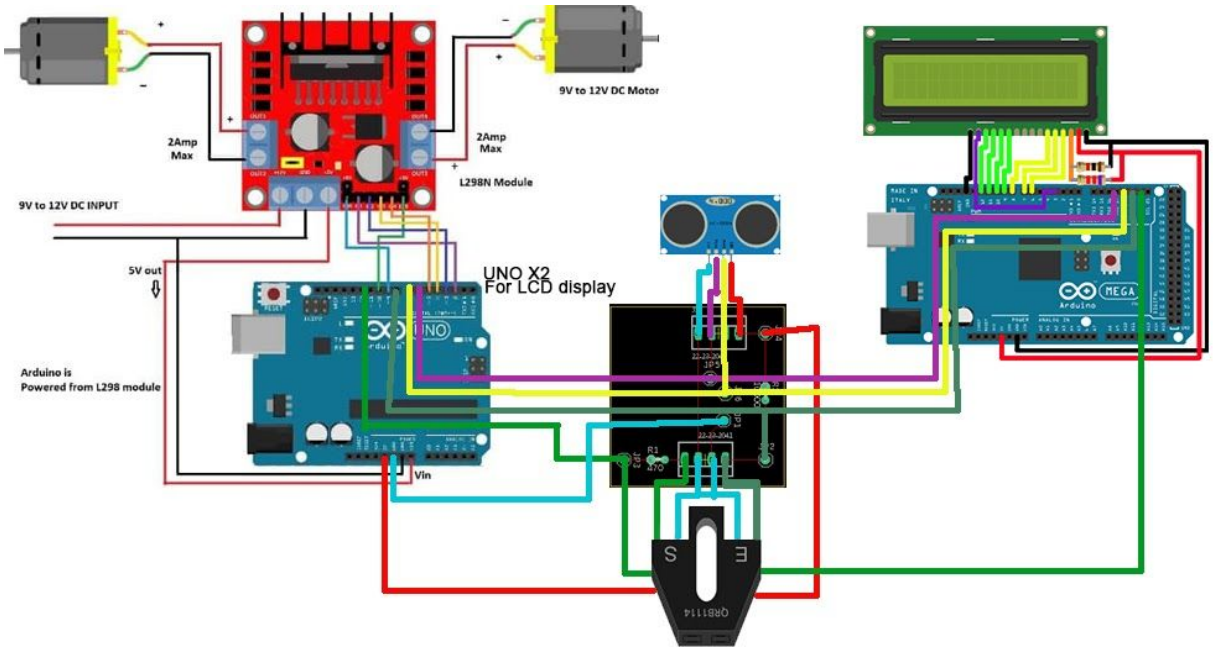


Here is a picture of the top and bottom parts of the enclosure 3D model. The top part has a slot to fit the ultrasonic sensor. The bottom part has two holes for the wheels and another slot for the infrared sensor. The bottom also has a slight ramp on the front to give more leverage to push other sumo robots.



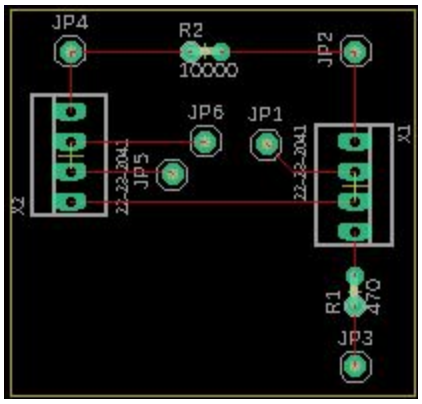


The black box diagram shows the basic inputs and outputs to the sumo robot. The robot will take power from the battery and make movements based on input received from the ultrasonic and infrared sensors. The top level block diagram shows the interfaces between each of the blocks of the system and how information travels between the blocks of the system.



The above wiring schematic displays the complete system of the mini-sumo robot. As seen, the system requires two arduino's in order to have enough I/O ports. The second arduino is almost completely dedicated to the LCD aside from the sensor input needed to be displayed. The sensors send the acquired environmental data to both arduinos for processing and execution of resulting actions. The data is processed from the first arduino and executes the directional output through the motor driver and dc motors. The second arduino proceed to display all the information recieved from the sensors for debugging purposes.

PCB Information



The PCB board is a 1.35 x 1.29 in (34.3 x 32.8 mm) 2 layer board. X2 is intended for the ultrasonic sensor and X1 is intended for the infrared sensor. We have connected both of the grounds and 5V for both sensors to maximize efficiency. We will have a 10k Ohm resistor at slot R2 and a 470 Ohm resistor at R1.

Part Information

Component	Description	Specifications	Supplier	Part Number	Cost	Quantity	Extended Cost
1	LCD Display	5V, 9.8 x 6 x 1.2mm, 20 x 4 Character Display	Banggood	908616	4.99	1	4.99
2	Current Sensor	5V, 28mm x 13mm	eBay	SEN-2817	3.84	1	3.84
3	Ultrasonic Sensor	5V, 45.5 x 20 x 15.5mm, Weight: 8.7g	Digikey	1528-2711-ND	3.95	1	3.95

4	Infared Sensor	15mm x 18mm x 5mm / 0.6" x 0.7" x 0.2" Weight: 1g	Adafruit	2349	1.95	1	1.95
5	Wheels	65mm Diameter	Banggood	912822	2.52	2	5.04
6	Motor Driver	5V-35V, 43 x 43 x 26mm, 26g	eBay	l298n	3.05	1	3.05
7	Resistor	10k (Part of IR sensor kit)	Adafruit	2349	1.95	1	1.95
8	Resistor	220	eBay	220R	2.49	1	2.49
9	Resistor	470 (Part of IR sensor kit)	Adafruit	2349	1.95	1	1.95