MEGA-MIND: A MODULAR ROBOT

The SumoBot Competition

A SumoBot competition has two robots that are trying to push one another out of the ring. The first robot to touch outside of the ring loses the competition. The robots can not attempt to flip or damage their opponents. The ring is 154 cm in diameter with a 5 cm white border. This is competition is in the Autonomous Mega Sumo class. Each robot has a maximum width and length of 20.0 cm and unlimited height. The robots can not exceed 3 kg in weight and are not allowed to receive any signals or directions during the match.

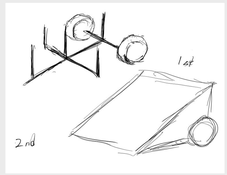
Key Customer Requirements

Compact – The SumoBot should fit in a 20 cm x 20 cm box.
Heavy – To maximize friction the robot should weigh as close to the maximum weight (3 kg) as possible.
OSU Themed – The robot should showcase OSU and have a pleasing appearance.
Durable – The SumoBot will need to be able to withstand the impact force of the opposing robot during competition.

Oregon State University

OUR DESIGN PROCESS

BRAINSTORMING



The team started by breaking the robot into four basic groups, general shape, sensors/electronics, wheels/mobility, and strategy. Team members generated ideas for their assigned group. The team then combined the groups to generate ten different designs and used a pugh chart to rank the designs. The modular design was the highest scoring design because of its compact size and design flexibility.

PROTOTYPING

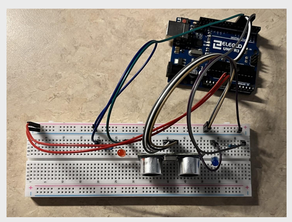
The first prototype was used to prove that the concept of a modular robot was possible. The second prototype was a full frame made from cardboard, and the third prototype was constructed from wood and used acrylic for the removable armor. Each iteration of prototyping found significant errors in the design and has resulted in a radically different design than first brainstormed.

MANUFACTURING

The robot frame is primarily constructed from ¼” aluminum plate and 3D printing. The base of the frame and side supports are machined from aluminum and assembled using JB Weld Glue. The removable armors, frame top, and motor mounts are 3D printed and attached with bolts.

TESTING

Many tests were performed to prove that the code and sensors worked properly. The photo shown is how the team first tested the ultrasonic sensor and the code for the ultrasonic sensor. In this test, the two LEDs light up to signal that the motor would be moving. One LED would turn on to signal the robot is turning in a circle, once an object is sensed both LEDs turn on and the robot would travel directly at the sensed object.



FINAL PRODUCT

After the months of brainstorming, prototyping, manufacturing, and testing, Mega-Mind the SumoBot was finished. The Sumobot has two interchangeable armors, a triangular armor, and an octagonal armor. Mega-Mind has three infrared sensors, two high quality Maxon Motors, and one ultrasonic sensor.

| Wei-Hung Chang | Christian Kuga | Hadley Massey | Ryan Schofield |

maxon

Maxon generously donated the motors and motor controllers for our sumobot. We are so grateful for the kind people at Maxon and are excited to showcase what their motors can do!

Maxon was founded in 1961 and specializes in DC motors. Maxon’s motors are used in a variety of industries from insulin pumps to NASA’s Mars rovers.

Figure 1. Photos of donated Maxon products.

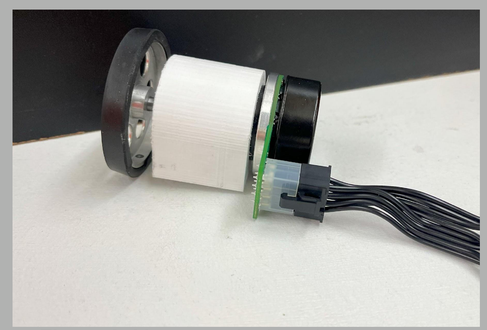


Figure 2. Motor attached to wheel and inside motor mount.

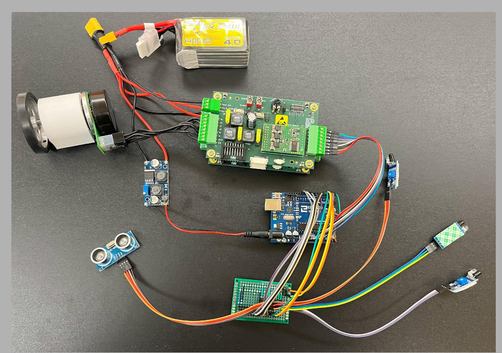


Figure 3. Photo of electronics being tested