

Sumo Bot Proposal 2015-2016

TEJ 3MI

For Mr. Webb

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Description:

Purpose

The purpose of the Sumo Bot project is to learn the theory and proper engineering skills required to build an effective bot that is able to sense another bot and push it out of a certain sized ring while keeping itself in the ring at the same time. This project involves all the skills we have learned throughout the entire semester and allows us to combine these skills in a “real-world” atmosphere. Through this project, we will apply our knowledge in areas such as construction, design and programming in order to create a successful bot that will excel in all the necessary categories to triumph over the other sumo bots. This opportunity allows us to create something that will not only help us understand the concept of computer engineering, but will also help us in the long run, whether that be carrying us further into the engineering world or nailing job interviews with our exceptional skills. The Sumo Bot is a creative and challenging project that will put our understanding to the test, but at the same time, create a fun atmosphere that will encourage us and motivate us to do our best.

Appearance

Our Sumo Bot will take on the shape of a wedge. The back will be around 2-3 inches thick and will gradually slope down, getting thinner and thinner. The front will be nearly flat. We will attach two wheels, 2 inches in diameter and about an inch thick, to either side of the bot, about three-quarters of the way back. They will be coated in a thick rubber to increase traction against the ring. The LED and phototransistor used to detect the line will be placed at the bottom of the slope of the bot and will be attached to the side using a rigid wire. The bot detection will be placed on another wire to the opposite side of the bot and will be raised about an inch above the bot. The Sumo Bot will be made mostly out of wood and plastic, held together by staples. Our Sumo Bot, like all others, will be painted white.

Strategies

One of our strategies to ensure that our Sumo Bot is successful is to create the bot in the shape of a slope. This means that when our Sumo Bot slams into another, the end of the slope will slide under the opposing bot and lift it up slightly so the wheels are less effective. With two of the wheels no longer in contact with the ground, it will give us an advantage to push the opposing bot out of the ring. We also plan to use large, rubberized wheels to give our bot extra traction along the ground. This means that when it collides with another bot, more force will be required to push our Sumo Bot out of the ring. We will make our bot weigh significantly more, at least 4.5 lbs. This and the rubber wheels will work together to keep our bot sturdy in the ring and keep it from sliding back from the force of the opposing bot.

Line Detection

Line detection will involve a Superbright LED and phototransistor attached to the bottom of the front half of our bot. As the light from the Superbright is reflected off the white border of the sumo ring, the phototransistor will sense the reflected light and open a path to ground. Current will stop flowing to the chip and go directly to ground because the easier path is open. We will program the chip to stop and reverse the motors when current stops flowing to the chip for 2-3 seconds, then it will continue moving forward and repeat the process if it hits the white border again.

Bot Detection

Using the infrared emitter and receiver, our bot will emit an infrared light in front in order to detect a bot. Since all Sumo Bots must be white, the infrared emitter will emit light that will be reflected back into the infrared receiver. Thus meaning the opposing Sumo Bot is in front of our bot. When there is no bot located in front of our Sumo Bot, there will be no light detected through the infrared receiver and the bot will continue to circle, trying to receive a reflection or detect another bot. Once our bot detects another bot, the programmed process will repeat itself.

Motors

The motors will function based on line detection and bot detection. When the phototransistor senses light, also known as the reflection of the LED off the white border of the ring, the motors will stop and reverse for 2-3 seconds. Once it has backed up, it will continue to circle around in search for another bot. It will repeat the process if it hits the white border again. When the Sumo Bot does not detect a white line, nor does it detect another Sumo Bot, only one motor will run, causing the bot to circle around in order to locate the opposing bot. Once the Sumo Bot has detected another bot, it will stop circling and both motors will turn on, causing it to run into the opposing bot and push it out of the ring.

Timeline:

Date	Jessica	Laila
Mon Nov 2	Start circuit board #1 in Traxmaker	Start circuit board #2 in Traxmaker
Tues Nov 3	Finish circuit board #1 Get started on circuit board #3 in Traxmaker	Finish circuit board #1 Get started on carving bottom layer of bot
Wed Nov 4	Finish circuit board #3 Print circuit board #1, 2 and 3 Solder the wires to the motors	Finish carving bottom layer of bot Sand the bottom layer down
Thurs Nov 5	Finish soldering wires to motors Attach wheels to motor	Continue sanding and filing the base
Fri Nov 6	Finish attaching wheels to motor Attach everything to the base	Continue sanding base if needed Scrub circuit board #1, 2, and 3
Mon Nov 9	Finish attaching everything to base	Place circuit board #1, 2 and 3 in etching tank. Start writing out motor program for PIC
Tues Nov 10	Place components in circuit board #1 Begin soldering components into place	Place components in circuit board #1 Begin soldering components into place
Wed Nov 11	Continue soldering components into place	Continue soldering components into place
Thurs Nov 12	Finish soldering components into place Scrub flux off	Finish soldering components into place Scrub flux off
Mon Nov 16	Place components in circuit board #3 Begin soldering components into place	Start writing motor program for PIC

Tues Nov 17	Finish soldering components into place Scrub flux off	Finish writing motor program for PIC Test motor program Troubleshoot motor program
Wed Nov 18	Test motor program Troubleshooting	Test motor program again Troubleshoot Finish motor program
Thurs Nov 19	Cut the side walls of the bot Sand walls down	Begin programming line detection
Fri Nov 20	Attach walls to bot with hammer and nails Attach phototransistor and LED to bot	Continue programming line detection Test line detection Troubleshoot
Mon Nov 23	Work out kinks and design flaws in assembly	Continue programming line detection
Tues Nov 24	Help Laila program and troubleshoot	Test line detection Continue programming line detection
Wed Nov 25	Start programming bot detection	Finish program and verify functionality
Thurs Nov 26	Continue programming bot detection	Attach bot detection parts to bot
Fri Nov 27	Continue programming bot detection Test bot detection	Continue assembling bot detection parts
Mon Nov 30	Continue programming bot detection Test and troubleshoot bot detection	Finish assembling bot detection parts
Tues Dec 1	Continue programming bot detection	Work out kinks and design flaws in assembly
Wed Dec 2	Continue programming bot detection Test and troubleshoot	Cut out top part of bot design Sand down piece
Thurs Dec 3	Continue programming bot Troubleshoot	Continue sanding down piece and making sure everything

		fits
Fri Dec 4	Continue programming bot detection Test bot detection	Help with programming issues Troubleshoot
Mon Dec 7	Finish programming bot detection Test whole Sumo Bot	Finish programming bot detection Test whole Sumo Bot
Tues Dec 8	Troubleshoot Sumo Bot	Troubleshoot Sumo Bot
Wed Dec 9	Finish Programming	Finish programming
Thurs Dec 10	Test Sumo Bot against other Sumo Bots	Test Sumo Bot against other Sumo Bot
Fri Dec 11	Troubleshoot Work out kinks in the system	Troubleshoot Work out kinks in the system
Mon Dec 14	More troubleshooting in case of malfunctions	More troubleshooting in case of malfunctions
Tues Dec 15	More troubleshooting	More troubleshooting
Wed Dec 16	Work on possible enhancements discovered over the course of the semester	Work on possible enhancements discovered over the course of the semester
Thurs Dec 17	Work on enhancements	Work on enhancements
Fri Dec 18	Work on enhancements	Work on enhancements
Mon Jan 4	Work on enhancements Finish enhancements (hopefully)	Work on enhancements Finish enhancements (hopefully)
Tues Jan 5	Install top layer of Sumo Bot Sand down Sumo Bot as a whole	Come up with ways to make Sumo Bot more appealing
Wed Jan 6	Paint Sumo Bot white Let it dry overnight	Paint Sumo Bot white Let it dry overnight
Thurs Jan 7	Work on appearance of bot	Work on appearance of bot
Fri Jan 8	Work on appearance of bot	Work on appearance of bot

Mon Jan 11	Test Sumo Bot on other bots	Test Sumo Bot on other bots
Tues Jan 12	Troubleshoot	Troubleshoot
Wed Jan 13	Complete project!	Complete project!

Materials

Material List	Part Number	Quantity Bought	Price for each	Quantity needed	Price needed	Source
1000uf capacitor	1000R16	50-99	\$0.29	3	\$0.87	ABRA Electronics
0.1uf capacitor	0.1R50	50-99	\$0.07	2	\$0.14	ABRA Electronics
1uf capacitor	1R50	50-99	\$0.07	2	\$0.14	ABRA Electronics
100ohms resistor	R1/4-100	2000+	\$0.01	2	\$0.02	ABRA Electronics
220ohms resistor	R1/4-220	2000+	\$0.01	3	\$0.03	ABRA Electronics
330ohms resistor	R1/4-330	2000+	\$0.01	1	\$0.01	ABRA Electronics
3.3k resistor	R1/4-3.3k	2000+	\$0.01	1	\$0.01	ABRA Electronics
4.7k resistor	R1/4-4.7k	2000+	\$0.01	1	\$0.01	ABRA Electronics
10k resistor	R1/4-10k	2000+	\$0.01	3	\$0.03	ABRA Electronics
100k resistor	R1/4-100k	2000+	\$0.01	1	\$0.01	ABRA Electronics
Line detection LED	C 503B-RAN	1	\$0.20	1	\$0.20	Digikey
PN168-Photo Transistor	IR-SET-5MM	1	\$2.99	1	\$2.99	ABRA Electronics
L293D	296-9518-5-ND	250	\$3.56	1	\$3.56	Digikey
40k Linear Taper	PSK	100	\$1.49	1	\$1.49	ABRA Electronics
74HC04	74HC04	1	\$0.49	1	\$0.49	ABRA Electronics
IR emitter	IR-Set-Smm	1	\$2.99	1	\$2.99	ABRA Electronics

7805 Voltage Regulator	7805T	500	\$0.59	1	\$0.59	ABRA Electronics
PIC 16F628A	PIC16F28A-I/P-ND	20,166	\$2.28	1	\$2.28	Digikey
Switch	PPS-1	100+	\$0.49	1	\$0.49	ABRA Electronics
Reset Switch	PBS-190	1	\$0.99	1	\$0.99	ABRA Electronics
Motors	GM8	50+	\$5.76	2	\$11.52	Solarbotics
Motor Bracket	GMB28	20+	\$1.50	2	\$3.00	Solarbotics
Wheels	N/A	2	\$0.00	2	\$0.00	Home
TSOP4038 VISHAY IR Detector	782-TSSP4038	100	\$0.93	1	\$0.93	Digikey
Wood	N/A	144.47"	\$0.00	144.47"	\$0.00	Home
White Paint Can	N/A	1	\$0.00	1	\$0.00	Home
6volt battery	N/A	4 pack	\$9.99	4	\$9.99	Home depot
9volt battery	N/A	8 pack	\$13.47	1	\$13.47	Home depot
AA Battery cell holder	150-399	1	\$0.99	1	\$0.99	ABRA Electronics
D Cell Battery holder	150-110	1	\$0.89	1	\$0.89	ABRA Electronics
Axle	52718	6 pack	\$21.25	2	\$21.25	Solarbotics
Screws	561-KSP2	10	\$0.58	10	\$5.80	ABRA Electronics
Nuts	561-G440	4	\$0.47	4	\$1.88	ABRA Electronics

Red Wire	30KY100-Red	100FT	\$9.95	9.84FT	\$9.95	ABRA Electronics
Black Wire	30KY100-Black	100FT	\$9.95	9.84FT	\$9.95	ABRA Electronics
Total			\$92.30		\$106.96	