Executive Summary

The project at hand is to make a robot to play a game of sumo wrestling. The robot is going to be placed in an arena that has a black floor with a white line around the border. The goal of the robot is to push the other robot out of the arena. The robot that successfully pushes the other robot out wins. All robots must run on their own from code that is programming in pybricks.

The final version of our robot included a very sturdy core that had a ramp attached to the front that could move up and down. The robot had a color sensor in the rear and a color sensor to the front left side of the robot. It had an ultrasonic sensor attached to the front right side of the robot. The ramp was controlled using a single motor that was attached to the core of the robot. The robot’s code was designed so it would drive forward fast if the rear color sensor sensed white. The robot would back up 100mm and then turn 180 degrees if the front color sensor sensed white. The robot would also slightly speed up if the ultrasonic sensor saw something closer than 300mm. If the ultrasonic sensor saw something that was closer than 120mm the robot would go max speed and also activate the ramp to turn 50 degrees upwards.

The robot did very well, only losing to 2 robots. The ramp was very strong and won the robot most of its battles. Overall, what would be changed in the future is angling the brick of the robot upwards to give more room towards the front. With this extended room it would be best to move the color sensor to be centered and behind the ramp to get accurate readings no matter what angle the robot approached the edge at. It would also be best to move the ultrasonic sensor to be centered behind the ramp. This would aid in ensuring that the ramp always activates when a robot is close, even if the robot comes from a weird angle. Another thing to change for the future is to have a higher speed. Sometimes the robot would lose solely because it wasn’t driving quick enough, upping the speed would fix this matter but it would have to be fine tuned so the robot doesn’t drive off the edge.

Introduction

The project we worked on was a sumo wrestling project with lego robots. The goal was to push the opponents robot out of the ring in order to win. The ring was a black square with a white line around the outside of it. We were a group of three: Xander Straw, Tim Song, and Connor Lambert. Xander did the coding for the robot, Tim and Connor did the building of it. Our original plan was to have a ramp of some sort that was could lift up and our goal was to lift up the other robot and then push them out of the ring. The reasoning for this plan was because if we could get the wheels of the ground it would be super easy to push the robot out of the arena. We started this project on 4/18/23, met once more on 4/20/23, and then finished the project on 4/21/23.

Methods

What we tried originally was to just have a solid ramp and see if we could just ramp the other robots over our robot. That didn’t work because we did not have enough pieces to complete it. We decided to go with just a small ramp but make it move up using one of the motors we had. We devised a mechanism that turned the horizontal motion of the motor to a vertical motion using 2 gears. Later Tim and Connor met to reinforce and finish the core of the robot. Didn’t get everything attached but made the core and the ramp of the robot much sturdier as the ramp would bend when trying to pick up something remotely heavy. Later Tim added the ultrasonic and 2 color sensors to the robot. The rear color sensor was directly in the back and the ultrasonic and front color sensor were mounted to the front but towards the side of the robot. After Tim added everything and the design was complete Xander came and coded the robot. Started by initializing all the sensors and adding code to reverse the and spin the robot 180 degrees if the front color sensor detected white. Then added code to make the robot drive fast if the rear sensor read white as that meant the robot was getting pushed off the edge. Added a while loop for everything then added a code to see how far away something was using the ultrasonic sensor. Then made code that would slightly speed the robot up if something was close, the intention was that if something is close then it must be a robot so gain some speed to ram the other robot. Then more code was added so that if the ultrasonic sensor detected something close enough to the ramp it would go max speed and activate the ramp. Outside of those 2 if statements Xander added code to return the ramp to the default flat state. When writing the code, the robot had an overriding issue and would be very slow to change speeds or stop when near the edge. This ended up being because the code was a bunch of if and elif statements. This was fixed by making all the statements their own if statement. Later there was another problem where the robot would be late reacting to the white line and end up falling off the edge anyway. This was because it was going too fast, so we had to turn down the speed.

Results

We did pretty good in the robot tournament, we only lost to 2 or 3 robots. The ramp worked very well and ended up destroying a lot of robots. The ramp was able to pick other robots up just enough to get their wheels off the ground. One area where it failed was in one battle the ramp actually fully came off. It got stuck under a part of the other robot and just got pulled off. Another area of failure was the placement of the color and ultrasonic sensor. At some angles the robot would run of the edge because the color sensor didn’t read white until the robot was off the edge. Another area of problem was were the ultrasonic sensor was located. Because the sensor was off to the side, it only detected the robot if it was on that side of the robot. We lost to a robot because of this when another robot came at our from the right side and the ultrasonic sensor didn’t see it because it is on the left side. This led to our robot going at a slow speed and not activating the ramp which led to our defeat.

Reflection

If we were to do it again, we would move the ultrasonic sensor to the front and center of the robot. We tried doing this in class but the competition was already over. We would also change the position of the core unit to be angled upward. This would give us more space behind the ramp and would also let us move the color sensor to the center. Moving the color sensor to the center would greatly help in keeping the robot on the board. Other than that I would say our design and execution was great and worked pretty well.