Lab 6: Ball Sorting
Team 2
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Introduction

The objective of this lab was to sort red and blue balls. The robot starts off facing all the balls at one end of the field. This side is the original home and the opposite side is the destination home. The robot goes towards the balls and when it reaches one it senses to see of it is a red ball or a blue ball. if it senses a red ball it throws it off that edge and continues to look for another ball. If it senses a blue ball it has to take it to the destination home side and throw it over that edge. For each correctly thrown over ball the team was awarded 10 points. For each incorrectly thrown over ball there was a deduction of 5 points.

Hardware and Software Design

We realized that our design for the previous lab was too low and that we needed more space underneath. We raised up the NXT and and attached a motor under it. We used this motor to construct a control a gate that we used to flip balls over the wall. We attached the compass about six inches above NXT so that it could give the most accurate readings possible without interference from the NXT or motors. Next came our color sensor. We attached it in the front and to the side, so that it was pointing in front of the gate. It took us a while to find the optimal distance and angle. We then attached touch sensors in the front of the robot to detect when it had found a wall. Finally we added a funnel system to funnel the balls to the center of the robot and in front of the gate. This allowed us to collect balls that were not directly in the path of the robot.

We designed the software with a procedural approach. We made each state that the robot was in into a subroutine. The robot would start off searching for the home direction. Then it would go forward. It would sense for balls as it went. If it did not find any before it reached the wall it would go to a subroutine that would make it back up and go left or right and then again go looking for the balls. If it found a ball it would call the appropriate subroutine for the color of the ball. After the robot takes care of the ball it would then go back to the searching for home direction and it would repeat everything.

Problems and Solution

Our major problems for this lab occurred when building the robot. We had to think of a way to push the ball over the edge of the table. Also, since there were two colored balls, we had to design a way to get all of the balls of the blue color over to the other side of the table. The way we solved this was by building a gate in front of the robot that can open and close using a motor. This way it can act as a trapdoor for the blue balls so that we can move them to the other side of the table and we can also use the gate to push the balls over the edge of the table as well.

The other problem that we had was with the color sensor. We could not get the color sensor to read the different colors of the balls. Every time we tested it we would end up getting different color readings from the sensor. We found out that the screen was printing a garbage number so we were getting the wrong readings. Once we found that out we easily adjusted the code for the correct readings and that fixed the problem.

Unsolved Problems

While we were testing our robot we had it moving slow so that we could easily spot the errors when they occurred. By the time we finished correcting all the other minor issues we had we didn't have time to increase the speed of our robot and recalibrate it with the faster speed. Another problem that was unsolved was the we got our robot stuck in a deadlock trying to move back and forth to locate a new ball.

Contest Results

For this contest our robot performed in top shape even with all of the problems that we had. We finished in first place out of all the robots that competed.

Conclusion

We felt as though our robot design made helped in making this competition a lot simpler. A lot of people used crane designs that we a lot more complex. This caused them to spend more time on figuring out how to get it to work rather than the algorithm to use. We are happy with the outcome of this competition.

Appendix

Please see the link "BallFinder_V2.nxc" for the code for Lab 6.