

Final Project: Robot Soccer

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Problem

Two robots are placed on opposite sides of the field facing an IR ball. They must attempt to score the ball on the opposite side of the field in the designated goal area. After a match's time expires, the robot with the most points wins. If there is a tie, a series of penalty kicks will be taken by each side until one side fails to score.

Method

Originally, we attempted to create a fully reactive robot which continuously reacted to the IR ball's location and score around the enemy robot. After some experimentation, especially with the IR sensor, we decided that it would be exceedingly difficult to ensure that our robot would have a consistently winning strategy due to sensory limitations. We deconstructed our previous robot and made a new one with a simpler (and better) design.

Our new robot used all three motors in the same direction for driving. Each wheel was geared for a three times increase in speed. The loss of power (in comparison to other robots) was mitigated by the addition of the third motor. Although the addition of the third motor made turning considerably slower, the accuracy of the robot's forward motion and the robot's acceleration and top speed were considerably improved.

This new robot was designed to rush to the IR ball before the other robot would reach it and use its triangular plow affixed to the front to knock the ball past one side of the opponent's robot and score. This was intended to score in a little over a second, removing the need for a fully reactive robot that tracks the ball and the other robot continuously.

The controller for the robot is divided into three programs: normal game rounds, penalty kicking, and penalty kick blocking.

Normal

Under the robot's normal mode of operation, it initializes sensors, and depending on whether or not the start button is depressed as the program initializes, it plays a musical phrase. Then, it waits for the button to be pressed to start a round. Using a touch sensor as a button to start the round reduces the delay for the robot to start compared to just launching the program on the NXC. The robot then drives forward for a set amount of time to drive into the IR ball at maximum speed. Then, it backs up to in front of the goal area it started in. The direction of the IR ball in relation to the robot is then detected. Depending on the orientation, the robot turns to present its side in an attempt to block the ball. This is a one-shot attempt at blocking; this sequence is only run one time to defend against one countering kick by the opposing robot.

Kicking

The kicking mode is a simplified version of the robot's normal operation. It stops operating after it hits the IR ball, however, instead of attempting to block.

Blocking

The blocking routine attempts to block the enemy robot from scoring as it does in the second half of its normal operating mode.

Results

In the final competition, our robot won first place. Although it did lose initially to the second place robot, it won through the losing bracket to win the double elimination tournament. The robot it lost to had an identical gear ratio which made our dedication to speed less important. Its wide basket occasionally caught the ball after our robot kicked it, too. We consider our victory to be a testament to the adage that the simplest approach is the best.