CPE 470/670 Autonomous Mobile Robots

Lab 4 Line Follower

Team 6

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Hardware and Software

The hardware design for our last lab did not turn out well as expected therefore we were very cautious of our design. We based our robot hardware design on the instruction manual present in the NXT kit. We modified it to add a sound sensor , 2 line sensors in the bottom and a color sensor as permitted by the contest. Our hardware was design was therefore very simple.

We tried using the textbook algorithm using single line sensor and tried modifying it to a accomodate 2 sensors . The textbook algorithm however did not work well when it had to take sharp turns and it would sometimes take the wrong turn. Therefore we came up with our own algorithm. We had 2 sensors spaced out so that the distance between them was only a little more than the width of the dark line. The algorithm is as follows
If

(a) Both the sensors in white spot given same amount of power both wheels

(b) If left senor on black spot then give more power to right wheel till right sensor hits the black spot

(c) If right sensor on black spot then give more power to left wheel till left sensor is the black spot

(d) If both sensors are black then turn right till one of the sensors hit a black spot again

Once it has hit home location , robot runs in home mode where the robots keeps on rotating till it senses a sound above a particular threshold. On occurrence of former event the robot keeps moving straight for a small interval of time. From the algorithm it is clear that we used the principle of simple feedback control . This made our robot really fast and our robot completed the contest the fastest.

Problems and Solutions

During the course of this project the team ran into a lot of problems. Almost all of the problems encountered by the team were solved. The issues were placement of the line sensor, placement of the color sensor, values read by the line sensors, delay issues with the mic, and issues with the track it self.

The issue that the team had with the line sensor placement. Placement the second had an effect on how much the robot had to “jitter” and during the end of the of the map it had to do a tight turn and if the sensor was too far away from the robot it would miss the turn and wander off to another line, it it was too close to the robot it would hit the line awkwardly and it would turn off of the line and jump to another line and follow that one. After playing with the position of the second sensor the “sweet spot was found” and after playing with the speed and color threshold.

The second issue was the placement of the color sensor was that the light of the sensor could interfere with the values in the line sensor, so using the threshold the team was able to correct the issue.

The delay issue with the mic was that if there was any silence the robot would start turning to fix this issue a timer was added so it would go straight for about 2 seconds even after there is silence.

The line following issue with the map was that due to the green line at the start of the track the robot would sometimes lock onto that line and not the black line because they give about the same value. To fix this permission was given to cover up the unused lines.

Unsolved Problems

The only unsolved problem that was encountered was a bug that only happened during making the very sharp turn at the end of the track. Where it would start to turn and then would unexpedly go straight, this problem happens about every 1 out of 15 times.