Teacher Notes: Faster Line Tracking

Introduction to Mobile Robotics > Faster Line Tracking

Description of the Unit

In the Follow the Guidelines activity, students learned how to program a robot to track a line. The students should have constructed a robot that was successful, but also very slow. In real world robotics projects, speed and efficiency are often important goals. For this reason, the students will learn how programming and engineering can be used together to track a line quickly, without sacrificing accuracy.

Activity summary: students will...

- Alter the Line Tracking program by increasing motor speed
- Study the effects of changing motor speed on line tracking ability
- Learn how the placement of the Light Sensor affects line tracking ability
- Reposition the Light Sensor to improve the robot's efficacy and test it

Prerequisites:

- Set up an area with a black line of electrical tape on a light surface, or have an area ready for students to set up
- Follow the Guidelines Activity
- Present to class the Faster Line Tracking slideshow from Teacher's Curriculum CD and have class discussion (optional)
- Review/teach calculating thresholds and using View Mode (optional)

Central Concepts

Math	Science
Boolean Logic	 Light & Reflectivity
 Comparisons (<,>) 	Color Perception
Distance	 Observations and Predictions
 Spatial Reasoning 	
 Thresholds and Averages 	
Technology	Communication
 Design Critiquing 	 Explanatory, Summative, &
 Conditional Statements 	Descriptive Composition
 Troubleshooting 	 Brainstorming Possible Solutions
 Robotic Decisions & Behaviors 	for Unexpected Situations

Approximate classroom time: 3-4 class periods (45-minute periods) Approximate homework time: Up to 1 hour (Conclusions section)

Note to the teacher

This Exploration can only be performed with the Taskbot model. The Robot Educator model (REM) has a different wheel configuration, and thus tracks the line in a different way. None of the explanations of the line tracking problems that the robot encounters will make sense if you are using the REM.

There are many reasons why a robot would be unable to track the line. Common problems include an incorrect threshold level, or a threshold level that is correct on one area of the board, but, due to lighting changes, will not work on another side of the board. With the Light Sensor on the front of the robot, it also cannot track the line very quickly, so watch out for students whose line tracking behavior will not work because the motor power levels are set too high.

Students may also find it difficult to understand how the light sensor detects colors as opposed to black and white. To help demonstrate this concept, refer to the Light Sensor page in the Basics > NXT Sensors portion of the student CD, or check out this <u>useful animation</u>.

Students will be able to:

- 1. Follow directions to conduct a guided partial inquiry
- 2. Learn about how the robot's geometry inhibits its ability to track a line
- 3. Learn how to speed up the line tracking behavior
- 4. Experiment with different aspects of the robot's design to come up with an optimal method for line tracking
- 5. Appreciate tradeoffs and decisions in the design process
- 6. Write a conclusion that summarizes the information learned in the exploration