Teacher Notes: Obstacle Detection
Introduction to Mobile Robotics > Obstacle Detection

Description of the Unit
In this activity, students will use two different sensors to make the robot perform the same behavior, but with a twist! With the Touch Sensor, they will program the robot to stop once it has run into an obstacle, and using the Ultrasonic Sensor, they will program it to stop before it runs into an obstacle. They will then explore the capabilities of the Ultrasonic Sensor.

Unit summary: students will…
- Build a Touch Sensor bumper and program the robot to stop when it hits something
- Calculate a threshold value for Ultrasonic Sensor levels
- Use the Ultrasonic Sensor and threshold to control the robot's behavior

Prerequisites:
- Full Speed Ahead Activity (optional)
- Have Touch Sensor bumper attachments built for each group (optional)
- Present to class the Obstacle Detection slideshow from Teacher's Curriculum CD and have class discussion (optional)
- Review/teach calculating thresholds and using View Mode (optional)

Approximate classroom time: 1-3 class periods (45-minute periods)

Note to the teacher
This Activity can be performed with either the Taskbot or the Robot Educator model (REM). With the REM, it should be noted that when you add the Ultrasonic Sensor to the front of the robot, it will point slightly upward and not straight ahead, so the readings will be slightly different than they would be with the Taskbot model.
This activity is designed to be relatively short so students can experience results quickly and familiarize themselves with the sensors. However, the bulk of the experimentation, graphing, and communication work lies in the much longer Field of View Investigation.
- The Obstacle Detection Activity guides students step-by-step through the process of programming the robot to respond to two different types of sensory stimuli.
- The Field of View Investigation has students further explore the detection abilities of the Ultrasonic Sensor by laying out a field of view plot and then scaling it to fit on a sheet of paper.
The Touch Sensor bumper attachment may take students a significant amount of classroom time to build. It may be worthwhile to have them built beforehand. It is the most complicated of all the sensor attachments to build.

Students will be able to:
1. Program a robot using the LEGO MINDSTORMS programming environment to respond to the Touch Sensor as well as the Ultrasonic Sensor
2. Understand how the Ultrasonic Sensor works and what it can and cannot detect well
3. Compare the differences in robot behavior using the two sensors, and make judgments as to which is best is a given situation