Teacher Notes: Wheels and Distance

Introduction to Mobile Robotics > Wheels and Distance Investigation

Description of the Activity

Students investigate what it takes to get the robot to move forward for a specific measured distance in a standard system of units. They will use the hypothesis equation to predict how far the robot will run, and then run the robot multiple times with different wheels and compare the results to the prediction.

Activity summary: students will...

- Investigate the mathematical relationship between wheel size and distance traveled with a set number of motor rotations.
- Describe the mathematical relationship between distance traveled in cm to motor rotations in degrees.

Prerequisites:

- Have Taskbot robots built for each group
- Full Speed Ahead Activity
- Present to class the Wheels and Distance slideshow from Teacher's Curriculum CD and have class discussion (optional)
- Teacher-led review of related mathematics concepts: calculating circumference, balancing equations, solving for a variable (optional)
- Teacher-led review of related scientific experimental steps: measurement, data acquisition, analysis (optional)

Central Concepts:

Math	Science
 Diameter & Circumference 	 Experimental Design
 Ratios & Proportions 	Measurement
Means	 Data Acquisition & Organization
Unit Conversion	Error Analysis
Technology	Communication
 Transportation & Systems 	 Reasoning with Evidence
Measurement	 Explanatory Composition
Purpose of Technology	Arguing Support/Dissent for a Topic

Approximate classroom time: 3-4 class periods (45-minute periods) Approximate homework time: Up to 4 hours (exercises section)

Note to the teacher

This Activity can only be done with the Taskbot model. The Robot Educator model (REM) robot will not perform as needed for this activity.

This is a science and math-focused follow-up to the Full Speed Ahead Activity in the Introduction to Mobile Robotics Programming Project.

In this Investigation, students will need to develop and apply measurement and calculation skills. Working in teams is recommended so that students can discuss and reason through problems.

Teachers may also want to reserve some of the questions to assign as homework, or skip over questions and simply discuss the answers as a class. Specifically, the questions in the Exercises section of the

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investigation are meant to test and build on the knowledge obtained throughout the investigation, and can therefore be done individually and away from the classroom materials.

Students will be able to:

- **1.** Follow directions to conduct a guided partial inquiry
- 2. Calculate averages and circumferences
- 3. Describe the relationship between diameter and circumference
- 4. Describe the relationship between wheel size and distance traveled in a constant number of rotations
- 5. Apply and describe the various points of experimental procedure:
 - a. Experimental hypothesis
 - b. Measurement technique
 - c. Multiple trials
- 6. Describe and apply a self-formulated procedure for converting centimeters into wheel rotations
- 7. Write a conclusion that summarizes the lessons learned in the investigation