Teacher Notes: Get in Gear

Introduction to Mobile Robotics > Get in Gear

Description of the Unit

Another way to improve the performance of the robot under different conditions is to change the robot's gear ratio so that that you can get more power or more speed out of your motors. In this activity, students will swap out the gear ratios on their robots to observe how this affects the robot's speed and its ability to push things.

Unit summary: students will...

- Swap the gears on the robot
- Observe how changing the gears effects the robot's speed
- Observe how different gearings effect the robot's torque (ability to push)

Prerequisites:

- Make sure all Taskbots have a 1:1 gear ratio
- Full Speed Ahead Activity (optional)
- Present to class the Get in Gear slideshow from Teacher's Curriculum CD and have class discussion (optional)
- Review/teach gear ratios, speed, torque (optional)

Approximate classroom time: 2-3 class periods (45-minute periods)

Note to the teacher

This Activity can only be performed with the Taskbot model. The Robot Educator model (REM) does not have gears.

Make sure that the gear ratio on all robots is 1:1 before starting this activity. This includes having classes who have completed the activity reset their gears for the next class, if robots are shared between classes. Robots should have 16-tooth gears on the motors and the wheels.

The Get in Gear activity is designed to be relatively short so students can experience results quickly and familiarize themselves with the hardware. However, the bulk of the measurement, calculation, analysis and communication work lies in the much longer Gears and Speed Investigation. *It is highly recommended that the Investigation NOT be skipped*, as it teaches critical skills.

- The Get in Gear Activity, which guides students step-by-step through the process of changing the robot's gears, running the basic moving-forward program, and observing the differences created by the different gear ratios.
- The Gears and Speed Investigation, which involves students in a quantitative investigation of the relationship between gear ratio and robot speed.

Gear ratios can be confusing. It may seem counterintuitive that *small* gear ratios produce *large* robot speeds. Remember it this way: by changing the gear ratio, you are either giving the robot more speed, *or* more torque (motor turning power), but never more of both. Originally, the concept of gear ratio was used to describe higher torque situations. Thus, the convention is that higher gear ratios produce higher torques (and therefore lower speeds). Also, remember that gear ratio is defined as "driven over driving."

Students will be able to:

- 1. Change the power level of the motors to speed up the robot
- 2. Change the gear ratio on the robot and observe the effects on speed and power

