Current Draw How much current will my motor draw? Lesson Procedures

An important concern of any mobile robot designer is powering the vehicle. In our robot designs we are using batteries to power our robots. In this investigation you will study the affect that "work" has on current.

Students will be able to describe:

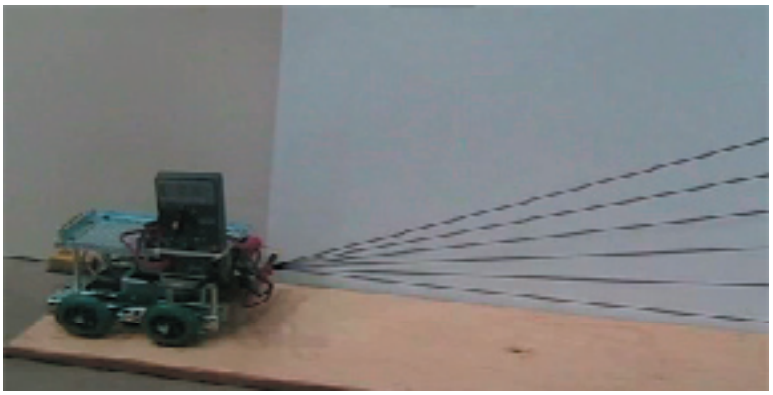
- Current flow
- The causes of excessive current flow
- How current is affected by work
- How to measure DC motor current with a multimeter

Materials needed:

- Digital multimeter
- VEX Squarebot
- Radio control transmitter
- Board or plywood (8 ft. by 12 in.)
- White foam board (8 ft. by 4 ft.) or other board suitable for drawing
- Protractor

Set Up

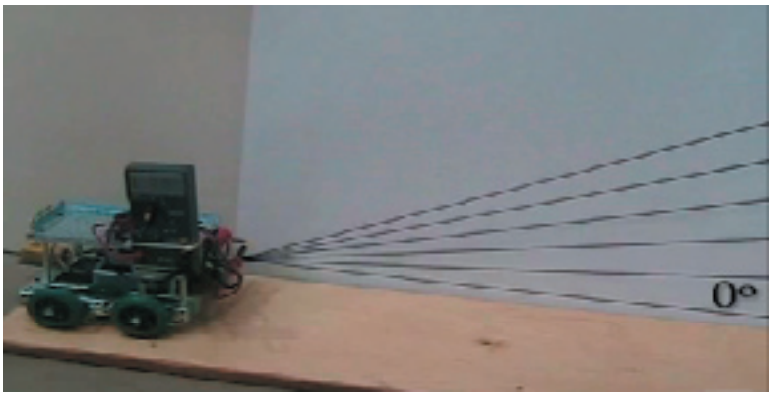
1. If you have not already done so, open and follow "Current Draw: Lesson Set up", in either its video or pdf form. Their content is almost identical, but the video is more detailed and descriptive. Before you can begin the lesson you need to have a Squarebot modified as it is in "Set up."
2. You will need the Squarebot you have modified, an 8' by 12" board, a protractor, and an 8' by 4' sheet or board you can mark. We used white foam board. Draw different angles on this board using a protractor as pictured below, then use it as a guide to angle the board carrying Squarebot. Use the protractor to draw six lines on the board beginning at 0 degrees (flat) and going up in increments of 5 degrees to 25 degrees. Finally, you will also need books or other objects you can use to raise one end of the board Squarebot runs on so that it matches the lines drawn on the board in the background. A picture of the complete set up is below.



3. The first trial will be at 0 degrees, so you can leave the board resting on the floor. You will use the remote control to operate the robot.

Try to begin with a fresh battery. Also, whenever you run the robot, drive at the maximum speed. Keeping the battery level and the position of the joystick as standard as possible will reduce the amount your actual results will vary from your predicted results.

Set the robot at the end of the board. Turn on and configure the multimeter to read “DC CURRENT.” Turn on the remote control, then the robot.



4. Drive the robot across the board, while observing the multimeter readings. Ideally, one person will drive the robot, and another will observe the reading.

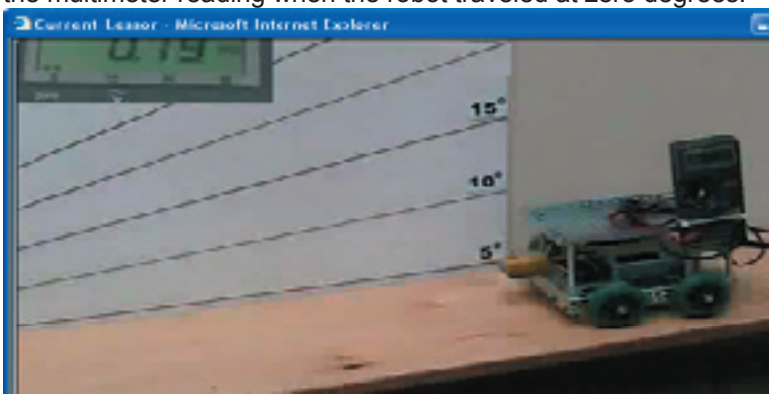
Expect the current readings to vary slightly in this and other trials. Do your best to estimate the average reading for the robot over the course of the trial. For example, you may find the multimeter begins at .68, stays there briefly, then varies between .64 and .65 for most of the trial. Therefore, you might conclude that .65 is the best average reading over the course of the trial. So enter .65 in the "Example data" under "Current (trial 1). You can access the Example data by clicking Resources/Example Data for Student Exercise, or you can create your own table using it as a guide Repeat this procedure for trials 2 and 3, then enter the average of trials 1, 2 and 3 under "Current (actual average)" for 0 degrees.

Note that you are not expected to find a "perfect" reading. Do your best to have a clear view of the Multimeter, and to estimate the best average value for each trial.

If you use the excel document itself, you should click "File/Save As" to save it to an appropriate place in your computer after you enter your values in it. Be sure to save it somewhere you can find it easily, so that you can continue entering data in the same document. You may want to create a folder on your desktop called "Current" and save the file as "Data...".

Note the white arrow in the video below points to the current reading displayed over the course of the trial.

5. Now prop the board up so that its angle is as close as possible to the 5 degree line you drew in the background (see picture below), and then follow the procedures you used to measure and record the multimeter reading when the robot traveled at zero degrees.



6. Follow the same procedures for 10, 15, 20 and 25 degrees. Remember, you are looking for the relation between current and work.

7. Open Quiz/Checking for Understanding and complete it.