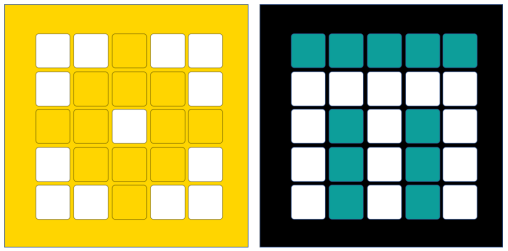
PRIME LESSONS

By the Makers of EV3Lessons



MORE ACCURATE TURNS

BY SANJAY AND ARVIND SESHAN

This lesson uses SPIKE 3 software

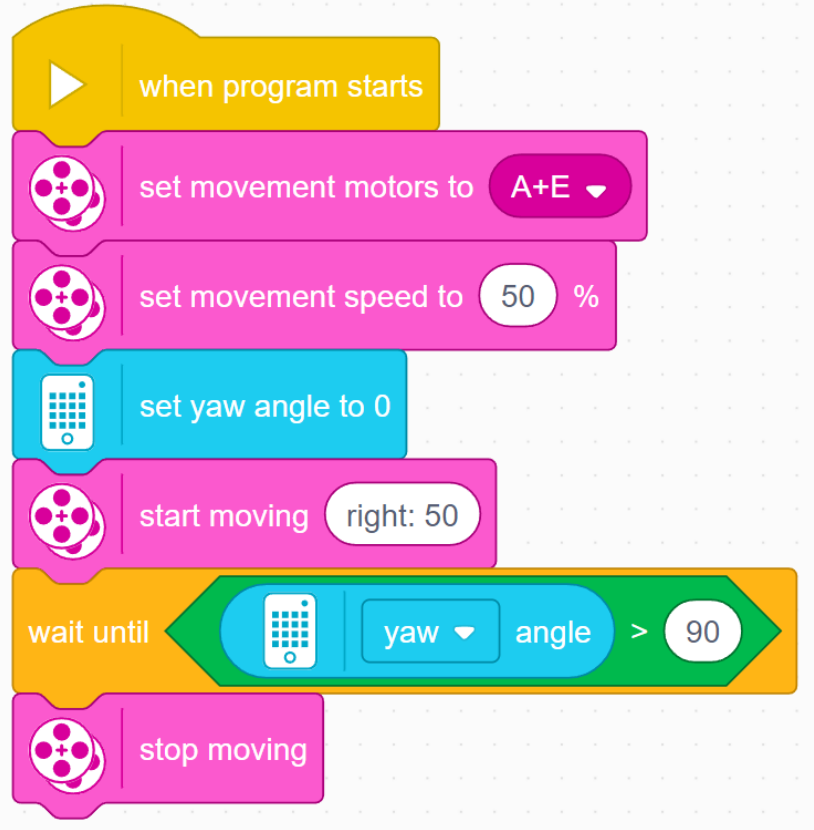
LESSON OBJECTIVES

- Learn how to improve the accuracy of turns
- Learn alternative ways to do pivot and spin turns
- Note: Although images in this lessons may show a SPIKE Prime, the code blocks are the may be a little different for Robot Inventor

HOW ACCURATE IS YOUR PIVOT TURN?

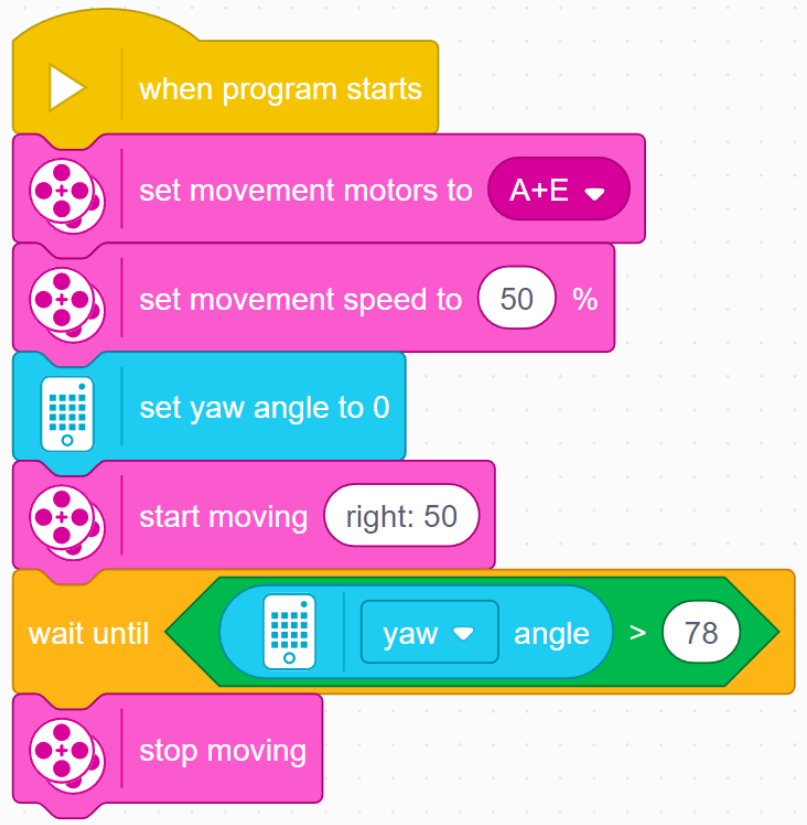
Run this code and use the Dashboard to see if turning 90 degrees actually turns 90 degrees.

- Note that we have set the motor speed to 50 instead of 20 in the previous lesson.
- For Droid Bot IV, this code turns 102 degrees (this value will be different based on the robot you are using).
- This is for two reasons
  1. It takes a short time to read the gyro. In this time, the robot has moved. This delay on the SPIKE Prime is relatively small but will produce a few degrees of error.
  2. It takes some time to stop the robot since it has momentum. This produces several degrees of additional error.



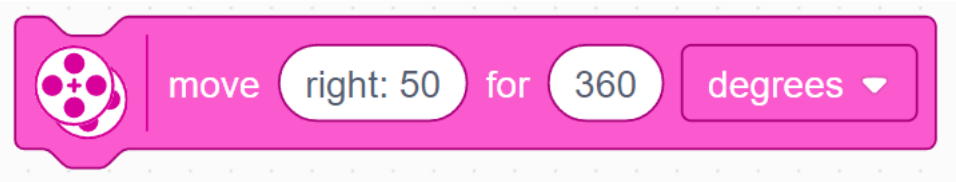
IMPROVING PIVOT TURN ACCURACY

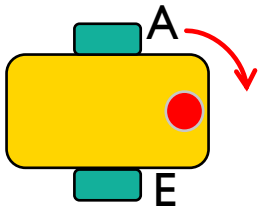
- As we mentioned on the previous slide, using Droid Bot IV at 50% Speed, the robot turns 102 degrees instead of 90 degrees.
  - How do we solve this problem?
  - One solution is to ask it to turn 12 degrees less for Droid Bot IV
  - The amount to reduce your turn will depend on the speed of your turn and your robot's physical design. You will need to try some values to get this right.
- The code on the right performs a 90 degree turn using Droid Bot IV using this method.



ANOTHER SOLUTION FOR PIVOT TURNS

- Another way to turn is to use movement blocks with duration.
- One advantage of these movement blocks is that they decelerate at the end of a move to improve accuracy.

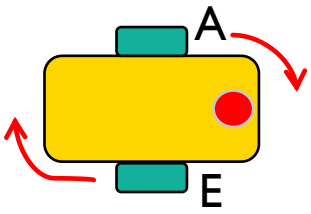


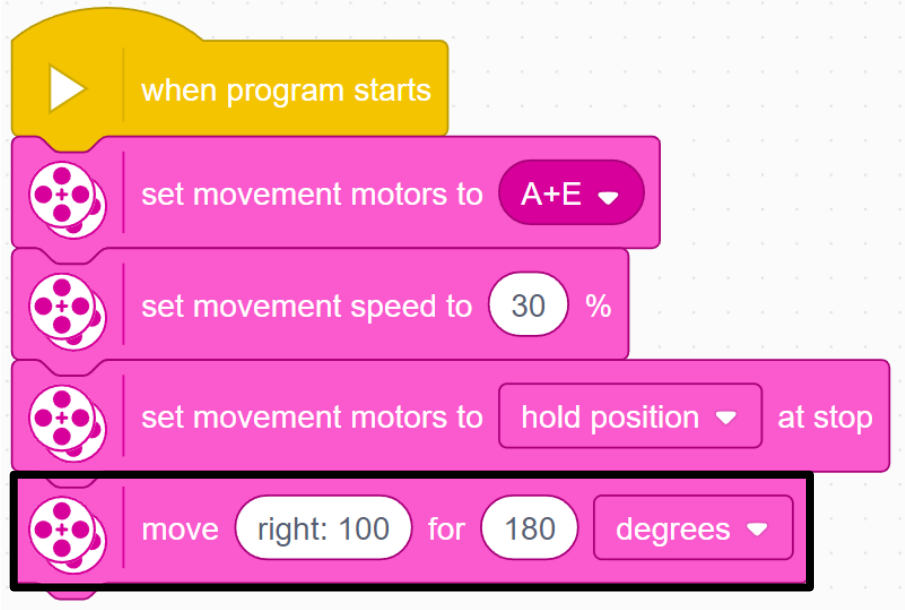


- **How much do the wheels turn for the above block?**
  - The distance specified is the maximum distance traveled by the two wheels.
  - At the end of any tank move, the value of the greater of the distance traveled by both wheels will be equal to the entered duration.
  - **Answer:** The left wheel will turn 360 degrees and the right wheel will turn 0 degrees.
  - Note that the above move will cause a Droid Bot IV to turn the "robot" 90 degrees to the right.

WHAT ABOUT SPIN TURNS

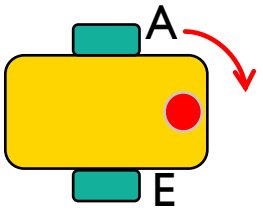
- In this example, on Droid Bot IV, each wheel on the robot will travel 180 degrees – but in opposite directions.
  - As a result, robot will turn 90 degrees to the right.
- We recommend setting the movement speed slower for spin turns since both wheels are turning, making it twice as fast as a pivot turn.

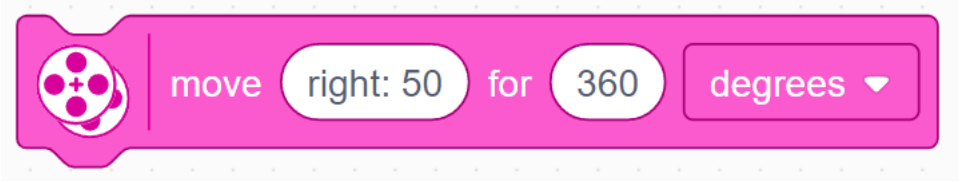




CHALLENGE

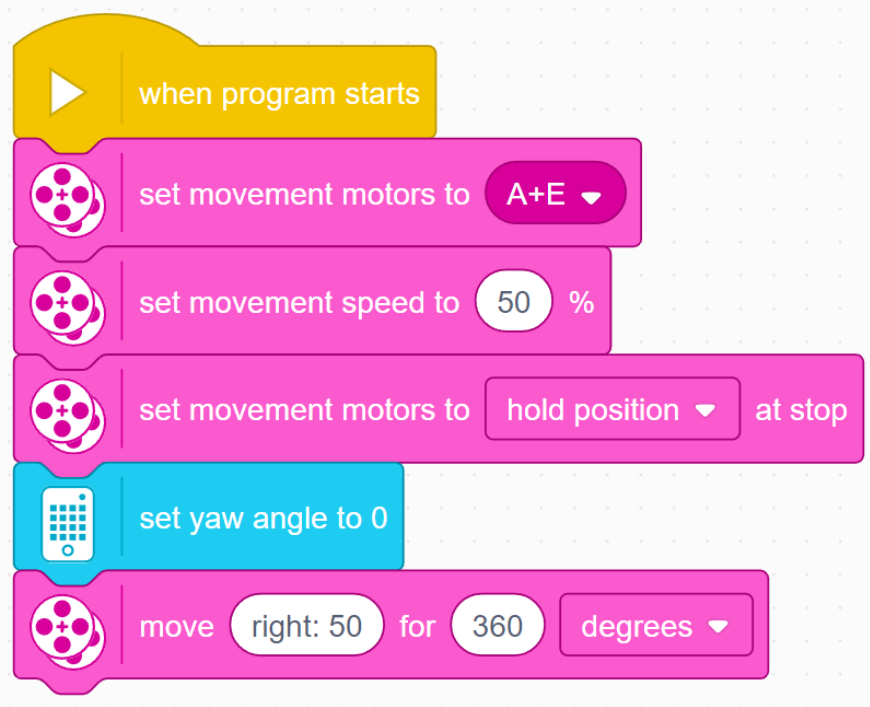
- Make a 90 degree right pivot turn using just movement blocks.
- You can use the Dashboard to determine how far to move for a given turn. Hold one wheel and rotate the other by hand until the robot reaches the target. Record the number of degrees of motor rotation – you will use this in your program.
- For Droid Bot IV, the left motor needs to rotate 360 degrees to perform and 90 degree right turn.





CHALLENGE SOLUTION

- Start by configuring your motor ports and movement speed.
- Use **hold position** to ensure that the robot stays where it finished its turn.
- Reset the **yaw angle**. This will let us see how far the robot turns on the Dashboard.
- Move the robot using **steering** set to **right: 50**. Note that this move has **duration** of **360 degrees**. The right wheel does not move, the left wheel will spin 360 degrees. This is for Droid Bot IV.
- After running this code, check your actual turn angle by using the Dashboard. It should be close to 90 degrees.



CREDITS

- This lesson was created by Sanjay Seshan and Arvind Seshan for SPIKE Prime Lessons
- More lessons are available at www.primelessons.org