SPIKE PRIME LESSONS

By the Creators of EV3Lessons

MORE ACCURATE TURNS

BY SANJAY AND ARVIND SESHAN

LESSON OBJECTIVES

- Learn how to improve the accuracy of turns
- Learn alternative ways to do pivot and spin turns

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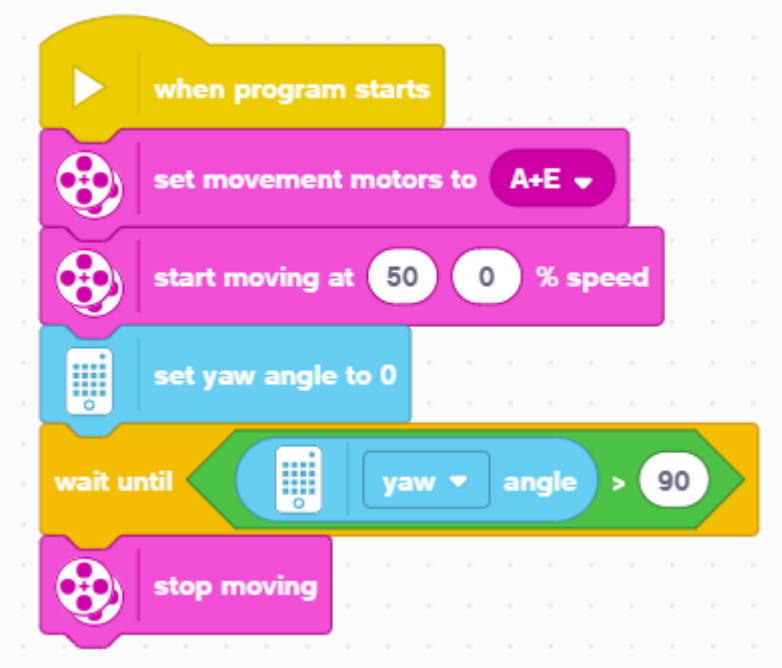
HOW ACCURATE IS YOUR PIVOT TURN?

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 ADB at 50% Speed, this code turns the robot 102 degrees, For Droidbot IV, it turns 98 degrees
- 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.



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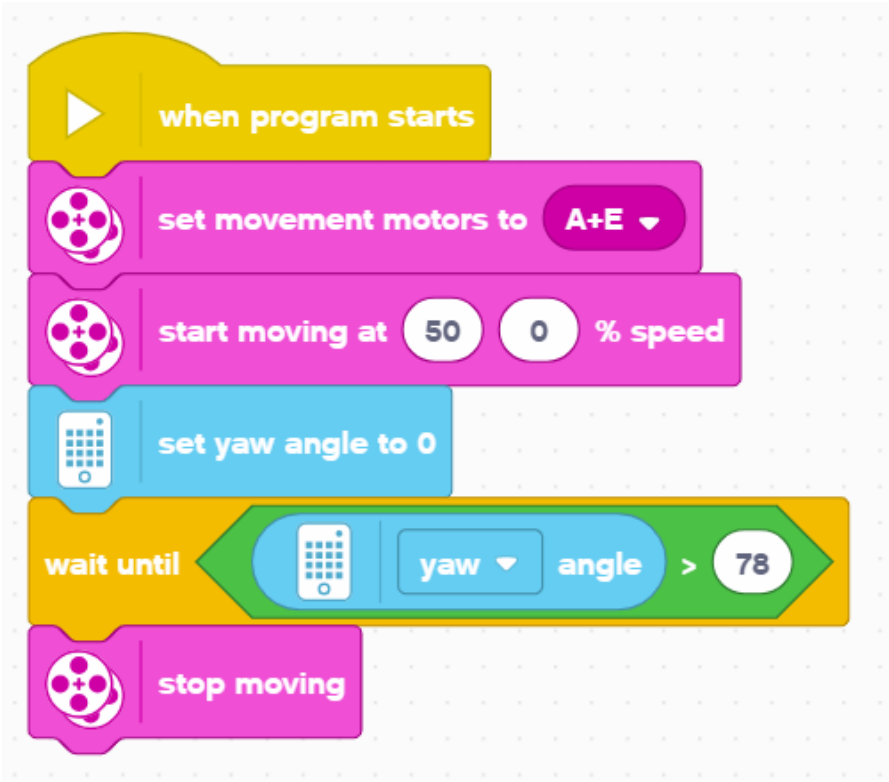
IMPROVING PIVOT TURN ACCURACY

- As we mentioned on the previous slide, using ADB at 50% Speed, the robot 102 degrees instead of 90 degrees. For Droidbot IV, it turns 98 degrees
  - How do we solve this problem?
  - One solution is to ask it to turn 12 degrees less for ADB or 8 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 ADB using this method.



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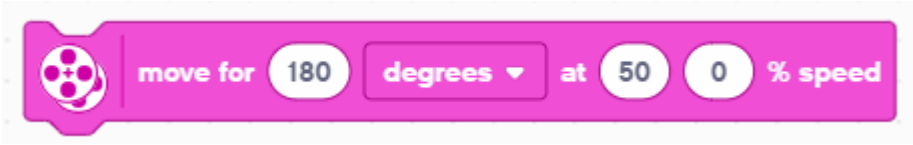
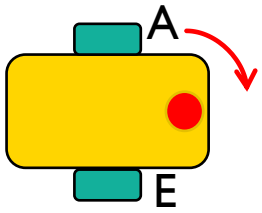
ANOTHER SOLUTION FOR PIVOT TURNS

- 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 average distance traveled by the two wheels
  - At the end of any tank move, the sum of the distance traveled by both wheels will be twice 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 Droidbot IV to turn the "robot" 90 degrees to the right

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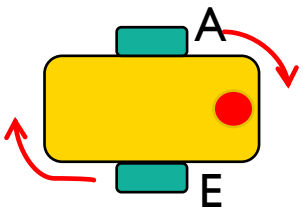
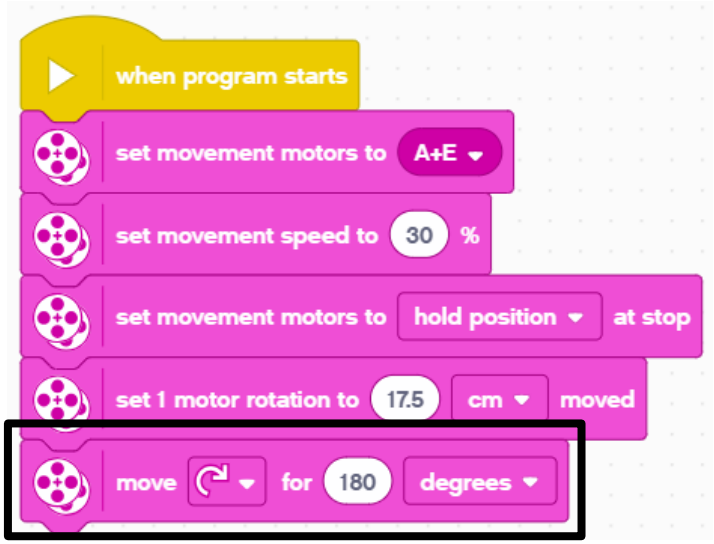
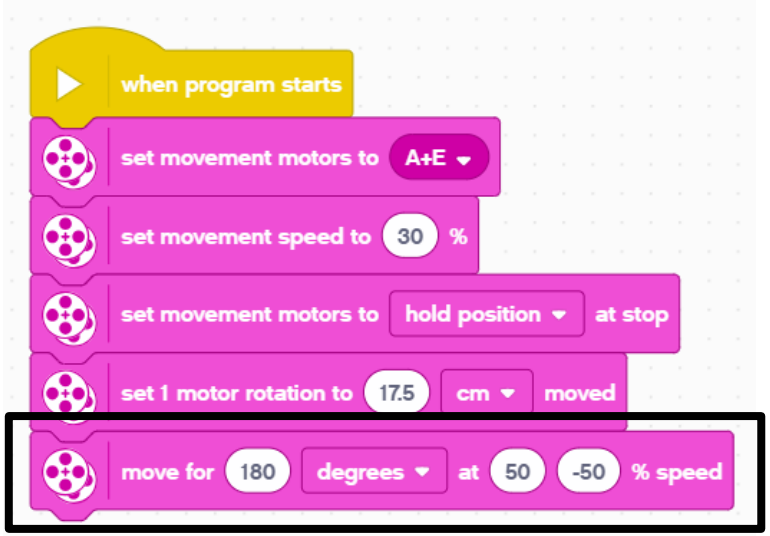
WHAT ABOUT SPIN TURNS

- Below are two ways to make a spin turn using two different movement blocks
- 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 using the tank block since it supports pivot turns, spin turns and curved movement.







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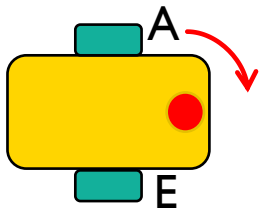
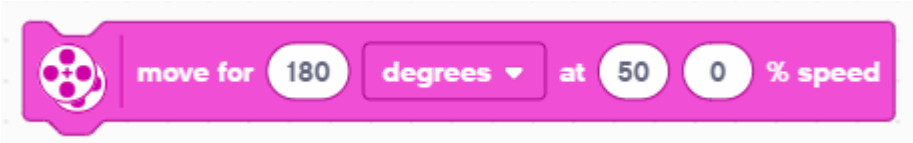
CHALLENGE

- 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 Droidbot IV, the left motor needs to rotate 360 degrees to perform and 90 degree right turn
- Recall from the previous slide how to calculate each wheel's rotation when using the Movement Block below





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CHALLENGE SOLUTION

- Start by configuring your motor ports
- 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 **Tank Move**. Note that this Tank Move has duration of 180 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

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