

PRIME LESSONS

By the Makers of EV3Lessons



SQUARING ON LINES

BY SANJAY AND ARVIND SESHAN

LESSON OBJECTIVES

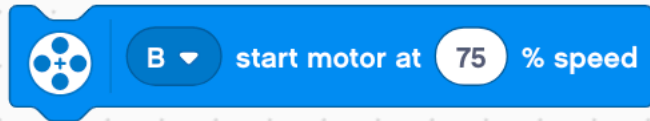
- Learn how to get your robot to square up (straighten out) when it comes to a line
- Learn how squaring (also known as aligning on a line) can help the robot navigate
- Learn how to improve initial code for aligning by repeating a technique
- Practice creating a useful My Block

REVIEW

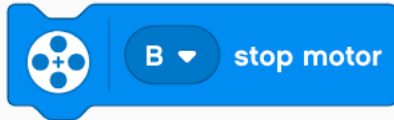
- Move Steering lets you control both motors at the same time
- What if you want to move or stop one motor at a time?
 - Use the Motor Blocks



Run Motor For Duration at Speed Block



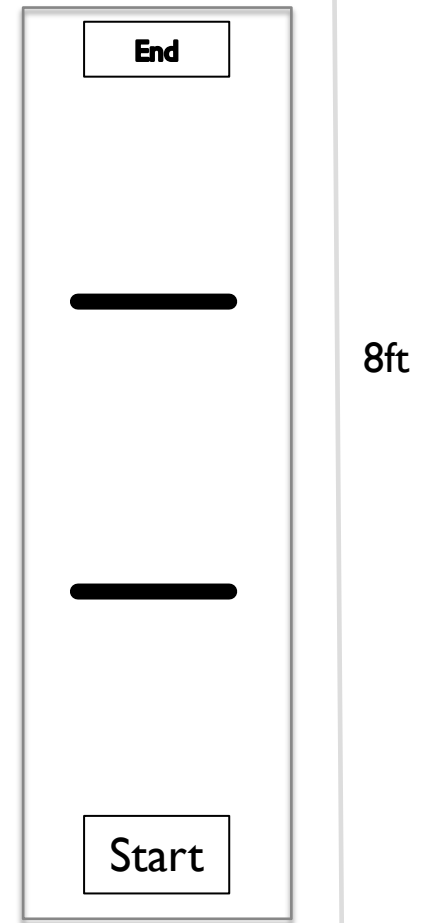
Start Motor at Speed Block



Stop Motor Block

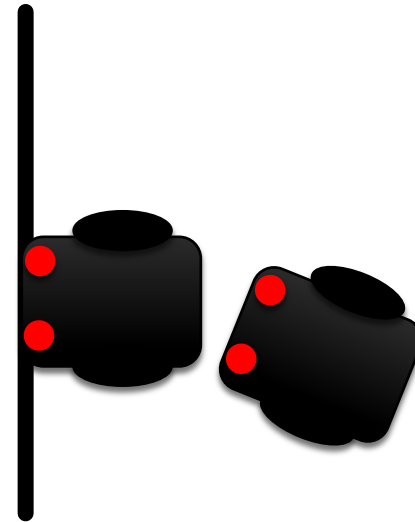
WHY ALIGN/SQUARE ON A LINE?

- Aligning on a line helps the robot navigate
 - Robots get angled as they travel farther or turn (the error accumulates)
 - Aligning on a line can straighten out a robot.
 - Aligning can tell a robot where it is when it has to travel far
- Example Goal: Your robot must deliver an object only inside a small END area. The distance between start and end is 8 feet
 - Do you think your robot can travel 8 feet and continue to be straight?



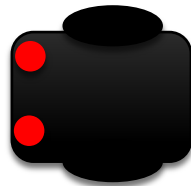
THREE EASY STEPS TO ALIGN

- **Challenge:** Make the robot straighten out (align/square up)
- STEP 1: Start both motors
- STEP 2: Stop one motor when the sensor on the corresponding side sees the line
- STEP 3: Stop moving the second motor when the sensor on that side sees the line
- Hints: Use a Motor Block, Separate Events

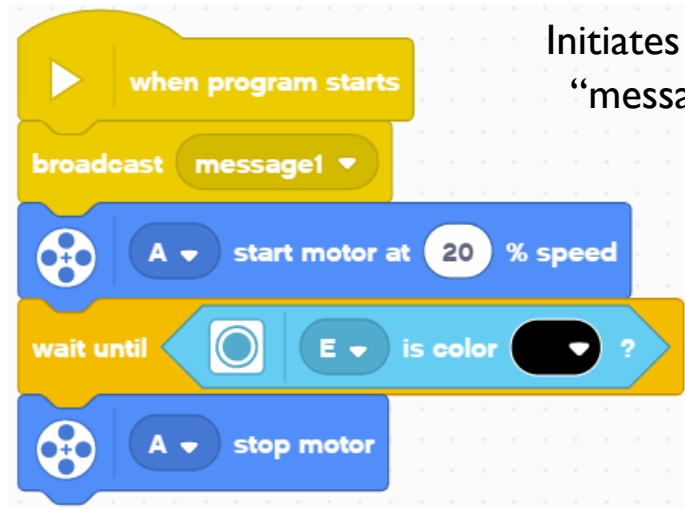


NOTES ON THE SOLUTION

- Our solution uses 2 Color Sensors (connected in ports E and F).
- Our solution assumes that the color sensor on port E is next to the wheel on motor port A and color sensor on port F is next to the wheel on motor port B.
- You should adjust the ports as needed
- Your color sensors should NOT be placed right next to each other



BASIC SOLUTION: MOVE UNTIL LINE

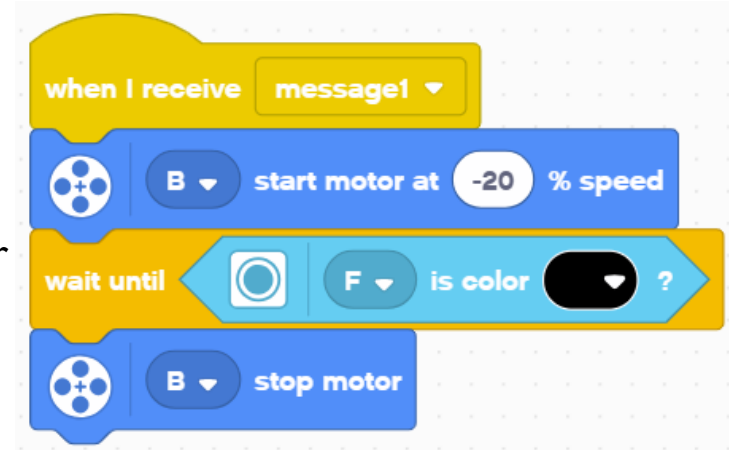


Initiates a second event when
“message1” is broadcasted

Starts motors

Wait for color sensor
to detect black

Stop motor



A NOTE ABOUT EVENTS

- When you have two or more events you do not know when each event will finish.
- If you wanted to move after the align finishes you might try to add a move block at the end of one of the events.
 - Note: This will not work because the code will play your move block without waiting for the other event to finish.
 - Solution: You need to synchronize your events. To learn more about synchronization and solutions go to the primelessons.org Lesson called Introduction to Events.
- The problem of synchronization can be solved by using Wait Until Blocks and Variables. The second event will set a variable to a specific value at its end and the first event will wait for that value to be set.

IMPROVING YOUR CODE

- What do you notice about the solution we just presented?
 - The robot is not always perfectly straight (aligned) at the end of it.
 - Both color sensors are on the line, but the robot stops at an angle if you started at a sharp angle
- **Challenge Continued: Think about how you can improve this code so that the robot ends straighter**

CREDITS

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



This work is licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License](https://creativecommons.org/licenses/by-nc-sa/4.0/).