# SQUARING ON LINES

BY SANJAY AND ARVIND SESHAN

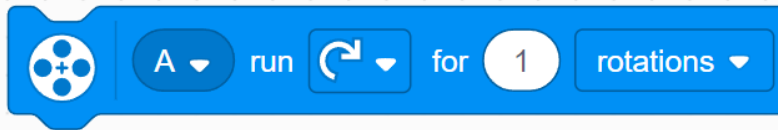This lesson uses SPIKE 3 software

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

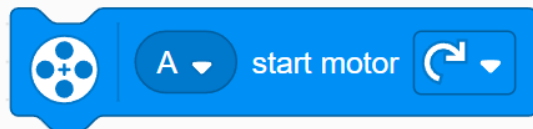- Practice creating a useful My Block

REVIEW

■ Move Steering lets you control both motors at the same time

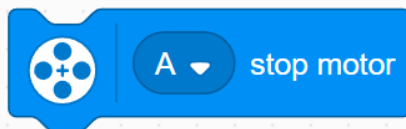■ What if you want to move or stop one motor at a time?

　■ Use the Motor Blocks
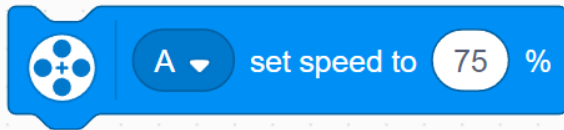
|	
A ▾ set speed to 75 %	Set Motor Speed
A ▾ run ↻ ▾ for 1 rotations ▾	Run Motor For Duration
A ▾ start motor ↻ ▾	Start Motor
A ▾ stop motor	Stop Motor

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?
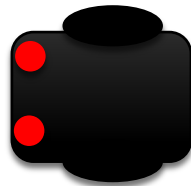
End

8ft
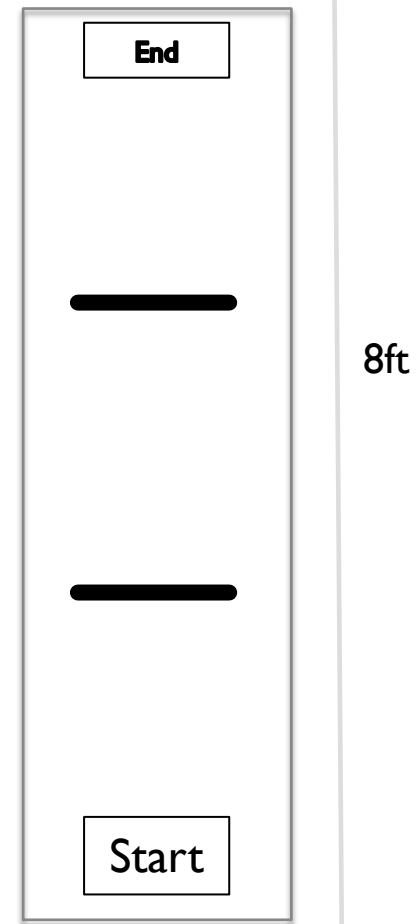
Start

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

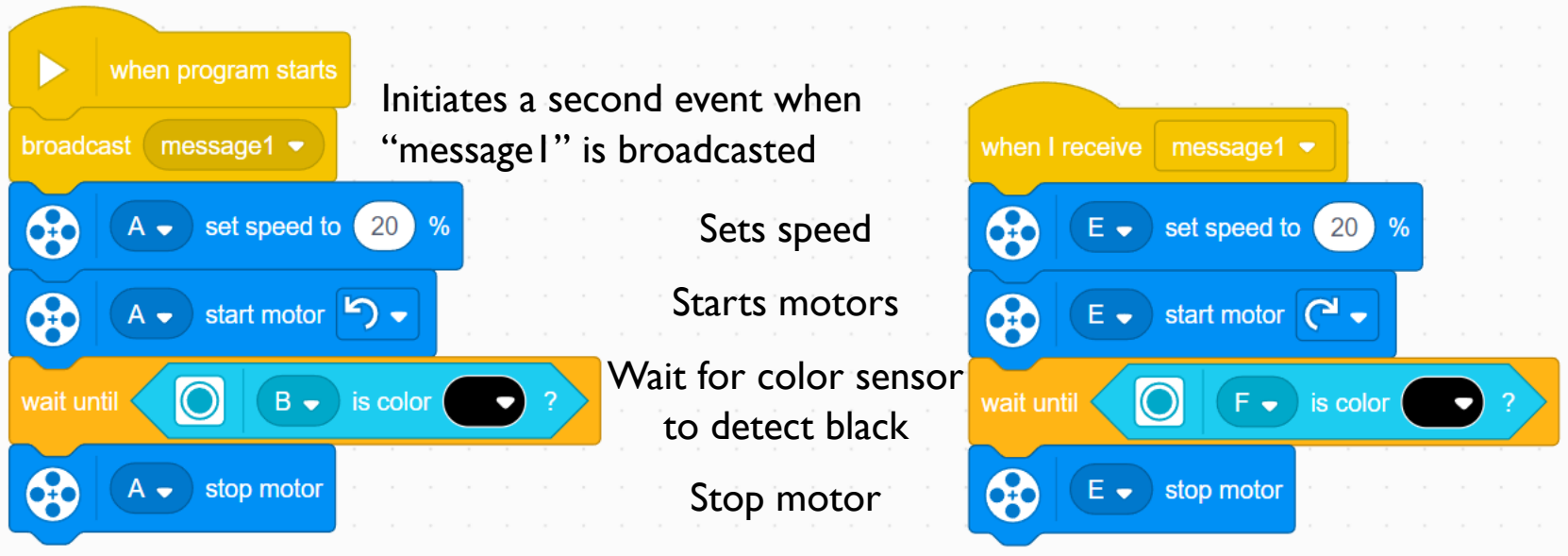- Hints: Use a Motor Block, Separate Events
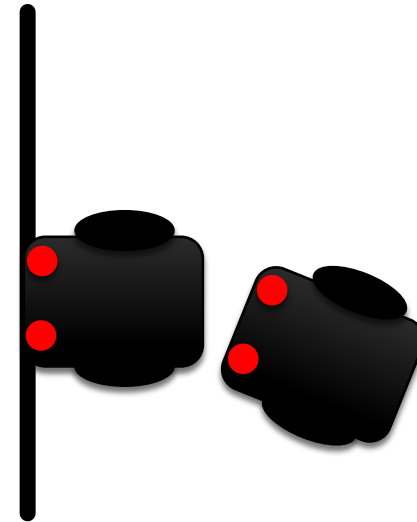
NOTES ON THE SOLUTION

■ 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

when program starts

broadcast message1

A set speed to 20 %

A start motor

wait until [B is color ● ?]

A stop motor

Initiates a second event when "message1" is broadcasted

Sets speed

Starts motors

Wait for color sensor to detect black

Stop motor

when I receive message1

E set speed to 20 %

E start motor

wait until [F is color ● ?]

E 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 lessons called Introduction to Events and Event Synchronization.

- 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

    - Solution: repeat the align except look for white this time

CREDITS

■ This lesson was created by Sanjay Seshan and Arvind Seshan for Prime Lessons

■ More lessons are available at www.primelessons.org