ADVANCED EV3 PROGRAMMING LESSON

EV3 Classroom:
Squaring or Aligning on a Line

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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

Prerequisites: My Blocks with Inputs & Outputs, Parallel Beams (Events), Parallel Beams Synchronization
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 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, Use Parallel Beams (Separate Events)

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What Aligning Should Look Like
Notes About Our Solution:

- Our solution uses 2 Color Sensors (connected in Ports 1 and 4).
- Our solution assumes that the color sensor on port 1 is next to the wheel on motor port B and color sensor on port 4 is next to the wheel on motor port C.
- You should adjust the ports as needed.
- Your color sensors should NOT be placed right next to each other (See red boxes below in robot image. These are the color sensors.)
Basic Solution: Moving Until Line

**when program starts**

- Broadcast "message1"
  - Motor B: Start motor at 20% speed
  - Wait until color is black
  - Stop motor

**when I receive message1**

- Start motor at 20% speed
- Wait until color is black
- Stop motor

Initiates a second event when "message1" is broadcasted.

Starts motors.

Wait for color sensor to detect black.

Stop motor.
When you have two or more events you do not know when each beam 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 Advanced EV3Lessons.com Lesson on Sync Beams.

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.
What do you notice about the solution we just presented?

- The robot isn’t quite straight (aligned) at the end of it.
- Both color sensors are on the line, but the robot stops at an angle.

Challenge Continued: Think about how you can improve this code so that the robot ends straighter
Tips for Success

You will get better results

- ....if your color sensors are about 4mm-12mm from the ground
- ....if you don’t come at the line at steep angles
- ....if you keep your color sensors spread apart
Credits

- This tutorial was created by Sanjay Seshan and Arvind Seshan
- More lessons at www.ev3lessons.com

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