

# ADVANCED EV3 PROGRAMMING LESSON



## Gyro Move Straight & Gyro Wall Follow

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# Lesson Objectives

- Learn what proportional control means and why to use it
- Learn to apply proportional control to get your robot to move straight
- Learn to apply proportional control to the Gyro sensor to wall follow (move at a particular angle)
- Prerequisites: Math Blocks, Data Wires, Proportional Control, Gyro Sensor

# Tips For Success

- You must go through the Proportional Control Lesson and the Proportional Line Follower Lesson before you complete this lesson
- You must also complete the two Gyro Lessons.
- The concept of proportional control is used in this lesson to go straight and wall follow
- Just like for any other proportional control, you need to figure out how to measure error and an appropriate correction
- Video of how the robot will behave: <https://youtu.be/0gII2wZs44Y>

# Pseudocode/Hints

Application	Objective	Error	Correction
<b>Gyro Straight</b>	Make the robot at a constant heading/angle	How far you are from that heading/angle	Turn sharper based on how far you are from that angle
<b>Line Follower</b>	Stay on the edge of the line	How far are our light readings from those at line edge (current_light – target_light)	Turn sharper based on distance from line
<b>Gyro Turn</b>	Turn to a target angle	How many degrees are we from target turn	Turn faster based on degrees remaining

# FYI: Proportional Line Follower

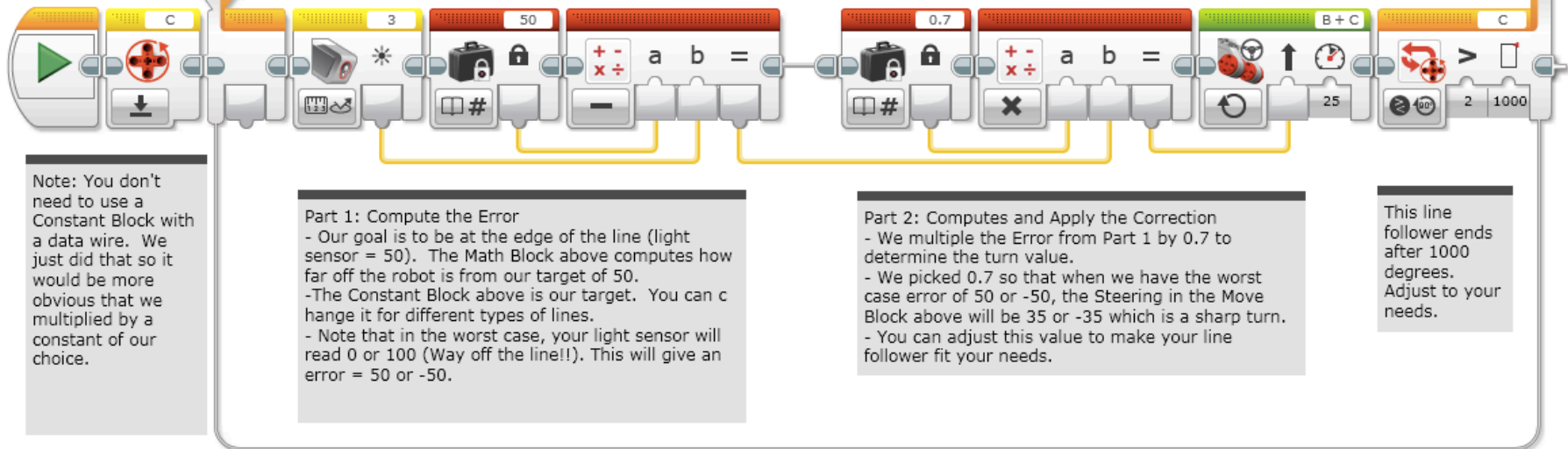
Note: This program uses the Color Sensors in Light Mode. This means that you will have to calibrate your sensors. Please read our calibration lessons before continuing! :-)

We recommend that your team uses a proportional line follower like this one. It will be smoothest of the 4 line followers in this lesson. There are even better line followers (that use PID control), but a line follower that uses the "P" is a great start.

A proportional line follower changes the angle of the turn based on how far away from the line the robot is.

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Every proportional program must have 2 parts: Part 1 computes the error (in this case, how far you are from the line) and Part 2 computes a correction that is proportional to the error (in this case how much to turn). You can use proportional control with other senses as well. It works really well!



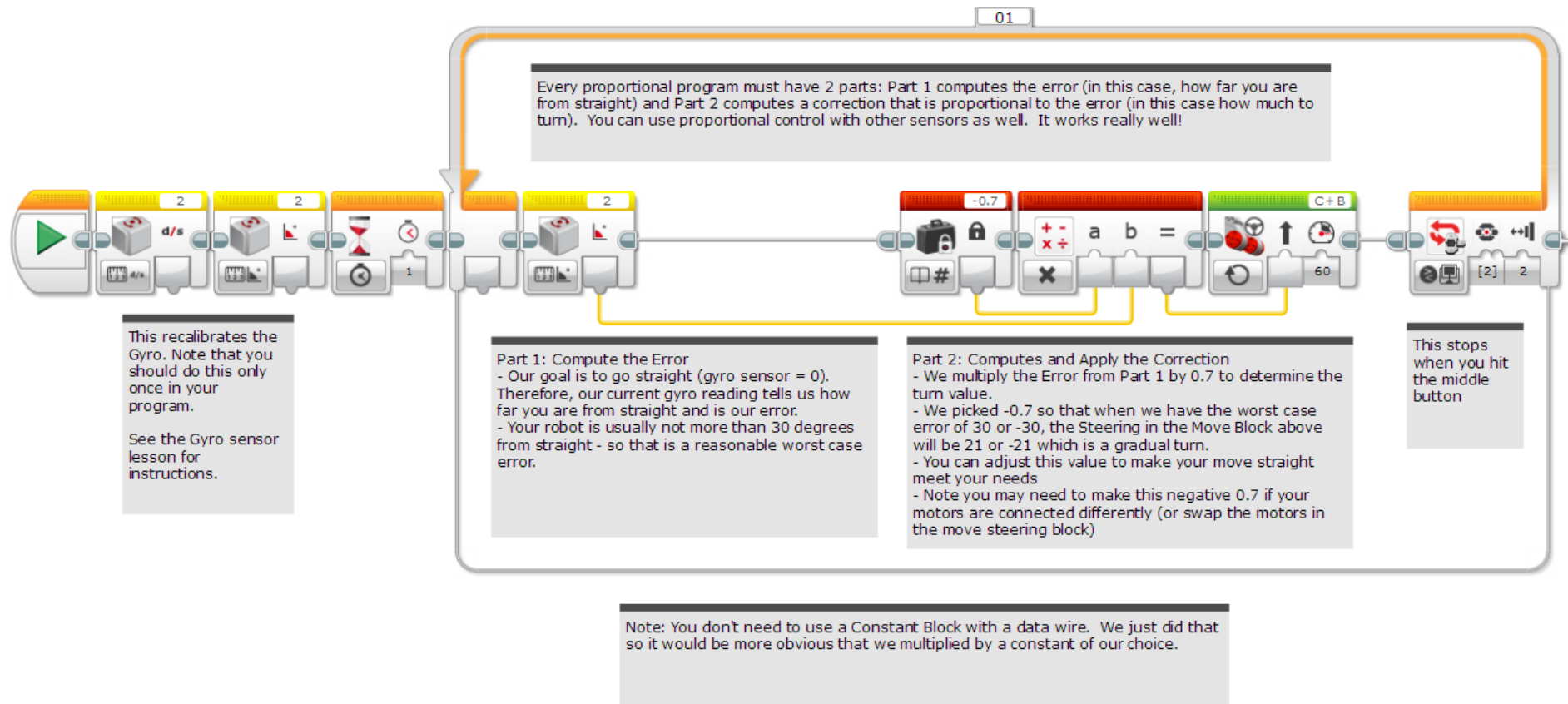
Note: You don't need to use a Constant Block with a data wire. We just did that so it would be more obvious that we multiplied by a constant of our choice.

**Part 1: Compute the Error**  
- Our goal is to be at the edge of the line (light sensor = 50). The Math Block above computes how far off the robot is from our target of 50.  
- The Constant Block above is our target. You can change it for different types of lines.  
- Note that in the worst case, your light sensor will read 0 or 100 (Way off the line!!). This will give an error = 50 or -50.

**Part 2: Computes and Apply the Correction**  
- We multiply the Error from Part 1 by 0.7 to determine the turn value.  
- We picked 0.7 so that when we have the worst case error of 50 or -50, the Steering in the Move Block above will be 35 or -35 which is a sharp turn.  
- You can adjust this value to make your line follower fit your needs.

This line follower ends after 1000 degrees. Adjust to your needs.

# Code: Gyro Move Straight

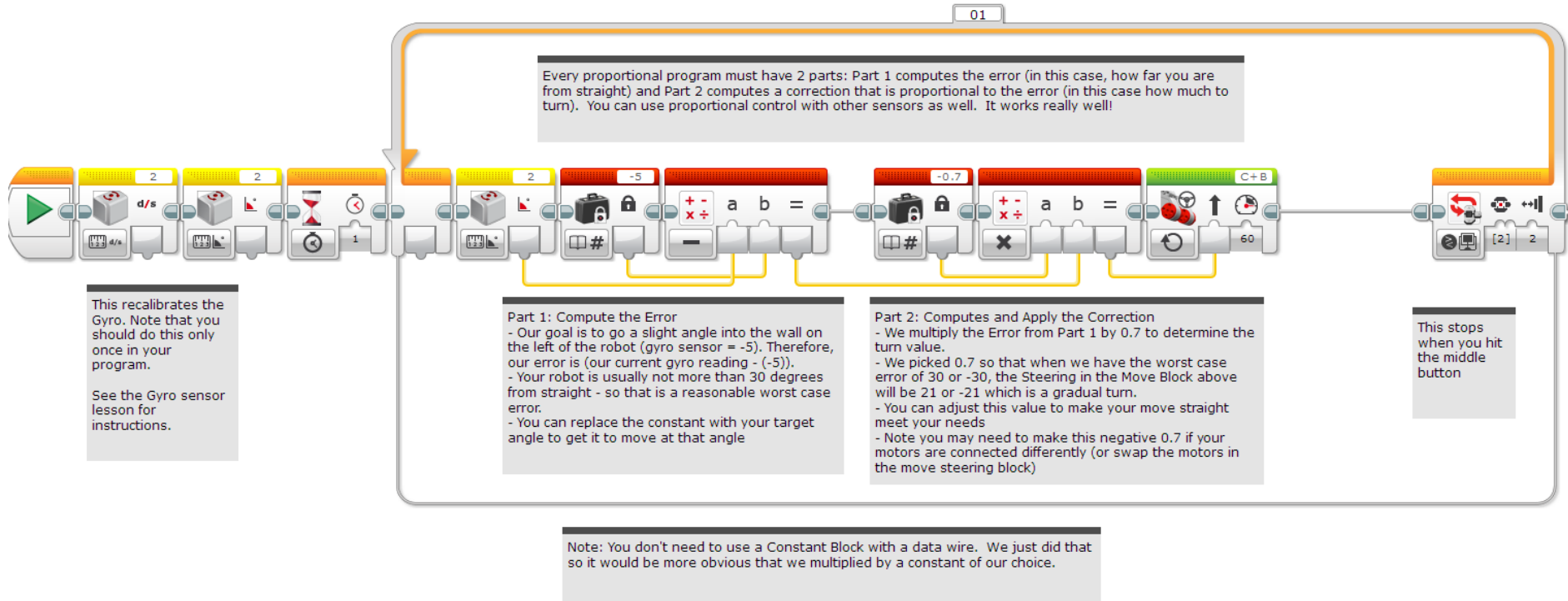


# Discussion Guide

1. Compare the proportional line follower code with the proportional move straight code. What similarities and differences do you see?

Ans. The code is almost the same. The one difference is how the error is calculated. The error is calculated using the gyro sensor. The correction is identical!

# Code: Gyro Wall Follow





# Discussion Guide

1. Compare the move straight code with the wall follow code. What similarities and differences do you see?

Ans. There is no target angle for moving straight is 0. But when you want to wall follow, you have to enter a target value of how much you want to angle into the wall.

# Credits

- This tutorial was created by Sanjay Seshan and Arvind Seshan
- More lessons at [www.ev3lessons.com](http://www.ev3lessons.com)



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