

ADVANCED EV3 PROGRAMMING LESSON



Gyro Turns



By Droids Robotics

Lesson Objectives

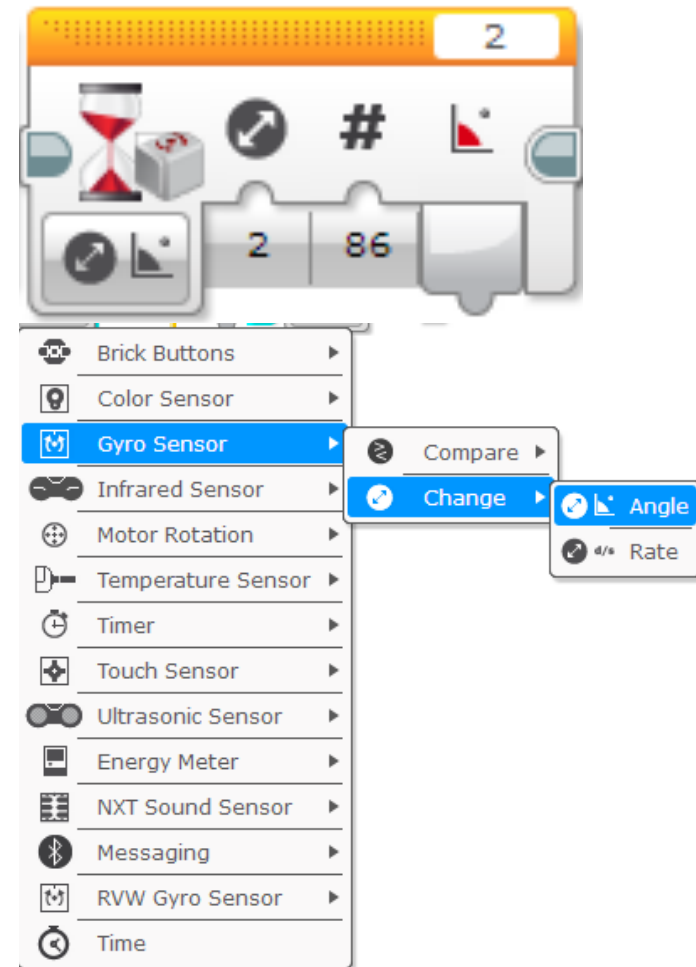
1. Learn what Gyro Lag is
 2. Learn one way to correct for this lag
 3. Understand why it is important to explore alternative solutions to a problem
- ➔ Pre-requisites: My Blocks with Inputs and Outputs, Data wires, Math Blocks, Loops

Gyro Problem 2: Lag

- What is lag?
 - The gyro sensor readings lag behind the true value sometimes
- When the turn starts, it takes time for the gyro to begin changing
- This lesson presents one way to deal with lag in a turn: reduce the amount of angle that you turn to compensate for lag

Change Mode in Wait Block

1. In this lesson we use the Wait Block (gyro sensor) in Change Mode
2. Advantages over Compare Mode:
 - You do not need to reset the gyro beforehand
 - You can measure if the value has changed the target degrees by both decreasing or increasing (no need to change the wait block for a left turn)
3. Direction (the first input) defines:
 - 0 – check if the value has increased the desired degrees
 - 1 – check if the value has decreased the desired degrees
 - 2 – check if the value has either increased or decreased the desired degrees



Gyro Turn in Four Easy Steps

STEP 1: Create a simple Gyro Turn program that turns 90 degrees using the Wait for Gyro block in Change Mode

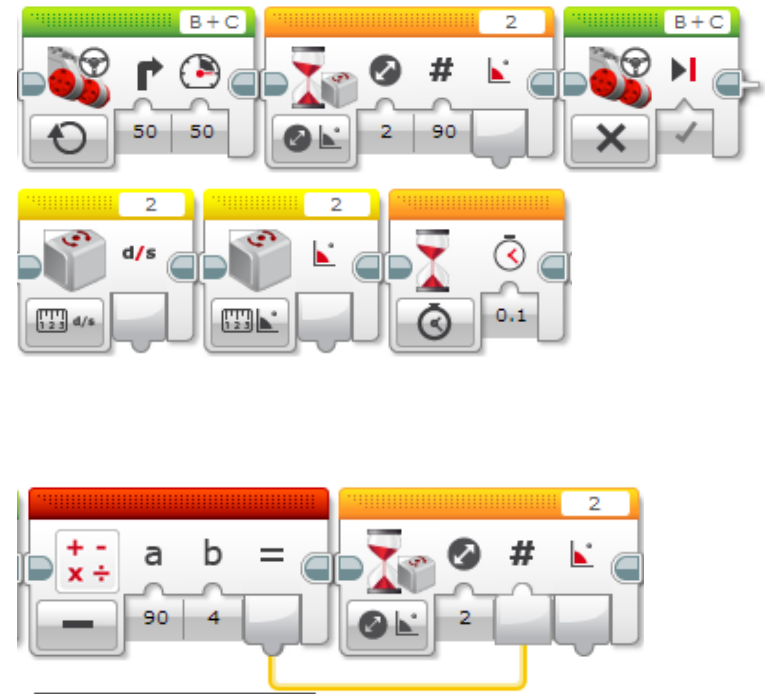
Remember to Calibrate the Gyro before the Wait For Block (see Gyro Lesson for help)

STEP 2: Compensate for Lag

- A. Compensate for the lag by reducing the amount of angle to turn based on your robot (e.g 86 degrees instead of 90 degrees)
- B. Use a Math Block to create an automatic calculator to compensate for lag

STEP 3: Create and Wire the My Block

STEP 4: Repeat the steps to make one for Left Turns vs. one for Right Turns.



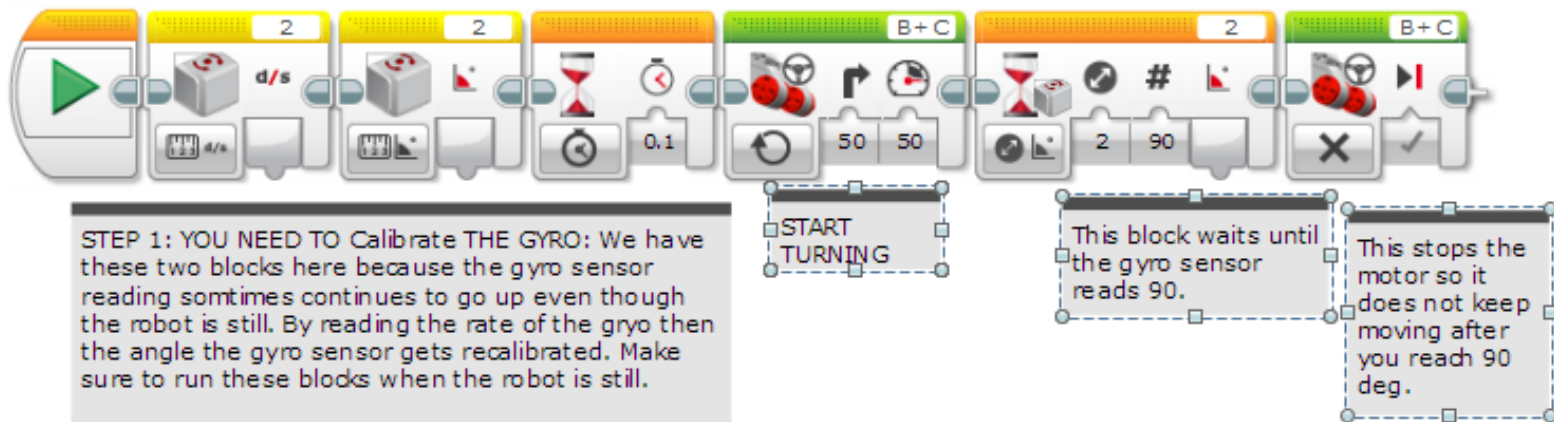
Step 1: Simple Gyro Turn

GOAL OF THE PROGRAM: Simple turn degrees using the gyro

This code is setup for the gyro being connected to port 2 ; adjust as needed.

Install tips: The gyro can be anywhere on your robot (even hidden or upside down is okay).

This program turns and waits for the gyro to read 90 degrees. This will make the robot turn 90 degrees to the right.



STEP 1: YOU NEED TO Calibrate THE GYRO: We have these two blocks here because the gyro sensor reading sometimes continues to go up even though the robot is still. By reading the rate of the gyro then the angle the gyro sensor gets recalibrated. Make sure to run these blocks when the robot is still.

We wait 0.1 seconds because it takes time for the gyro sensor to reset to zero.

Step 2A: Dealing with Lag

Problem with the Step 1: You will find that the gyro does not go the degrees you want it to. If you set it to turn 90 degrees, sometimes it overshoots to 93. You need to make adjustments for your robot because of this. For ours, we need to turn only 86 degrees in order to turn 90 degrees.

Program goal: A more precise gyro turn

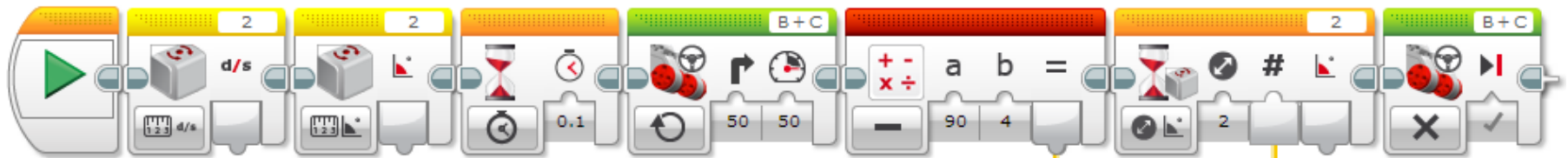
This program turns the robot a bit less than 90 degrees to reach exactly 90 degrees. This value will have to be changed for your robot. The reason the robot does not turn exactly 90 deg. when you type in 90 is because the gyro readings lag behind the robot's actual position.

The only change made from the previous step is that we are now waiting until the Gyro reaches 86 degrees rather than 90 in this block. This will make a more precise turn

Step 2B: Automatically Correct for Lag

Program goal: subtract degrees automatically

We subtract 4 degrees from your desired degrees using a math block, so we do not need to type in 86 degrees to do a 90 degree turn

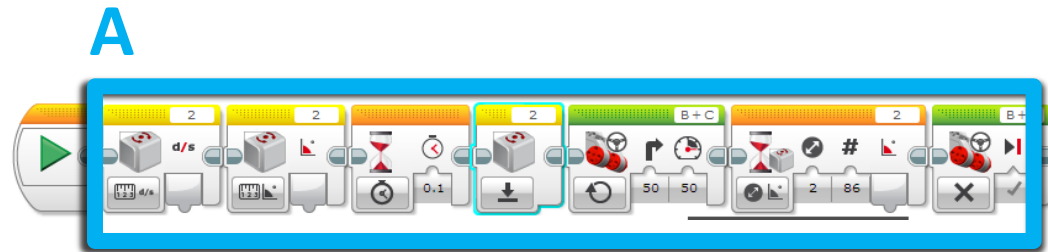


This block was added to automatically correct for lag.

The desired degrees is inputted into input a

Step 3A: Create a My Block

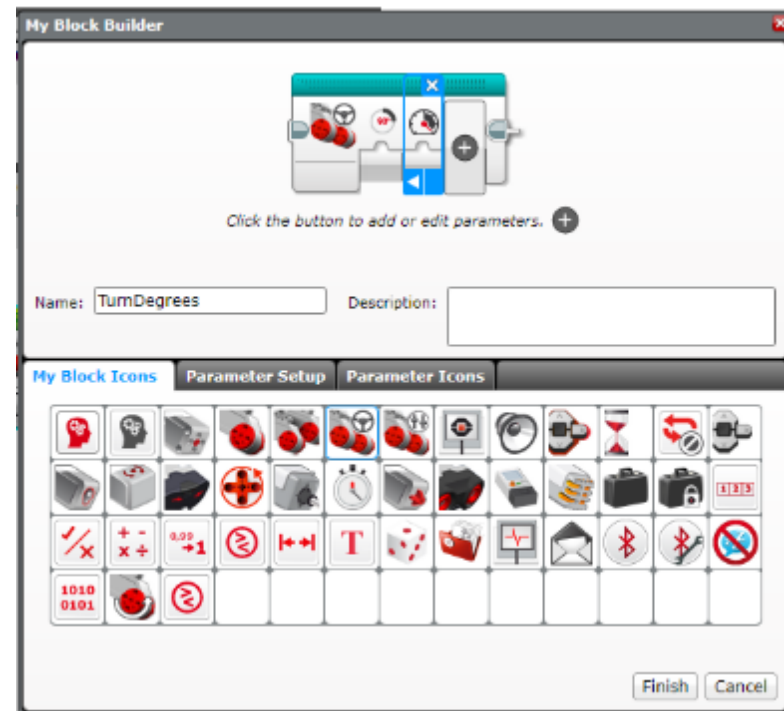
A. Highlight all the blocks then go to My Block Builder



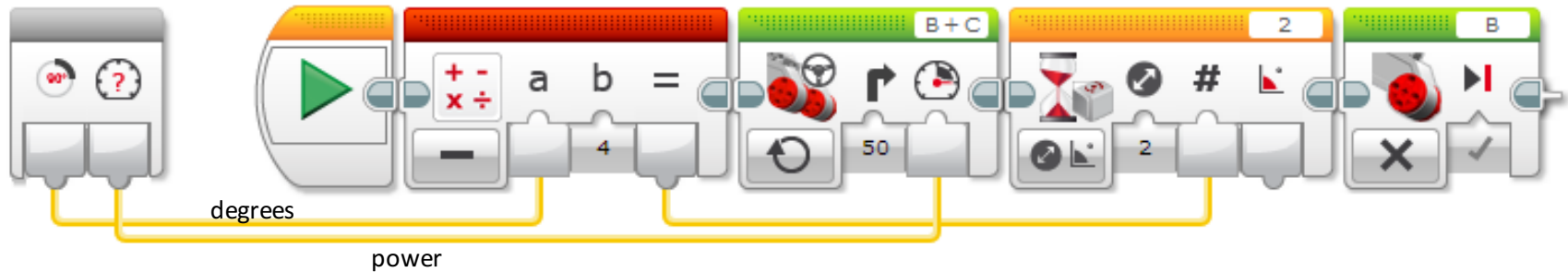
B. Add 2 inputs: one for power and one for and degrees

Refer to the My Blocks with Inputs & Outputs lesson if you need help setting up the My Block

B



Stage 3B: Wire the My Block



Connect the degrees value into the math block and the power into the move steering block

Stage 4: Using the My Block

Here is our final stage, it is the same as Step 3, but converted into a my block. It has two inputs, degrees and power. Double click on the my block(s) to see inside.

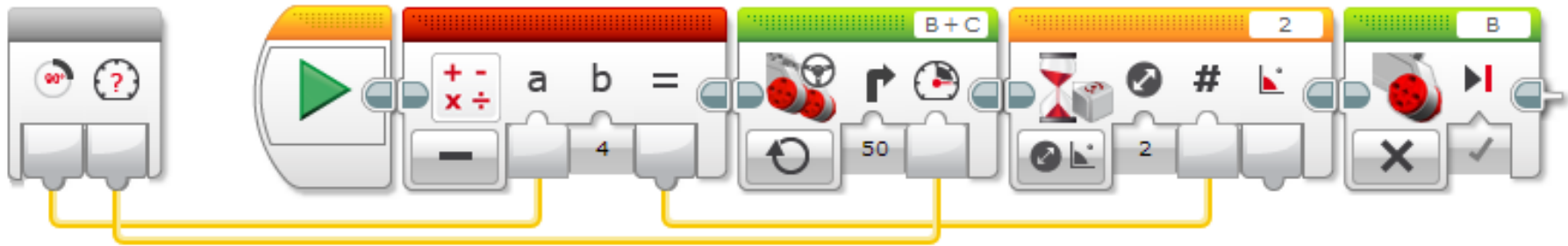


Here two different my blocks that have been made turn left and right.

DO NOT SELECT the gyro calibrate blocks while making the My Block

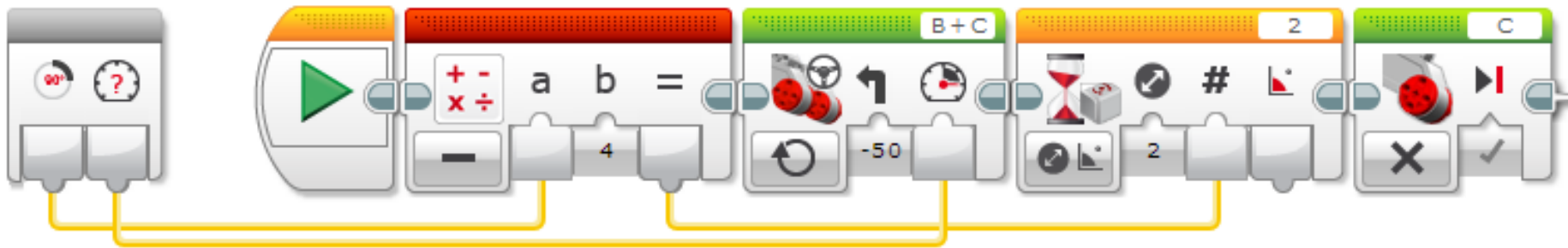
Step 4: Turn Degrees Right

This program is the same as Step 2 other than it is a my block. It was made with two numeric inputs: Power and degrees



Step 4: Turn Degrees Left

This program is the same as Step 2 other than it is a my block. This has been converted to turn left. It was made with two numeric inputs: Power and degrees



Discussion

➤ What is gyro lag?

Ans. The gyro sensor's reading lags behind the true reading

➤ What is one way to compensate for lag?

Ans: Reduce the number of degrees that you turn

Credits

- This tutorial was written by Sanjay Seshan and Arvind Seshan from Droids Robotics
- More lessons at www.ev3lessons.com



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