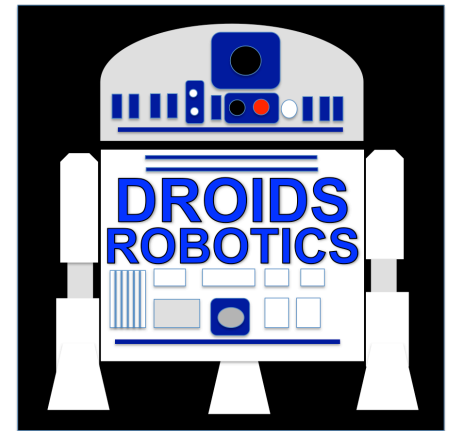# ADVANCED EV3 PROGRAMMING LESSON

GYRO TURNS

BY DROIDS ROBOTICS

WHY USE THE GYRO SENSOR

This lesson will help you turn your robot using the gyro

The gyro is a bit difficult to use correctly, but if you learn how to use it, you can make your robot make much more accurate turns

Read the comments in the code carefully to understand how to use it correctly.

Start at Stage 1 in the corresponding EV3 file

There are 2 common Gyro Errors….we provide some simple solutions

PROBLEM 1: CALIBRATION & RESET

- For a color sensor, you have to "teach" the robot what is black and white

- For your gyro, you need to calibrate the sensor to understand what is "still"

- Unfortunately, there is no gyro calibration block. The "stage 1" program shows how to calibrate the sensor.

- You will also need to Reset the gyro at this stage

BEFORE YOU USE YOUR GYRO

FIRST CALIBRATE. NOTE: THE ROBOT MUST BE STILL.

SECOND, RESET GYRO. ADD A WAIT BLOCK TO GIVE THE SENSOR A BIT OF TIME TO FULLY RESET
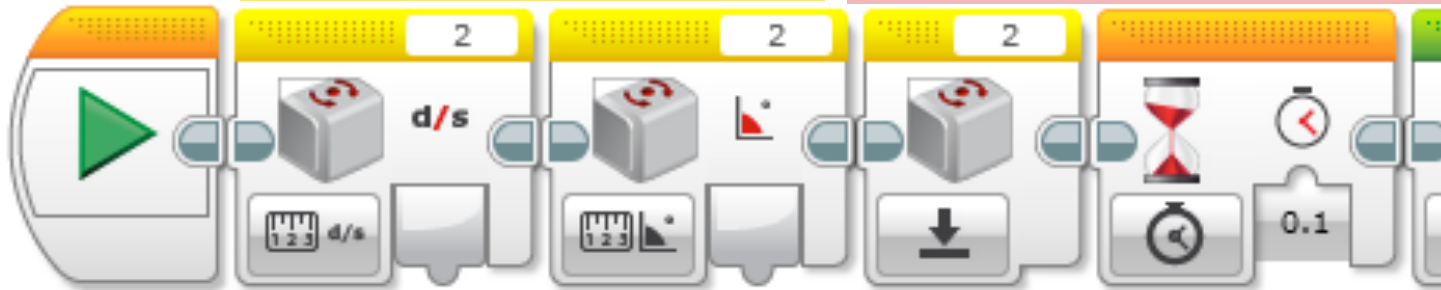
STEP 1: YOU NEED TO RESET THE GYRO: We have these two blocks here because the gyro sensor reading somtimes continues to go up even though the robot is still. By reading the rate of the gryo then the angle the gyro sensor gets recalibrated. Make sure to run these blocks when the robot is still.

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

STAGE 1: SIMPLE GYRO TURN

GOAL OF THE PROGRAM: Simple turn degrees using the gyro

To run these programs, you will need a gyro sensor on your robot connected to port 2. Connect motor B to the left wheel and motor C to the right wheel.

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

This program turns one motor on 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 RESET THE GYRO: We have these two blocks here because the gyro sensor reading somtimes continues to go up even though the robot is still. By reading the rate of the gryo then the angle the gyro sensor gets recalibrated. Make sure to run these blocks when the robot is still.

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

Turns on left motor.

Stops right motor.

This block waits until the gyro sensor reads 90.

This stops the motor so it does not keep moving after you reach 90 deg.

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**

- **Stage 2 in the corresponding EV3 file shows one way to compensate for this delay**

STAGE 2: DEALING WITH LAG

Problem with the Stage 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 this.

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.
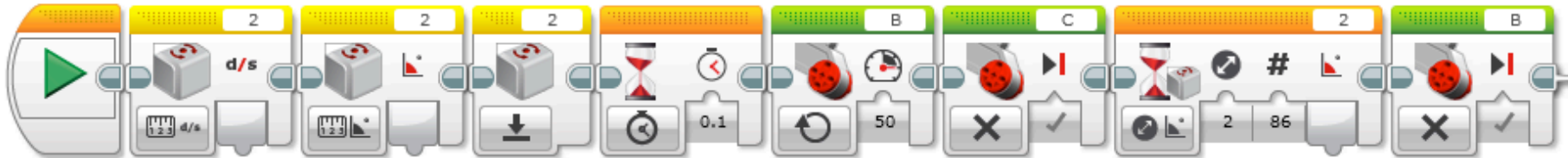
The only change made from the previous stage is that I am now waiting till the Gyro reaches 86 degrees rather than 90 in this block.

STAGE 3: MAKING A MY BLOCK

This program is the same as stage 2 other than this program allows you to use constants to choose different power and degrees.
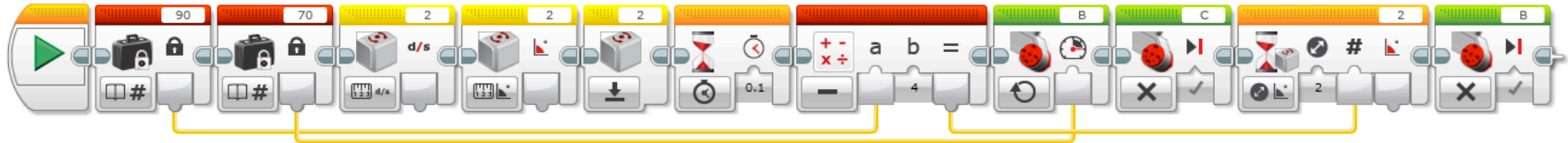
Constants! Look where the wires go to.

Here we subtract some degrees so we can have a precise turn

You can make the My Block by pressing on the tools menu and choosing My Block Builder. To make the My Block, select all the blocks execpt the constants (the constants become the inputs).

STAGE 4: USING THE MY BLOCK

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


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

You can make the My Block by pressing on the tools menu and choosing My Block Builder. To make the My Block, select all the blocks execpt the constant (the constants become the inputs). Double click on the My Blocks to see inside.
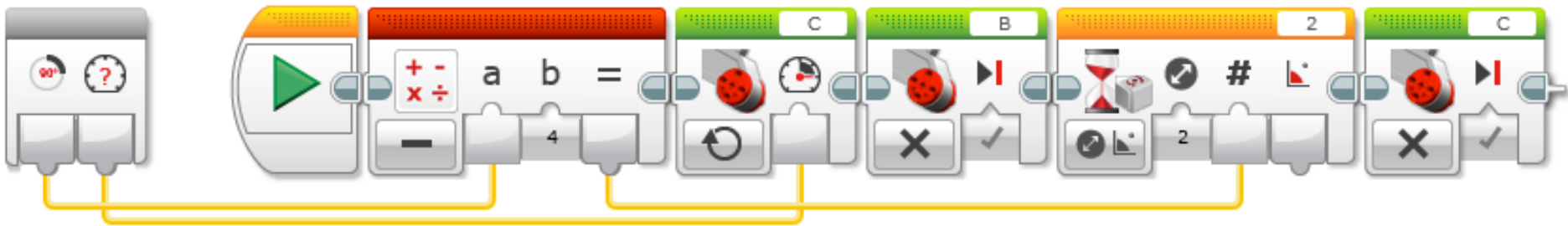
INSIDE THE MY BLOCK: TURN DEGREES RIGHT

This program is the same as stage 3 other than it is a my block. The two constants turned into the grey block with two outputs.
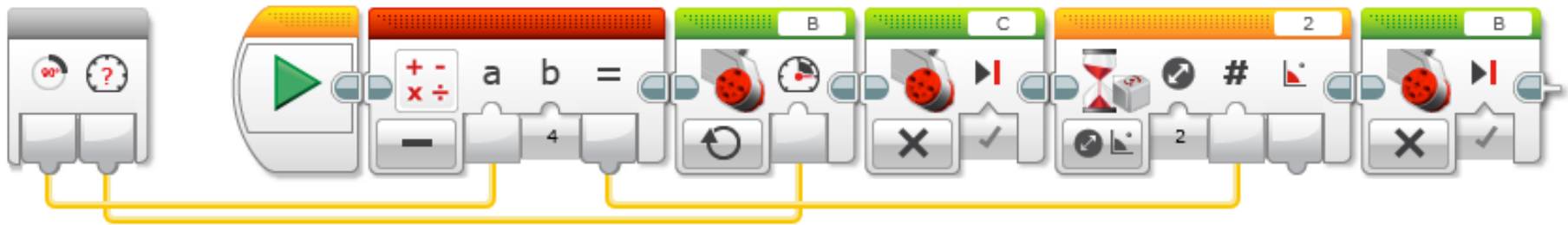
INSIDE THE MY BLOCK: TURN DEGREES LEFT

This program is the same as stage 3 other than it is a my block. The two constantss turned into the grey block with two outputs.

CREDITS

- These slides and the corresponding EV3 project files were made by Sanjay Seshan and Arvind Seshan from FLL Team: Not the Droids You Are Looking For.

- They are free to use and distribute. Please just give credit to the team and send a thank you note if you can.

- You can reach the Droids at: team@droidsrobotics.org

- Calculator for converting CM/IN into degrees: www.ev3lessons.com/resources.html

- More lessons: www.ev3lessons.com