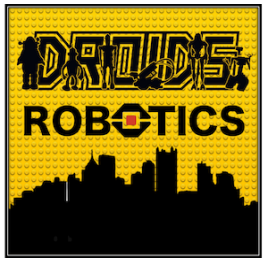
ADVANCED EV3
PROGRAMMING LESSON

Parallel Beam Synchronization



By Droids Robotics

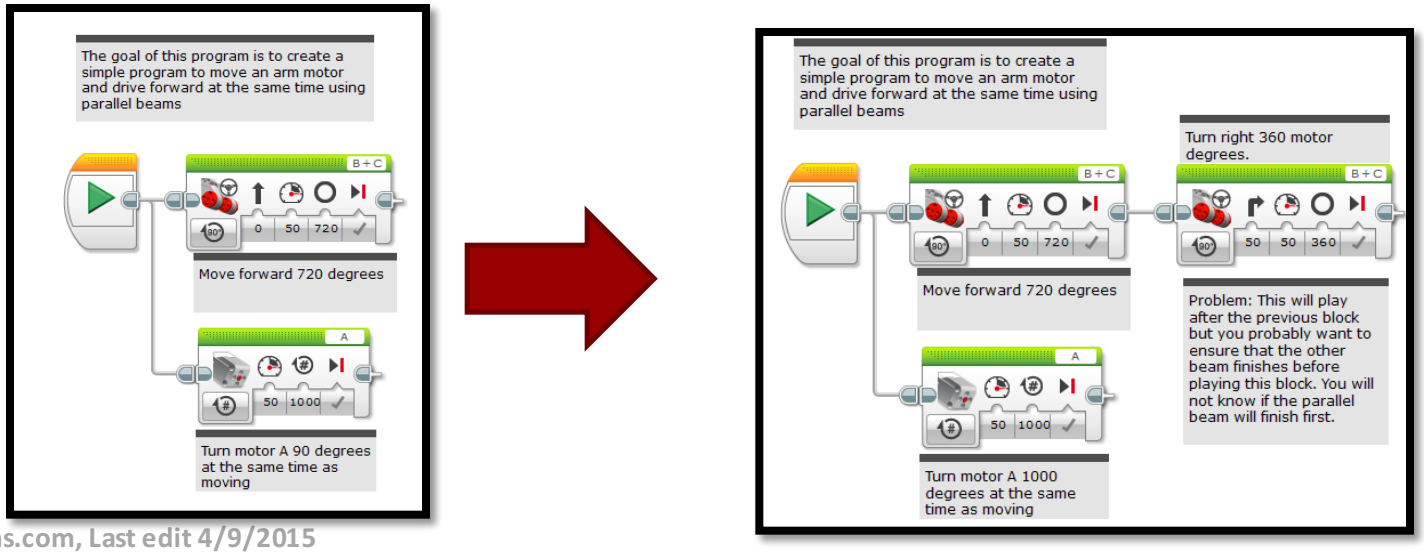
Lesson Objectives

- Understand what the “synch problem” is when you use parallel beams
- Learn techniques to to ensure that two beams end before moving to the next block of code (variables, data wires, loops and My Blocks)
- Prerequisites: Parallel Beams Lesson, Data Wires, Variables, My Blocks with Inputs and Outputs

Using Parallel Beams Inside Programs

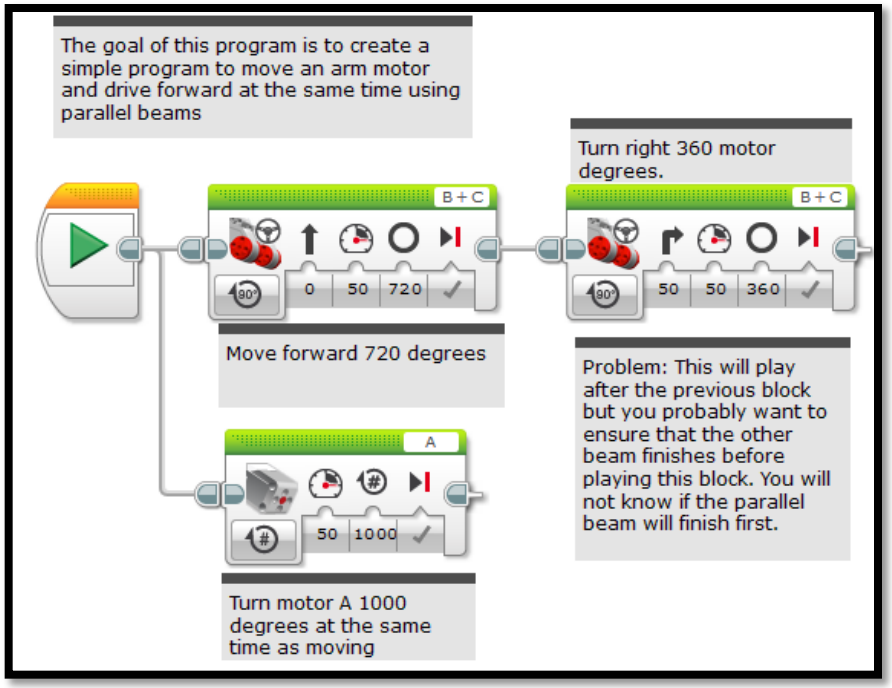
- Parallel beams are great for doing two things at the same time
  - Often want to do something after you complete the Parallel Beam
  - Hard to tell which beam will finish first (called the "synch problem")
- Need to synchronize the beams to make sure that blocks execute when you expect them to

In the picture below, will the turn start after motor A is done or before? Answer: You do not know



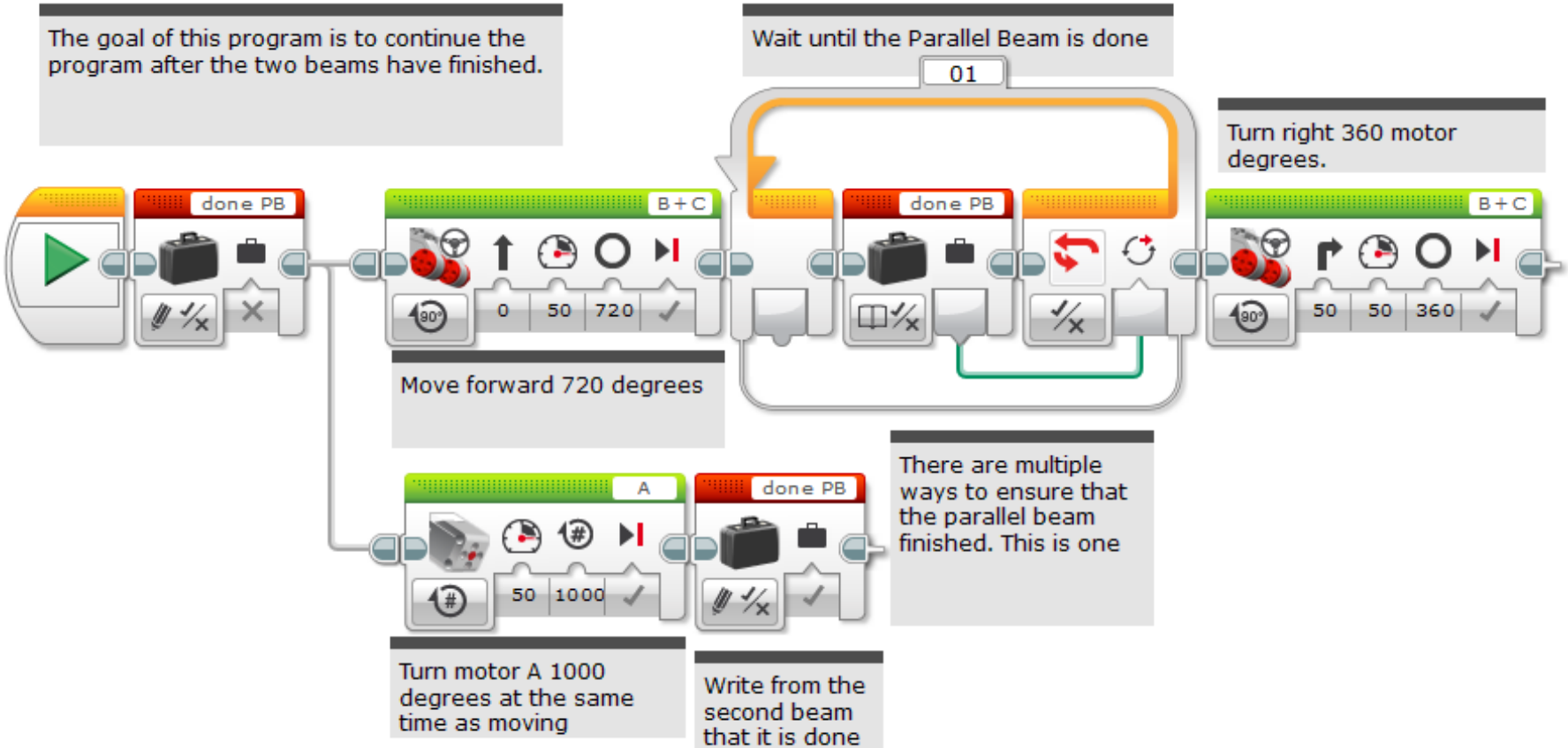
Ensure That Both Beams Finished

- In this example, we want both the 720 degree move steering (the move) and the motor A move to finish before the 360 degree move steering (the turn)
- There are several ways to do this:
  - Variables (see slide 4)
  - Wires (see slide 5)
  - Loops (see slide 6)
  - My blocks (see slide 7)



This is labeled as "synch problem" in the corresponding EV3 code file

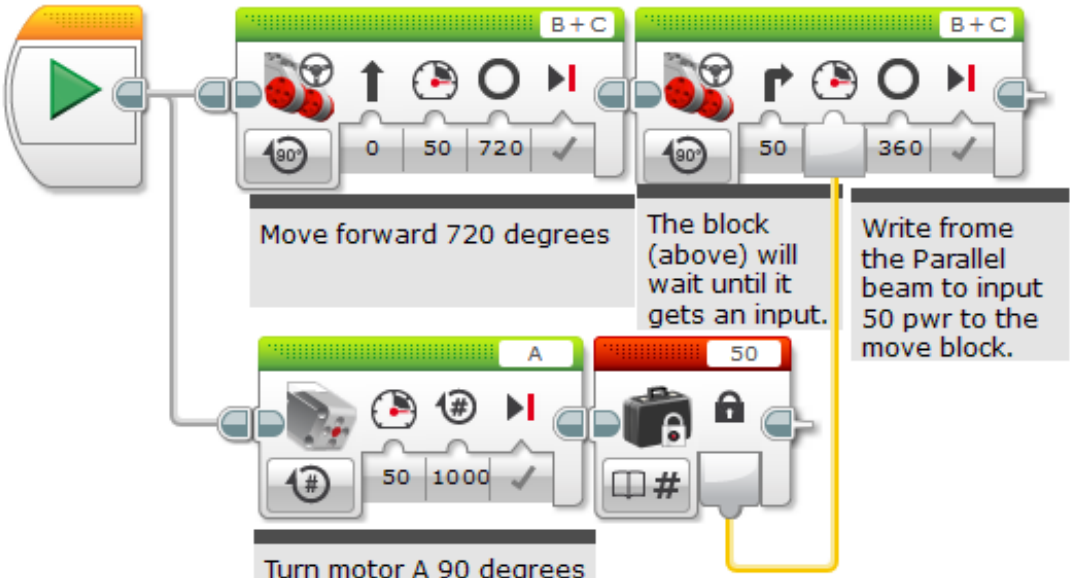
Use Variables To Synchronize



This is labeled as “variables” in the corresponding EV3 code file

Use Wires to Synchronize

The goal of this program is to continue the program after the two beams have finished.



Move forward 720 degrees

Turn right 360 motor degrees.

The block (above) will wait until it gets an input.

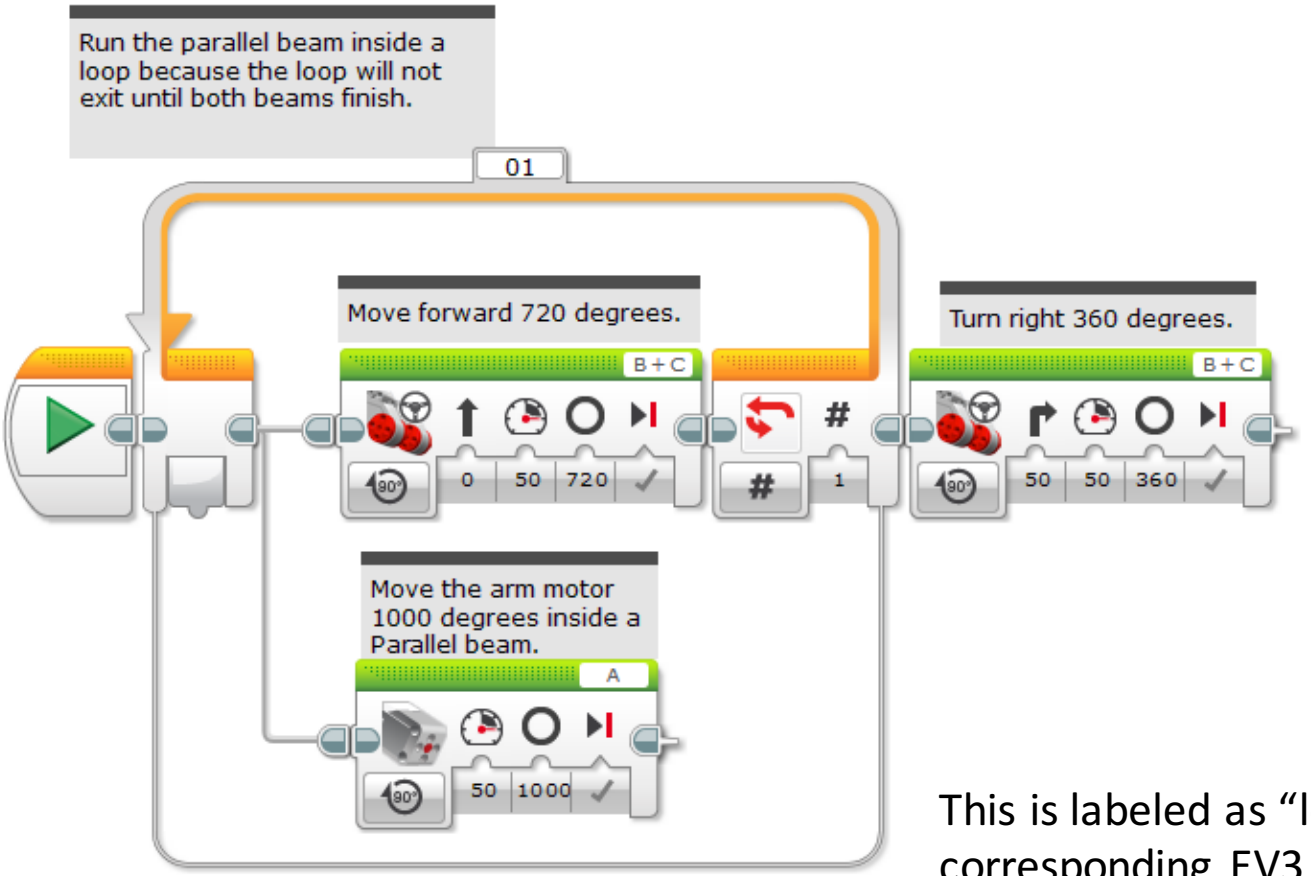
Write frome the Parallel beam to input 50 pwr to the move block.

There are multiple ways to ensure that the parallel beam finished. This is one.

Turn motor A 90 degrees at the same time as moving

This is labeled as “wires” in the corresponding EV3 code file

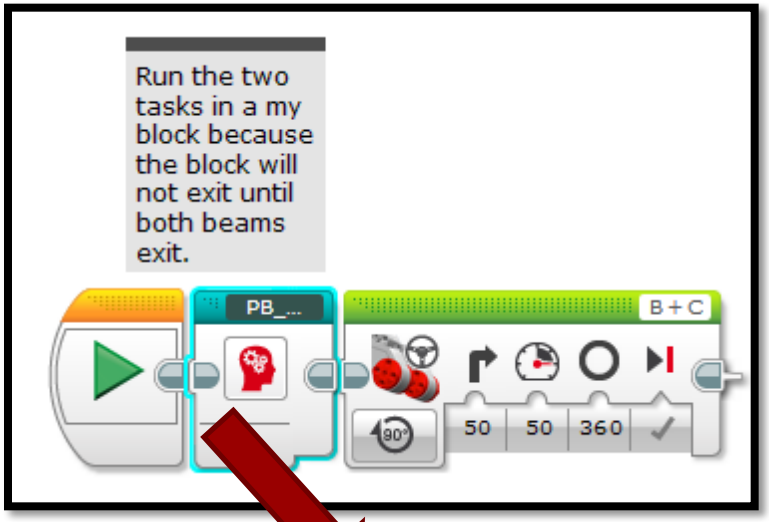
Use Loops to Synchronize



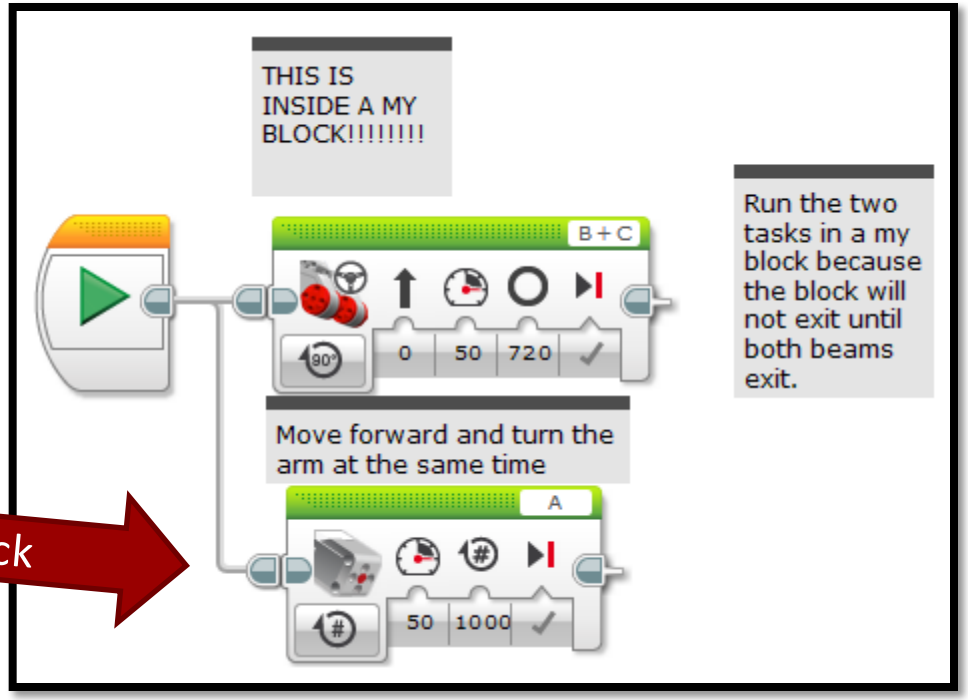
This is labeled as “loops” in the corresponding EV3 code file

Use My Blocks to Synchronize

This is labeled as “My Blocks” in the corresponding EV3 code file



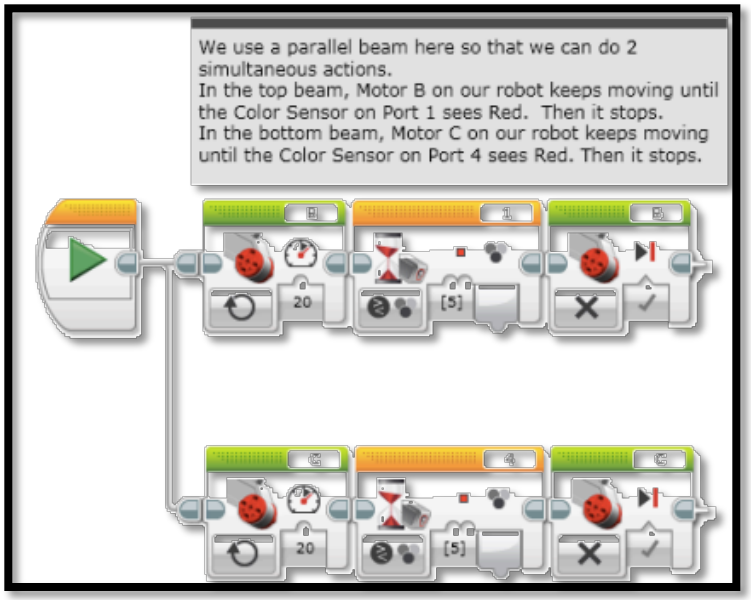
This is labeled as “Parallel_Beam_My_Blocks” in the corresponding EV3 code file



Inside the My Block

Challenge: Squaring on a Line

- Synchronization is critical for aligning on a line using parallel beams
- As a challenge, complete the Squaring on Line lesson.
- Note: You must ensure that both beams in an align are completed before moving onto the next block
  - Otherwise, the robot will not be straight on a line



This example is from the Squaring on a Line Lesson

Discussion Guide

1. What is the “sync problem”?
   Ans. When you write code with parallel beams, you are not certain when the two beams will complete. You don’t know if one beam might finish before the other.

2. What are 4 ways to solve this problem?
   Ans. Use variables, data wires, loops or My Blocks to make sure that the parallel beams compete before moving on to the next block of code.

Credits

- This tutorial was created by Sanjay Seshan and Arvind Seshan from Droids Robotics (team@droidsrobotics.org).
- Original Gyro Turn code was provided by the Construction Mavericks (frank.levine@gmail.com)
- More lessons at www.ev3lessons.com