BEGINNER EV3 PROGRAMMING LESSON 1

Intro to Brick and Software, Moving Straight, Turning

By: Droids Robotics
www.ev3lessons.com

SECTION 1: EV3 BASICS

THE "BRICK" BUTTONS

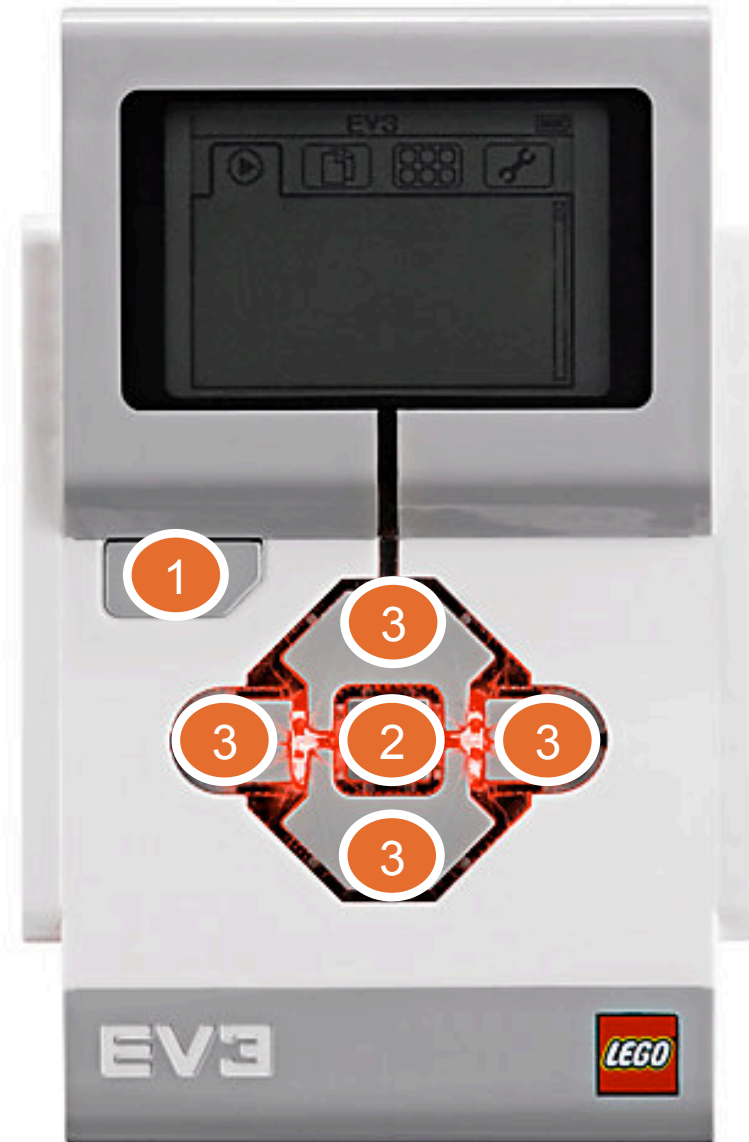**1 = Back**
    Undo
    Stop Program
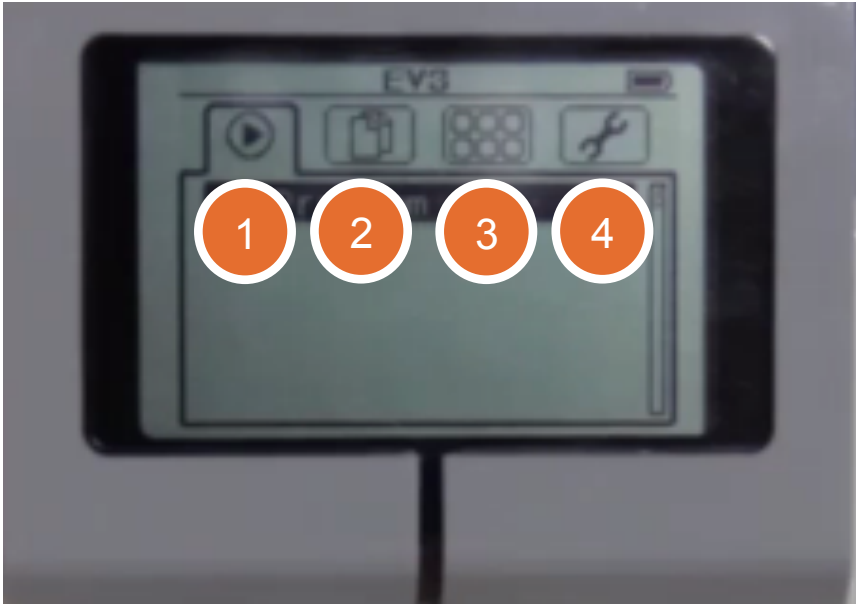   Shut Down EV3

2 = Center Button
    Select options
    Run Program

3 = L, R, Up, Down
    Navigate menus

THE "BRICK" SCREEN

Tabs on Screen

1. **Run Recent**
   Find programs you ran recently

2. **File Navigation**
   Find all programs by project

3. **Brick Apps**
   Port views

4. **Settings**
   Bluetooth, Wifi, Volume

PORTS, SENSORS, MOTORS

Ports A, B, C, D = Motors

Default setup assumes Right Motor in C, Left Motor in B

B

Default setup •

C

Ports 1, 2, 3, 4 = Sensors

EV3 SOFTWARE

Open Saved Project

Open New Project

EV3 SOFTWARE: STARTING A NEW PROGRAM

Opened Projects

Create a Project

Opened Programs

Project Properties

List of programs

EV3 SOFTWARE: PROGRAMMING SCREEN

Programming Area or Canvas

Programming Blocks in 6 Colored Tabs

Brick Status & Downloading

EV3 BLOCKS: COLORED TABS

ACTION BLOCKS
Move, Large & Medium Motor, Display…

FLOW BLOCKS
Start, Wait, Loop, Switch, Loop Interrupt

SENSOR BLOCKS
Brick Buttons, Gyro, Color, Ultrasonic

DATA OPERATIONS
Variables, Array, Logic, Math, Compare…

ADVANCED BLOCKS
Data Logging, Unregulated Motor…
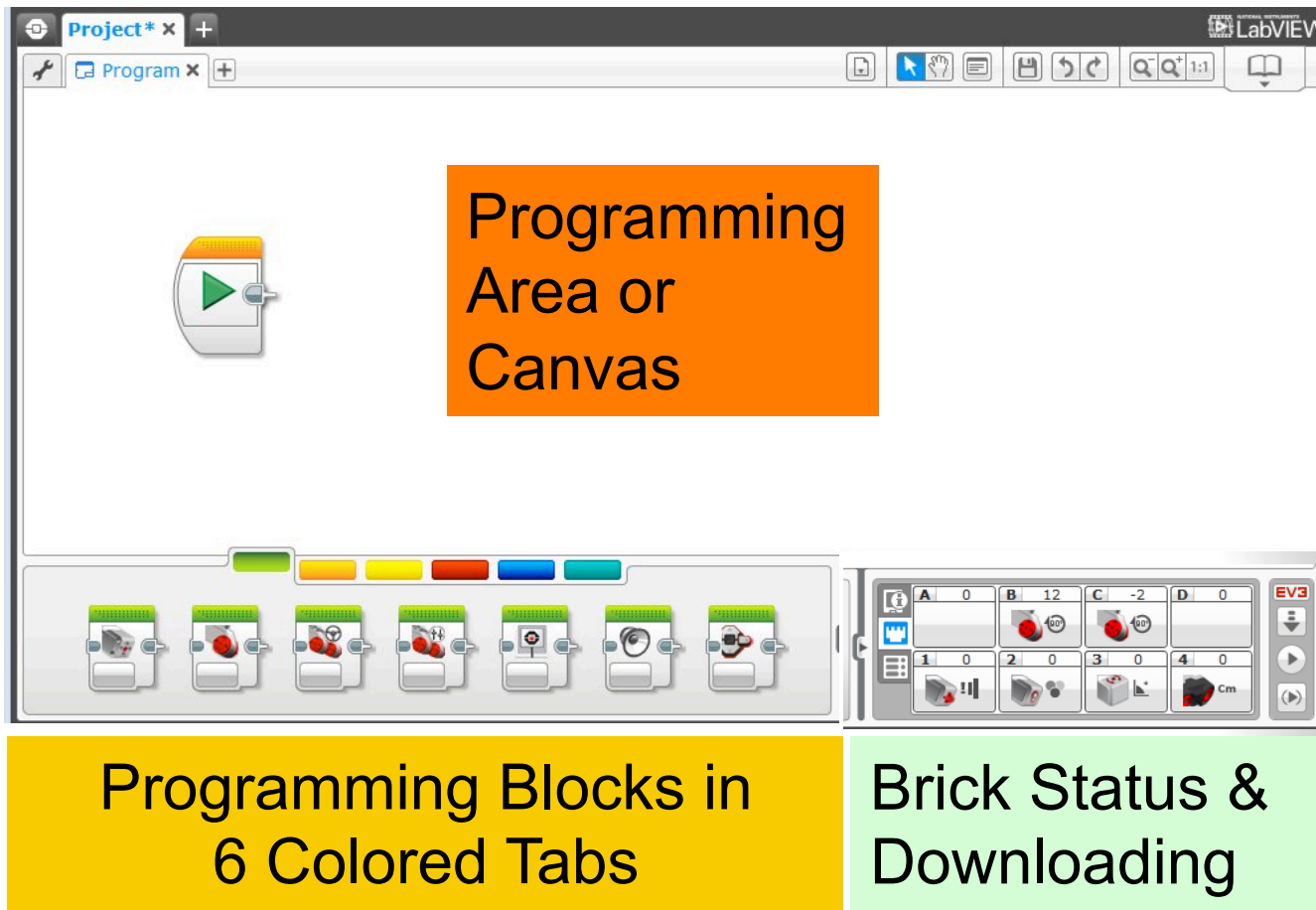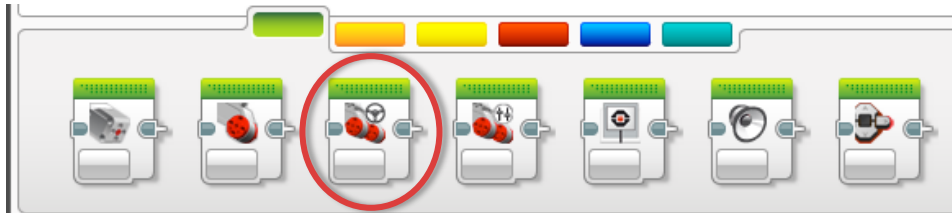
MY BLOCKS
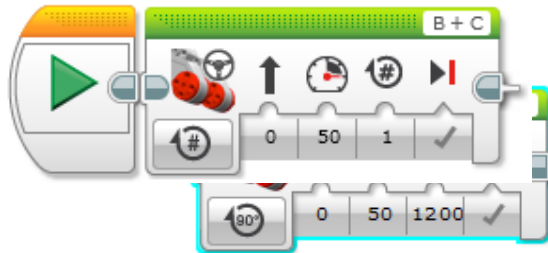Custom Blocks you create
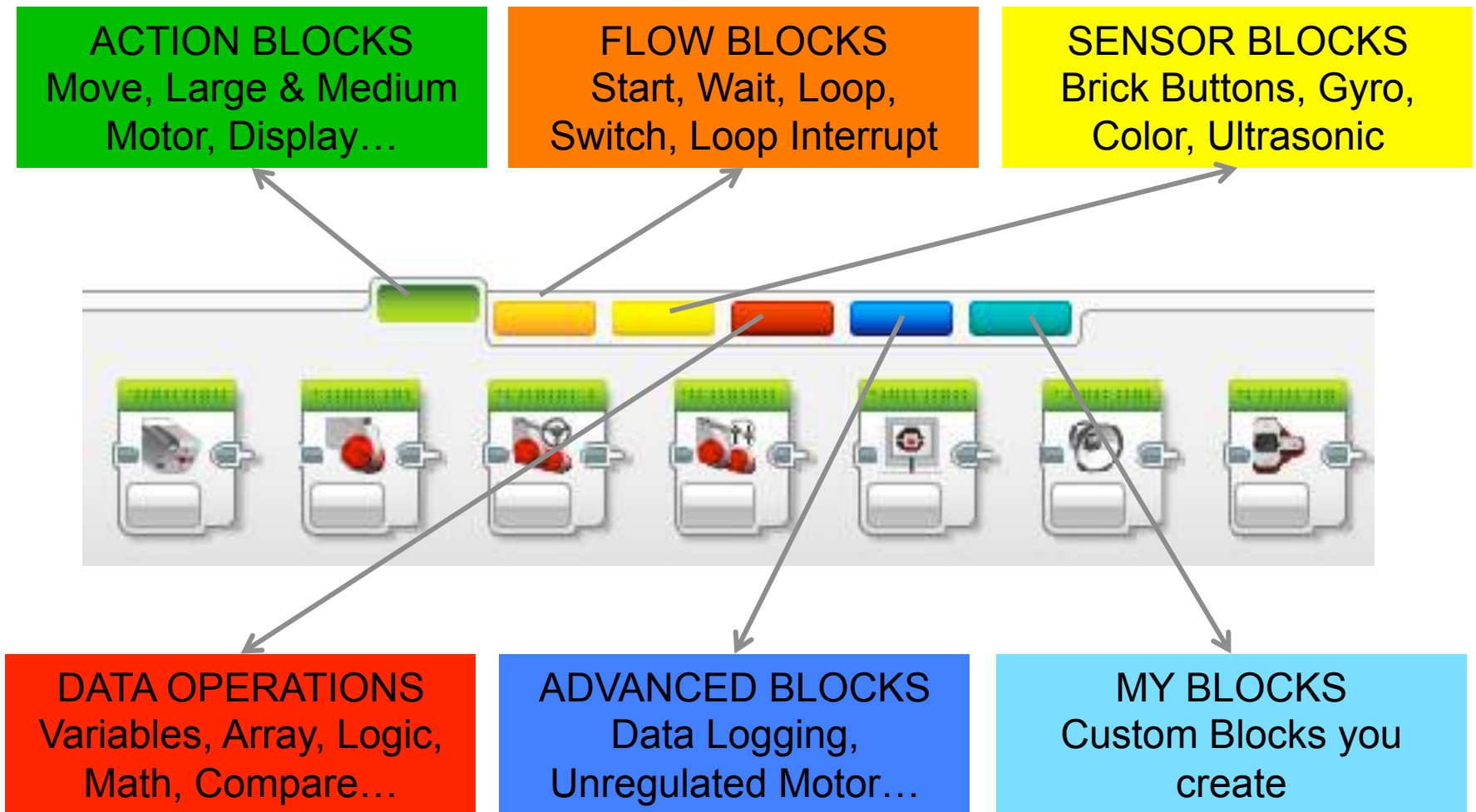
SECTION 2: MOVING STRAIGHT

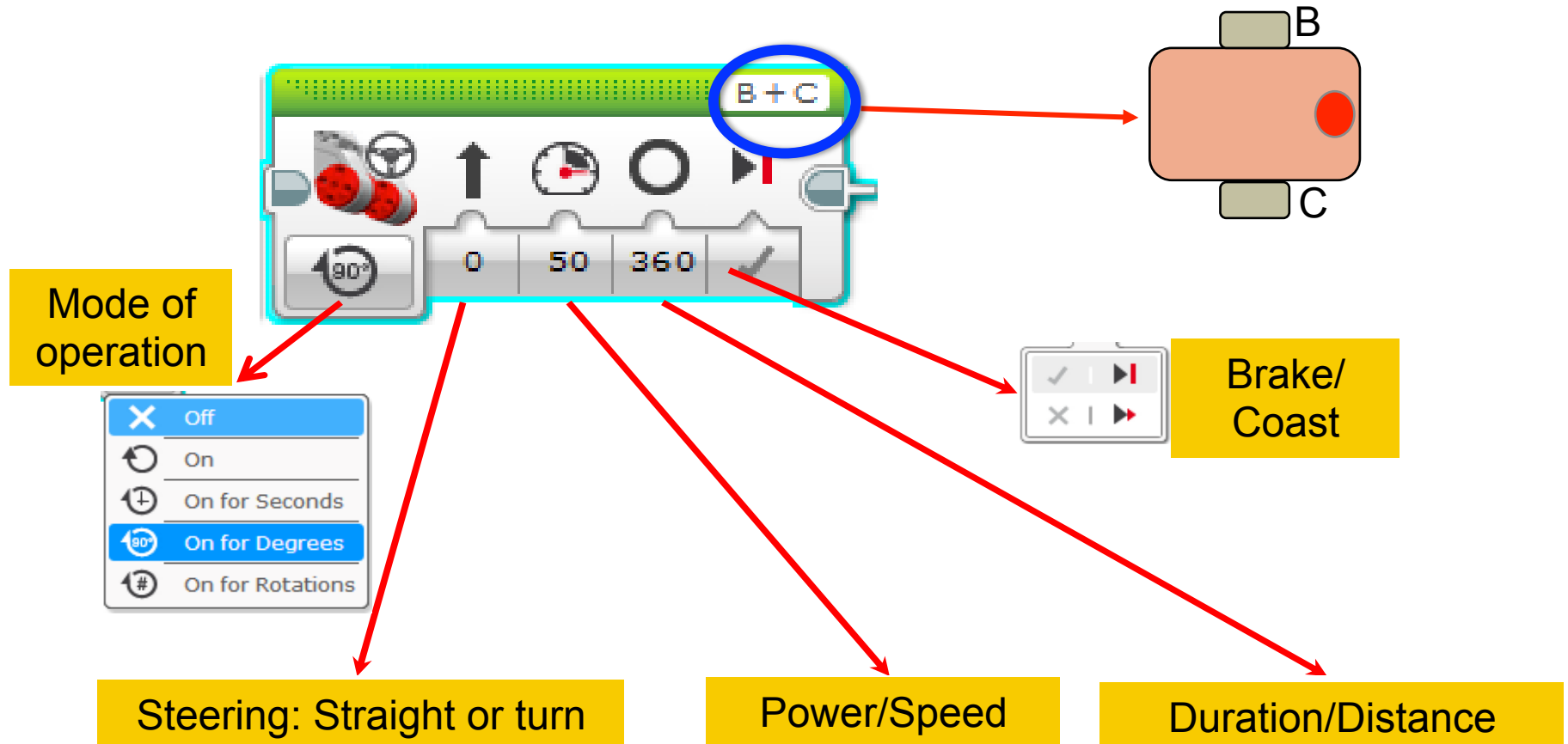# CHALLENGE: MOVE STRAIGHT

STEP 1: Green Block Tab, Click and hold Move Steering and drag to programming area

STEP 2: Drop next to the Start Block (green arrow)

MOVE STEERING BLOCK

B + C

B

C

Mode of operation

- ✗ Off
- ↻ On
- ⊕ On for Seconds
- 90° On for Degrees
- # On for Rotations

Brake/ Coast

Steering: Straight or turn

Power/Speed

Duration/Distance

NEGATIVE & POSITIVE POWER: BACKWARD & FORWARD

Negative Power = Backwards

Positive Power = Forward
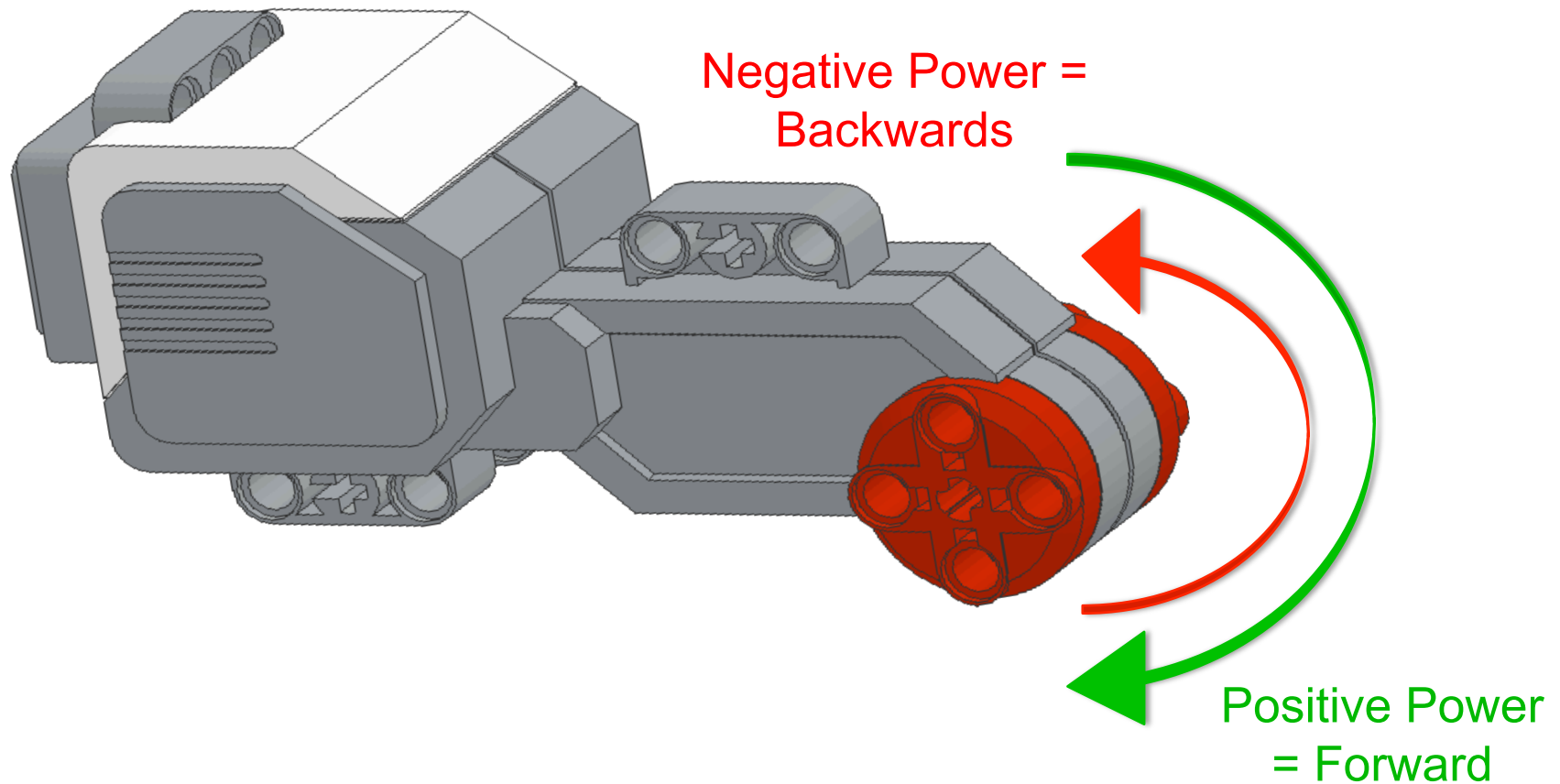
CHALLENGE: MOVE STRAIGHT (3 SECONDS)

STEP 1: Green Block Tab, Click and hold Move Steering and drag to programming area
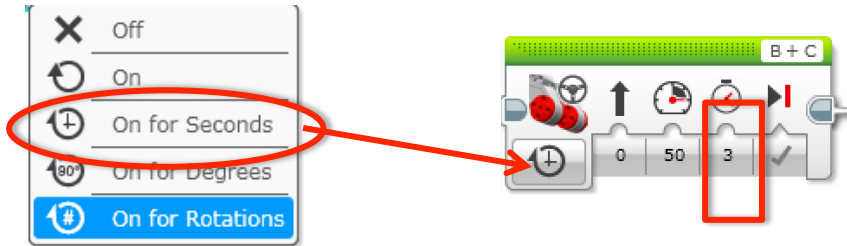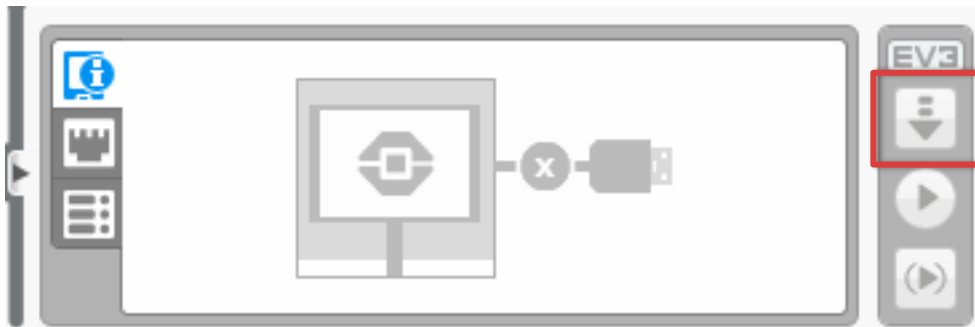
STEP 2: Drop next to the Start Block (green arrow)

STEP 3: Select Options. Move "3 Seconds"

STEP 4: Connect USB cable to EV3 and Laptop.

STEP 5: Download to EV3
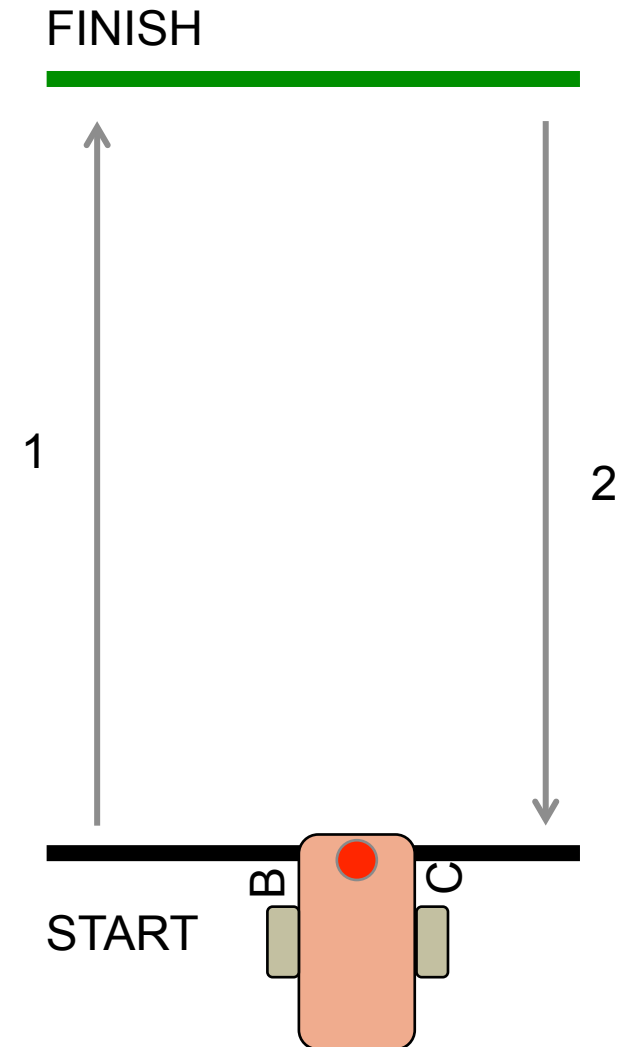
MOVE STRAIGHT: SECONDS VS. DEGREES VS. ROTATIONS

CHALLENGE: Move your robot forward from the start line to the finish line (1) and back to the start (2).

Try: Select SECONDS, DEGREES or ROTATIONS

Try: Different speeds

What are some advantages or disadvantages of using each one?

Did you have to do a lot of guess and check to reach the line?

FINISH

1

2

B   C

START

MOVE STRAIGHT CHALLENGE – PART 1 SUMMARY

TEAMS	SECONDS	DEGREES	ROTATIONS
Team 1			
Team 2			
Team 3			
Team 4			

MOVE STRAIGHT DISCUSSION

Teams	Did you guess and check a lot?	Did changing the speed matter?	What was more accurate? Seconds? Degrees?	Do you think wheel size will matter?	Do you think battery level matters?
Team 1					
Team 2					
Team 3					
Team 4					

MOVING STRAIGHT MORE ACCURATELY: USE PORT VIEW

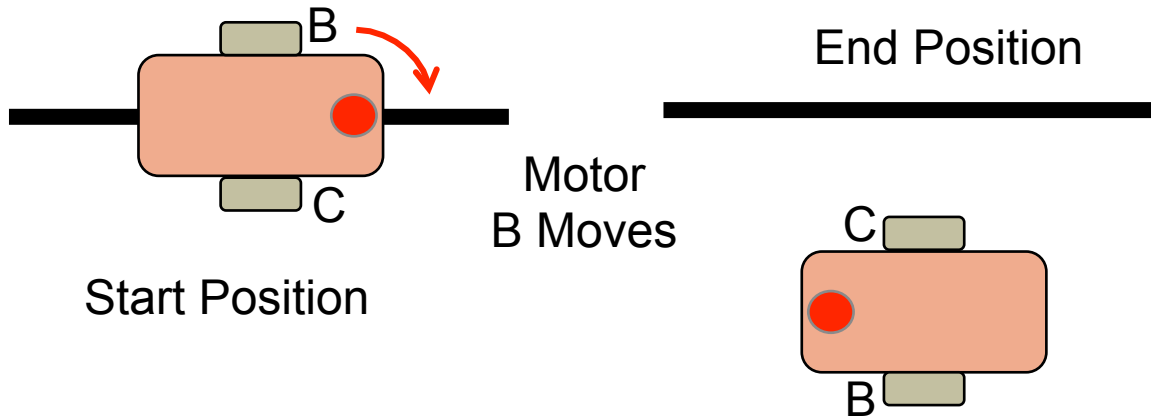**Try "port view" on brick (on Brick Apps tab)**

- Move your robot with your hand from your start line to your end line
- Read how many degrees your robot moved
- Use this number in the Move Steering Block to move the correct distance.

SECTION 3: TURNING

PIVOT VS. SPIN TURNS

180 Degree Pivot Turn

B

C

Start Position

Motor
B Moves

End Position

C

B

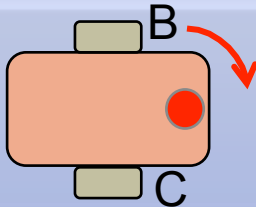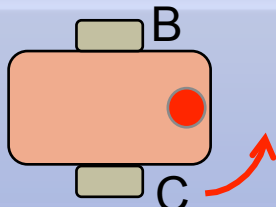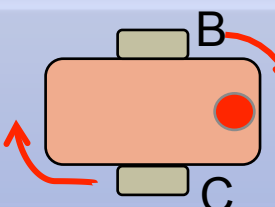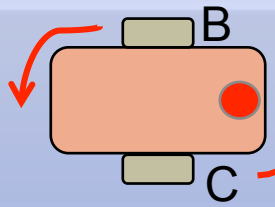Notice where the robot ends in both pictures after a 180 degree turn.

In the Spin Turn, the robot moves a lot less and that makes Spin Turns are great for tight positions. Spin turns tend to be a bit faster but also a little less accurate.
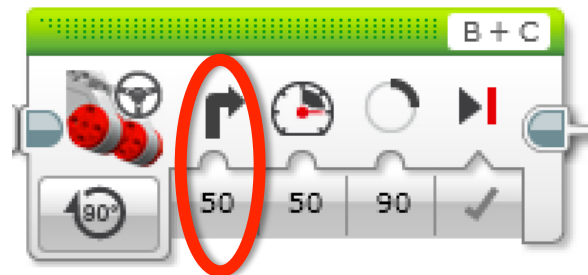
180 Degree Spin Turn

Start Position

B

C

Motors
B and C
Move

End Position

C

B
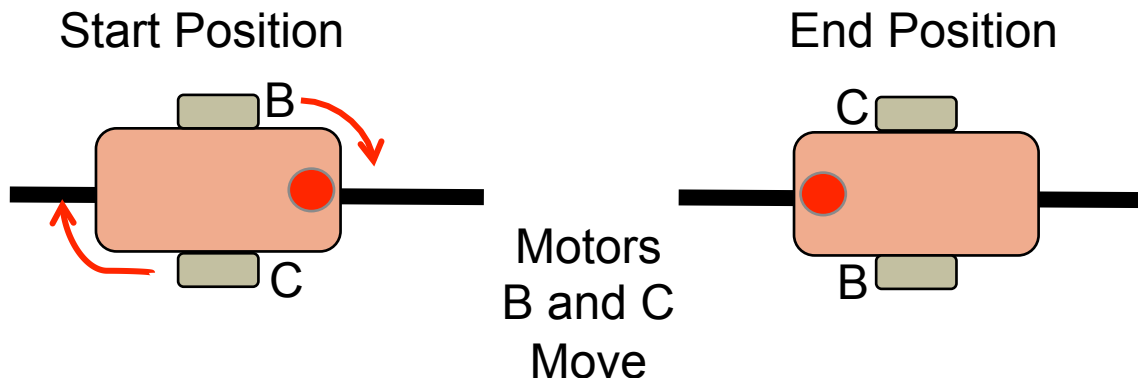
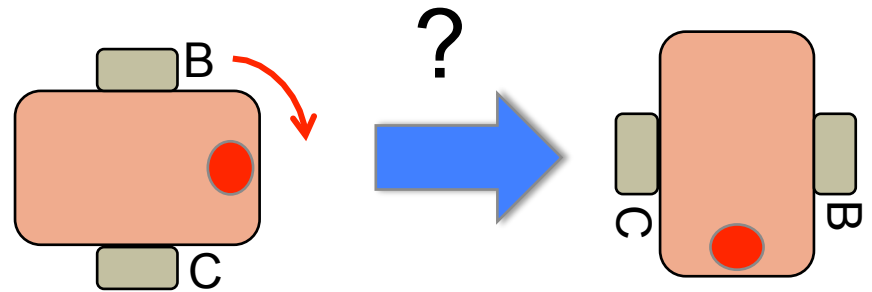So when you need to make turns on the FLL board, you should decide which turn is best for you!

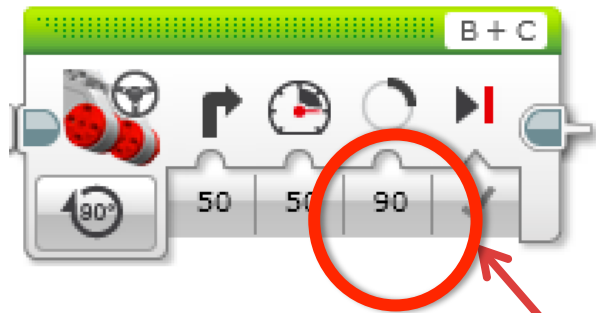# HOW TO MAKE PIVOT AND SPIN TURNS

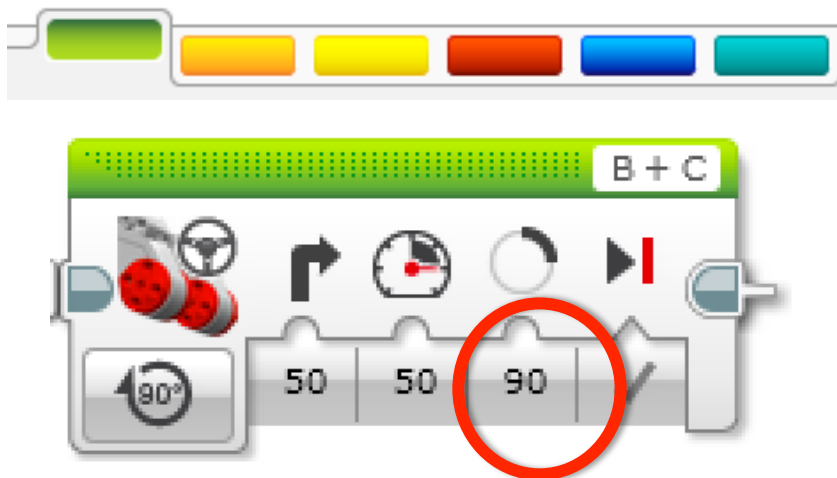| Steering Value			
50	-50	100	-100
Pivot Turn Right	Pivot Turn Left	Spin Turn Right	Spin Turn Left

Change Steering value here

MAKING A PIVOT TURN FOR 90 DEGREES

Program your robot to turn 90 degrees....Does the robot actually turn 90 degrees if you just pick 90 degrees for distance?

HOW DO YOU MAKE THE ROBOT TURN 90 DEGREES?

Ans. Try using the port view again to measure the turn and then input the correct number of degrees.

TURNING AN ATTACHMENT ARM, NOT JUST THE WHEELS

- **Attach a medium motor to Port A or a large motor to Port D as needed.**

- **Move Steering vs. Motor Block**

  - For moving your wheels you should use a Move Steering Block that syncs both wheel motors.

  - For moving your attachment your arm, you use either a Medium Motor Block or a Large Motor Block because you don't need to sync your motors.

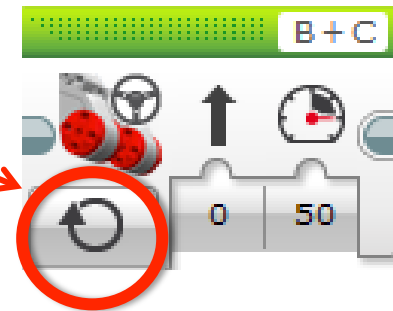Medium Motor Block
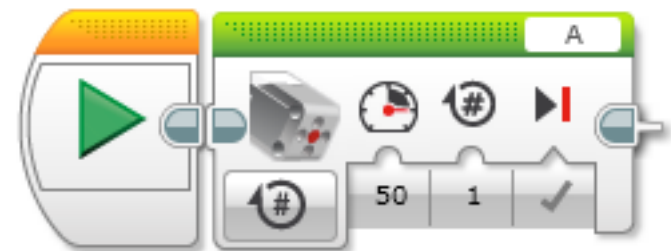
Large Motor Block
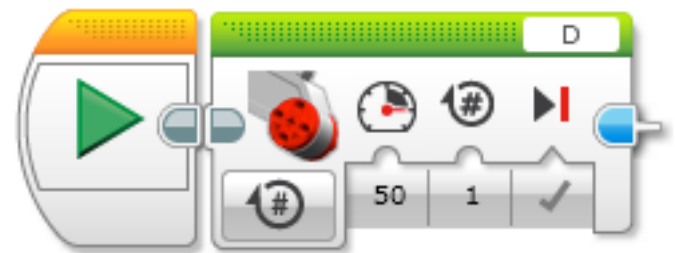
MOTOR "ON" AND "WAIT" BLOCKS

Leaving the motor "on" and "off"

Why use the "on" instead of "degrees"?

- May want the program to do other tasks while moving

**"Wait" block in Flow Tab**

- Wait for seconds

SOMETHING FUN: DISPLAY BLOCK

- Use the Display Block to display information and pictures on the screen

- You can control the location and size of text

- You can use this same block to display sensor readings and instructions.

- Challenge: Can you display eyes on the screen while moving? Alternate eyeballs that look left and right.

  - Use the Display Block, Motor On and Wait Block

CHALLENGE SOLUTION

Motor On

Display Block

Wait Block

Motor Off
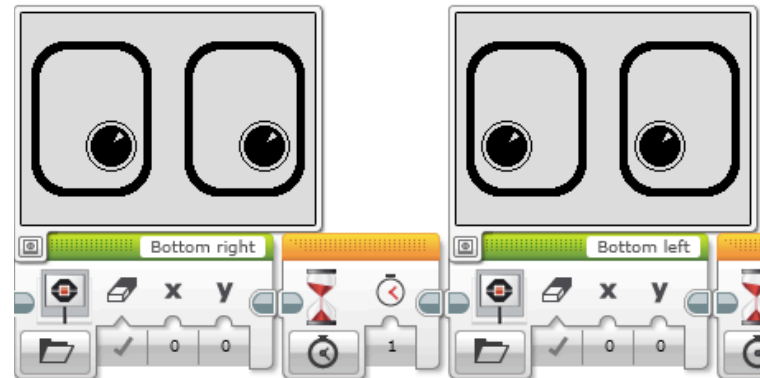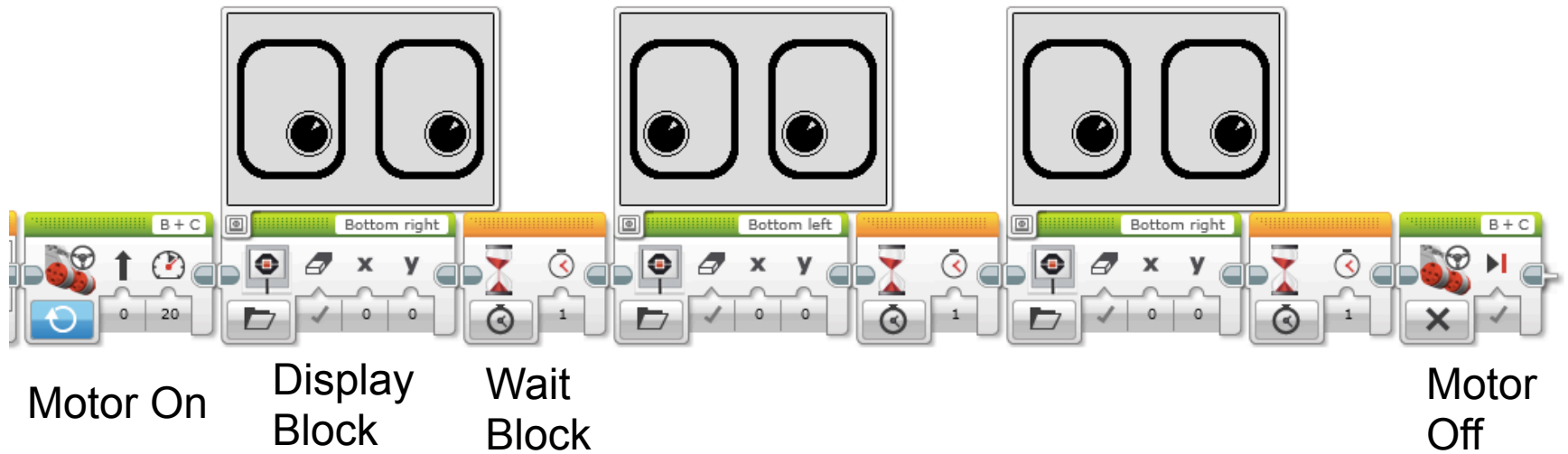
CREDITS

- **This tutorial was created by Sanjay Seshan and Arvind Seshan from FLL Team Not the Droids You Are Looking For (Droids Robotics)**

- **We have additional material for more advanced lessons available on request.**

- **Useful tools for FLL teams and robot programmers are available at www.ev3lessons.com**

- **The material is made available to you free of charge. However, we would greatly appreciate a letter indicating that you are using the materials and what you think of them.**

- **Feedback and suggestions are encouraged.**

- **Email: team@droidsrobotics.org**

PITTSBURGH, PENNSYLVANIA
NOT THE
DROIDS
YOU ARE LOOKING FOR