Getting started with LEGO EV3 Mindstorms software

This is intended to be a short introduction to the LEGO Mindstorms software and programming the LEGO EV3 robot. There's more to the program than what can be found here, but this should get you started. Hopefully it should also alleviate some issues that can be common to new users.

Putting Commands in a Program

This is the program beam. This is where you put commands for the robot.

| Command 1 | Command 2 | Command 3 |

The commands get executed in a row by how far away they are from the beginning of the beam. So, command 1 in this picture happens first, and command 3 happens last.

Using Commands

You can pull commands down from the "palette" on the bottom of the screen to the program beam.
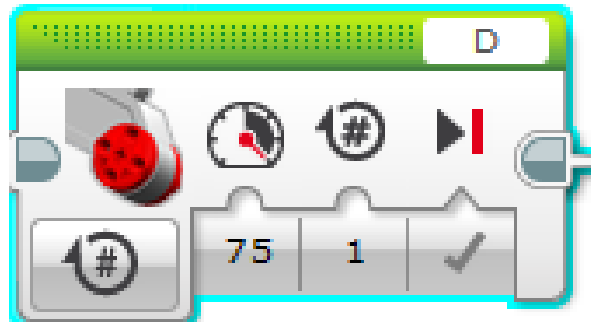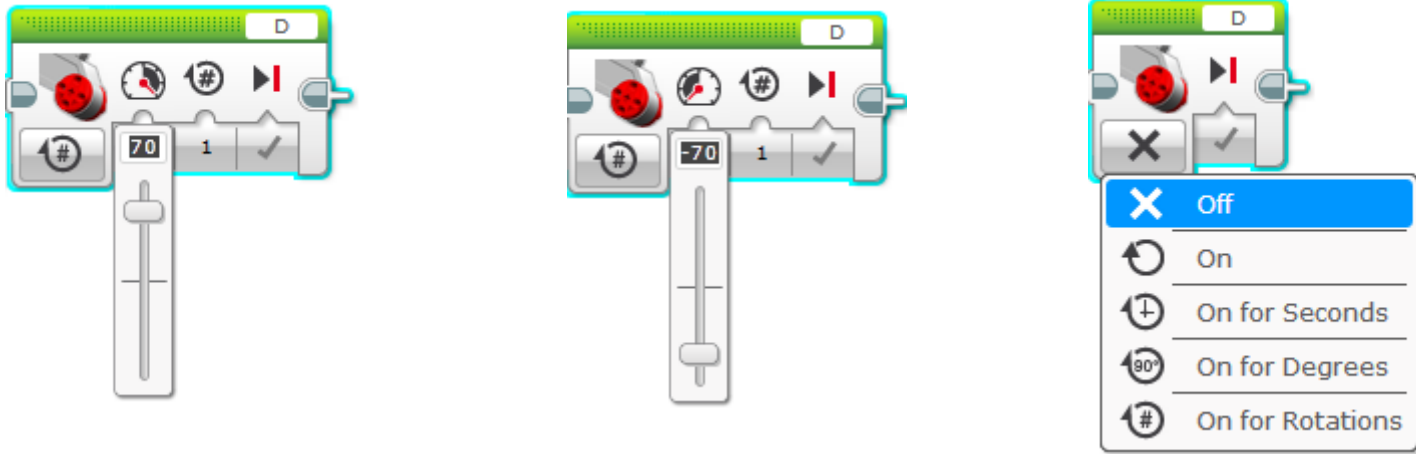
We'll start with the MOVE command.

Move Settings

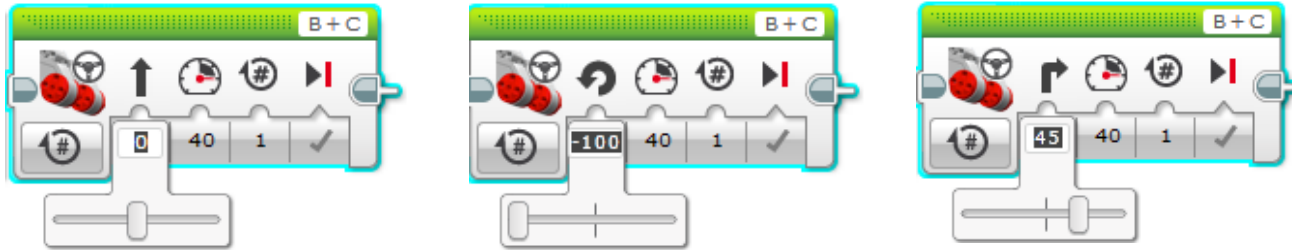When you put a new command in the program, parameters you can set pop up on the block you just added.

These are the settings for the MOVE command.

Direction

1. Positive means forward, negative means backward.
2. The cross sign means turn off the motor.

Steering

1. The STEERING setting can be used to tell the robot to turn to the left or to the right.
2. The arrow in the middle will change to give you an idea of how the robot will move.
3. If the slider is moved all the way to the left or right, the robot will spin in place.
4. However, if the slider is moved to just before the extreme left or right, the left or right wheel (respectively), will not rotate during movement. (In other words, the robot will pivot.

Power
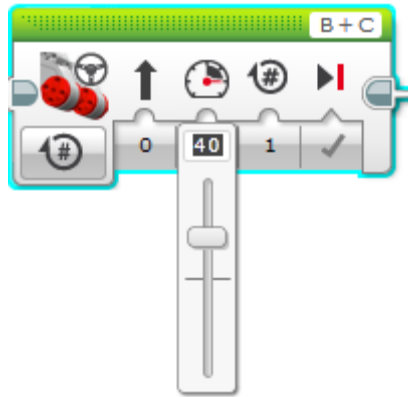
1. The POWER setting tells the robot how fast to move.
2. Think of it as a percentage, with 0 being no power and 100 being full power.
3. Also keep in mind that this is not necessarily a measure of speed. A heavy robot moving at 100 power can still go slower than a very light robot moving at 50 power.

Duration
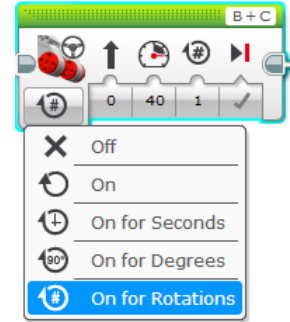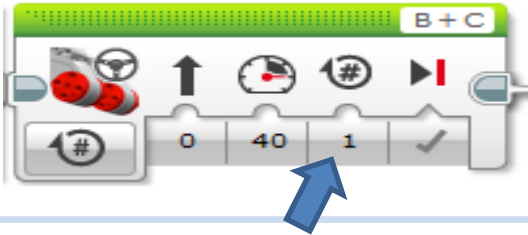
1. With the DURATION setting, you can tell the robot how long or how far to move.
2. There are four options for the duration:
   - Unlimited: The robot will continue to move with these settings until it is given a new movement command.
   - Rotations: For each rotation, the wheels turn through 360 degrees. So, going forward 2.5 rotations would make the wheels rotate 2.5 x 360 = 900 degrees.
   - Degrees: Same as rotations, but specified in degrees of rotation.
   - Seconds: Amount of time for wheels to rotate at the given speed.

Putting the Settings Together

- The actual movement of the robot is a combination of all of the settings. Some examples:
  - You tell the robot to turn to the left using STEERING and set the DURATION to three rotations.   Both wheels can't do three rotations, because if they did, the robot would move straight. So, the robot's computer figures out how far to turn each wheel to make the robot drive to the left on a path that is equivalent to three rotations of the wheels.
  - If you set the POWER to 75, then setting different DURATIONS in seconds will make the robot move different distances.
  - When making the robot turn, it usually makes the most sense to pull the STEERING slider all the way to the left or right. When you do this, each wheel will rotate the same amount (which can be set with DURATION in rotations mode), but in opposite directions.
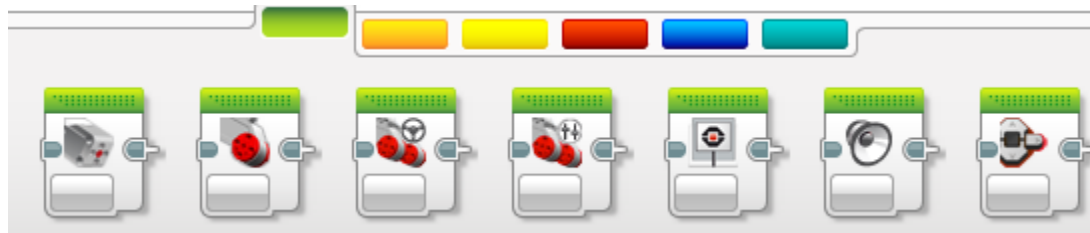
Issues for First-Timers

- There are a lot of small issues that can put off new users to the EV3 robots and software. Hopefully these pointers can help you get started!

- When the EV3 software is first loaded on the computer, in order to create a program, you need to just click the add button.
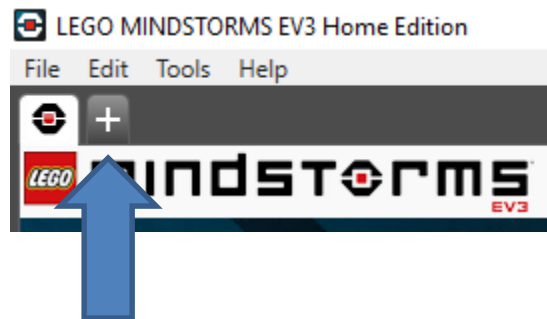
Issues for First-Timers

- As shown in the picture on the bottom, there are tabs at the bottom that bring you to different palettes of programming tools. The green palette is for action, the yellow is for flow control, the red is for sensors. Those are the common ones student will use.

- Also, If you have a lot of commands on the screen at once, you can move it around by highlighting them all and dragging them.

Issues for First-Timers

- When you have finished building the program for the robot, it's time to download it to the robot's EV3 brain.

- First, make sure that the USB cable that came with the EV3 kit is plugged into the back of the computer and into the top of the EV3 robot.

- Then, turn on the robot with the middle button on the EV3 brain. (It doesn't really matter whether you plug the robot in or turn it on first.)

Issues for First-Timers

- Once the program is downloaded on the EV3 brain it automatically goes into the program.

- To navigate the EV3 brain you use the keypads on the brain.

Issues for First-Timers

- If you are finished with the robot, you can turn it off by hitting the dark gray button on the top left, under the screen, of the EV3 brain. You will be asked if you want to turn the robot off. Select the checkmark to say OK.

- The EV3 brain only has a limited amount of space to store programs. It's not a bad idea to go into the second tab on top of the screen and delete old programs from time to time so that you won't run out of space.

- If you are running the Mindstorms software at a school, you probably have a tech specialist that installs software for you. You will probably need to ask the tech specialist to install the software for the first time. Make sure he or she knows that the students in your class are going to need to be able to run the program.