

Getting started with LEGO NXT Mindstorms software

This is intended to be a short introduction to the LEGO Mindstorms software and programming the LEGO NXT 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.



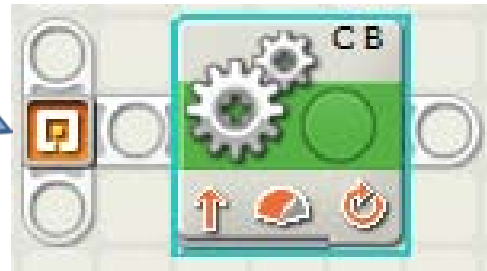
The commands get executed in a row by how far away they are from the beginning of the beam. So, command 1 in this picture happens first, and command 3 happens last.

Using Commands



You can pull commands down from the “palette” on the left side of the screen to the program beam.

We’ll start with the MOVE command.



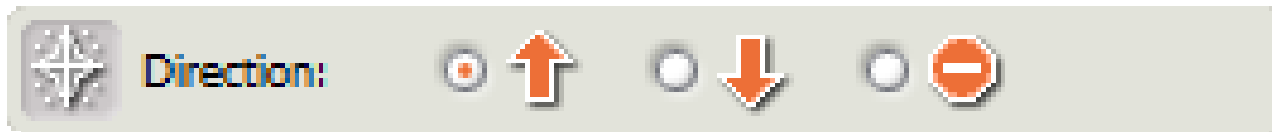
Move Settings

When you put a new command in the program, settings pop up at the bottom that you can change.

The screenshot displays the 'Move Settings' panel, which is organized into two main columns of controls. The left column includes: 'Port:' with radio buttons for A, B (selected), and C; 'Direction:' with three radio buttons (Up, Down, Stop) where Up is selected; 'Steering:' with dropdown menus for B and C, an Up arrow button, and a horizontal slider; and 'Power:' with a horizontal slider and a numeric display showing 75. The right column includes: 'Duration:' with a numeric input field showing 1; 'Rotations' with a dropdown menu; and 'Next Action:' with radio buttons for Brake (selected) and Coast.

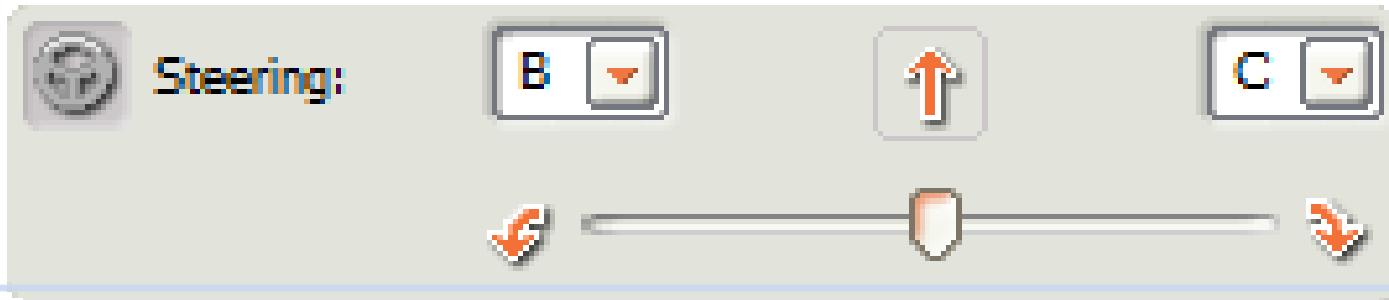
These are the settings for the MOVE command.

Direction



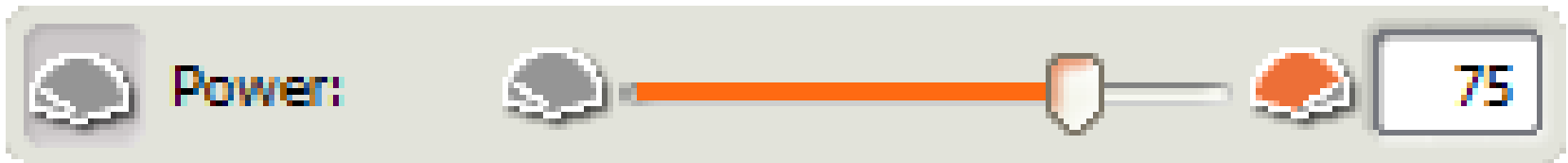
1. Up means forward, down means backward.
2. The “Do Not Enter” sign means “stop.” If you use this setting, nothing will happen to the robot’s movement unless it is already moving when this command is given.

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



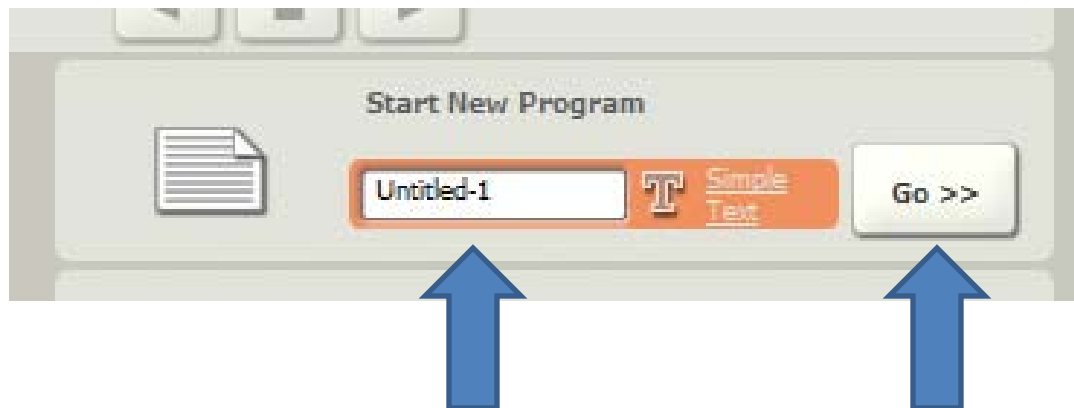
1. With the DURATION setting, you can tell the robot how long or how far to move.
2. There are four options for the duration:
 - Unlimited: The robot will continue to move with these settings until it is given a new movement command.
 - Rotations: For each rotation, the wheels turn through 360 degrees. So, going forward 2.5 rotations would make the wheels rotate $2.5 \times 360 = 900$ 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.

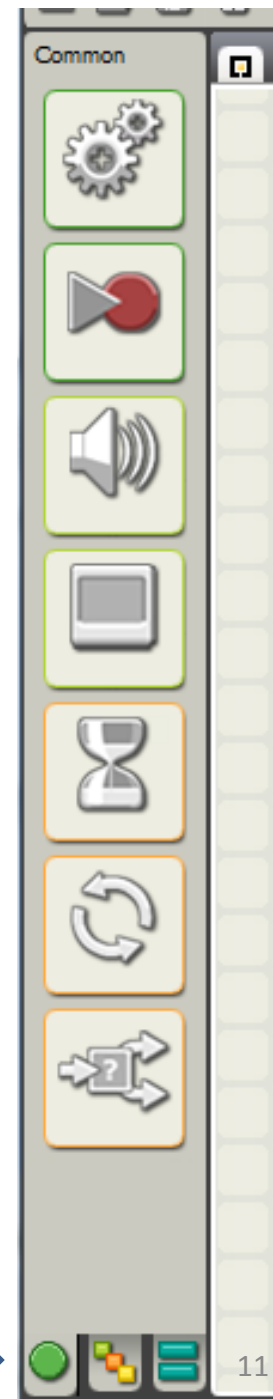
Issues for First-Timers

- There are a lot of small issues that can put off new users to the NXT robots and software. Hopefully these pointers can help you get started!
- When the NXT software is first loaded on the computer, in order to create a program, you need to give it a name and hit GO as shown in this picture.



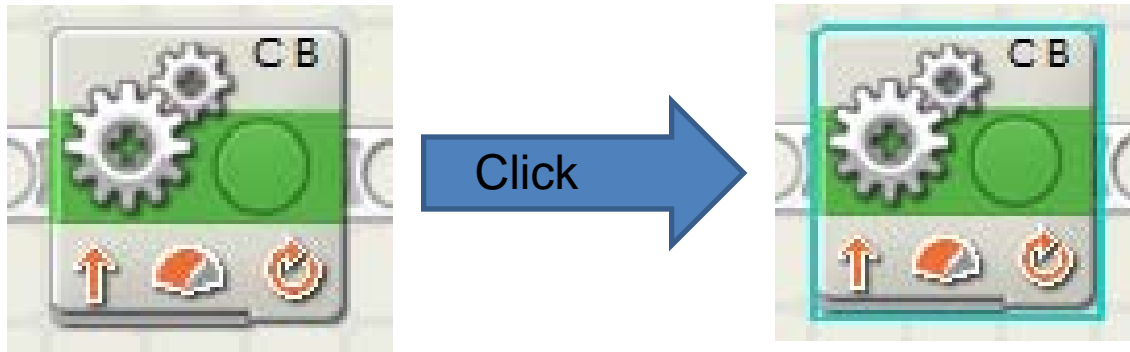
Issues for First-Timers

- As shown in the picture on the right, there are tabs at the bottom that bring you to different palettes of programming tools. The “Common Palette” (shown as the green circle) has most of the tools a beginning student should need.
- Also, If you have a lot of commands on the screen at once, you might want to move around the programming area so that you can have more room or see commands that are off the screen. You can move around the programming area with the arrow keys on the keyboard.



Issues for First-Timers

- “Where did my settings go?”
 - If you hear this, this usually means that the student has clicked away from the command for which they want to change the settings. If you put the mouse cursor over the command you want to change, it will have a blue highlight and the settings will reappear below the programming window.

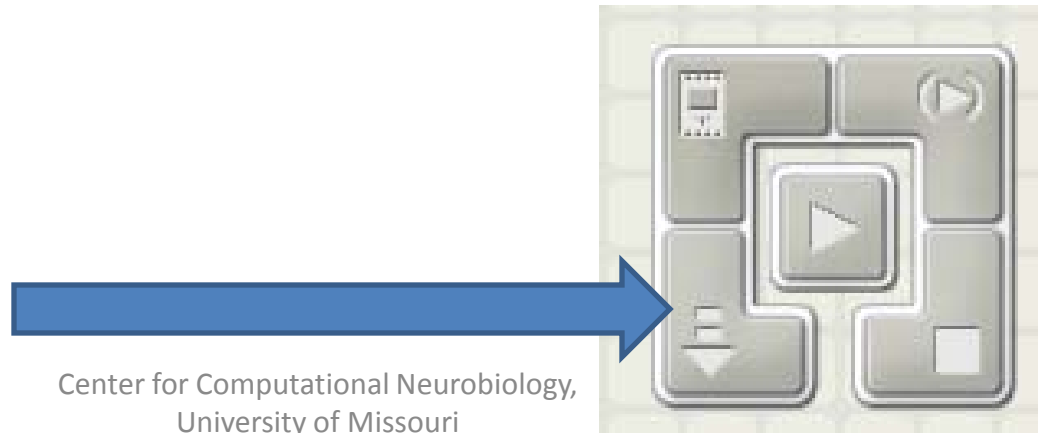


Issues for First-Timers

- When you have finished building the program for the robot, it's time to download it to the robot's NXT brain.
- First, make sure that the USB cable that came with the NXT kit is plugged into the back of the computer and into the top of the NXT robot.
- Then, turn on the robot with the orange button on the NXT brain. (It doesn't really matter whether you plug the robot in or turn it on first.)

Issues for First-Timers

- When you plug in the robot for the first time, the computer has to figure out how to talk to the robot before you can put the program on it. (For the computer savvy, the operation system installs the NXT drivers.)
- You don't have to do anything for this, but it's a good idea to wait about one minute after you have turned the robot on and plugged it into the computer. If you don't, you might get an error message.
- Once the robot is on and plugged in, you can hit the “download” button (pointed out in the picture below). You should get a “Complete!” message on the computer screen if it downloaded correctly.



Issues for First-Timers

- Once the program is downloaded on the NXT brain, you use the buttons on the front of the brain to run the program.
- You use the orange button to select items on the screen, and the dark gray button to back up in the menus. (They're a little like the green and red buttons on a cell phone.) The arrow buttons move left and right in the menus.
- To run the program you downloaded, you first need to find it. From the main menu, programs you download are located in My Files->Software Files. The program you downloaded should be called by the same title you gave it at the beginning.
- If you press the orange button when you find your program, you will be given the option to Run or Delete the program. Choose Run to see if the program did what you wanted!

Issues for First-Timers

- If you are finished with the robot, you can turn it off by hitting the dark gray button from the main menu on the NXT brain. You will be asked if you want to turn the robot off. Select the checkmark to say OK.
- The NXT brain only has a limited amount of space to store programs. It's not a bad idea to go into the My Files->Software Files folder 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.
- Also for the tech specialist: The LEGO Mindstorms software is not compatible with display resolutions below 1024 by 768 pixels. Make sure before you need to use the software in your class that all of the computers you will use are set to this resolution or higher.