

Intro Programming

We're going to discuss programming in more depth tomorrow, but let's get a couple of programs running on your robot right now to make sure all of your equipment works. The first program will just make your robot move forward, and the second will make your robot drive and turn. **Reading the text in this document is optional; if you don't have time, feel free to just skip to the screenshots and follow the pictures.**

Overview

A program is just a **detailed list of instructions** for a computer. Since computers don't understand human language (yet!), we write our programs in a specialized **programming language** that the computer can understand. For the LEGO Mindstorms NXT, this language is called NXT-G.

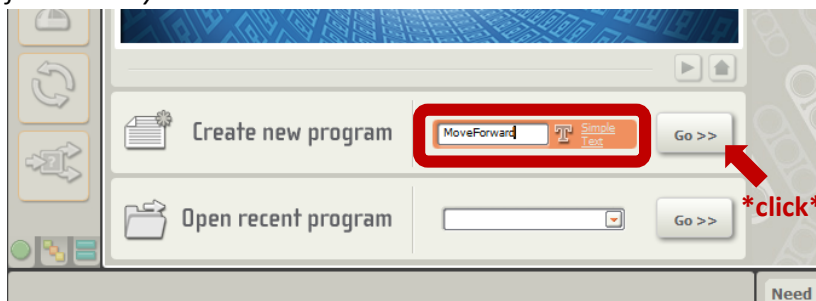
NXT-G is called a graphical language because every instruction is represented by an icon, called a "block." Each block has many options that can be changed in the **configuration panel** in the lower left portion of the screen. Once you've written (and saved!) your program, you tell the NXT to download its instructions.

Walkthrough: Moving Forward

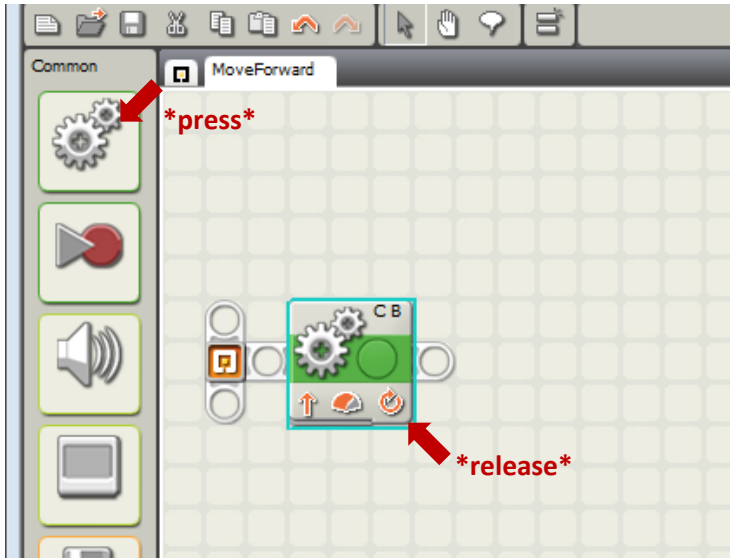
1. Start the NXT-G programming environment by clicking the applicable desktop icon:



2. After the software loads, fill in a program name (something short-ish, but it doesn't matter exactly what you did), and click "Go." *Note that your software may look slightly different, but the functionality is the same.*

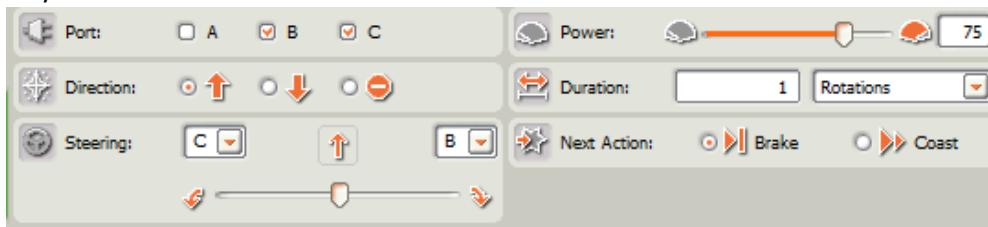


- Click and drag a **Move** block from the **Common Palette** to the **Sequence Beam**. (Yes, lots of vocab there; just do what the picture says):



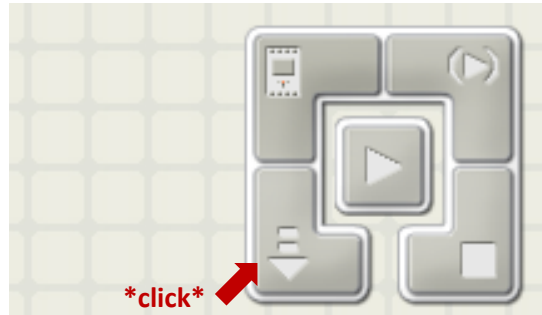
In case you were wondering, the “Common Palette” is the pane on the left side of the screen, and the “Sequence Beam” is the white LEGO-looking thing where you put the block. The “Move Block” is an instruction to tell the robot to use its motors.

- If you click the block so it is highlighted in blue (like in the screenshot above), you’ll notice the **Configuration Panel** at the bottom of the screen. All the default settings are fine for our purposes, but feel free to change some things after going through these instructions to see what they do.



- We just want the robot to move forward, so we just need this one instruction. Save your work—it’s not much for this program, but saving early and often is a good habit to build.

- Let's download our program! Connect the NXT brick to the computer using the USB AB cable (the port is in the upper-right of the brick), and turn on the NXT. After waiting a couple of seconds for the computer to recognize the device, click the download button in the lower-right corner of the workspace:



You may notice that the center button is called “Download and Run.” Although tempting, it’s not a good idea to use this button with the robot still plugged into the computer—you don’t want the robot running off the table with your laptop! 😊

Running Your Program

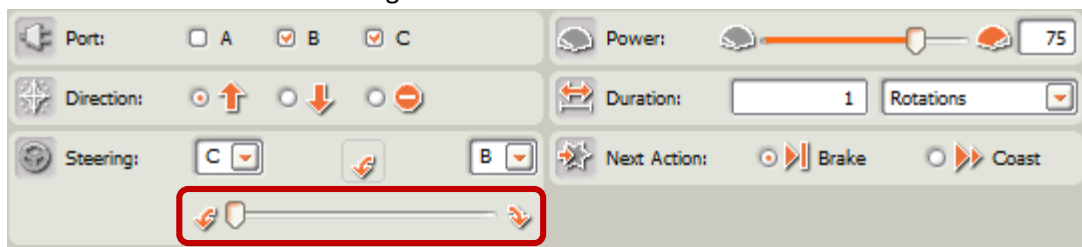
Unfortunately, it’s a bit hard to take screenshots of the NXT. So, I’ll try to talk you through this; you’re going to use the orange and grey buttons on the NXT.

- Your downloaded program will be stored in “My Files > Software Files.” So, press the orange “enter” button twice.
- Use the grey arrow buttons to find your program (it should be the first one you see) and select it using the enter button.
- You now have a couple of options, including “Run” and “Delete.” Make sure your robot is in a safe place (i.e. it won’t drive off a table), then press enter a final time to run the program.
- If you get lost, you can use the grey, rectangular “back” button to move up a level in navigation.
- If you back all the way out, you’ll be asked if you want to turn off the robot.

Further Exploration

Now that you know your robot can at least move, try some variations on this program!

- Use the “turn slider” to tell your robot to turn. How does the robot turn at the extreme ends? What about intermediate settings?



- Try out different durations. Can you get your robot to turn approximately 90 degrees? (Note 1: the motor measures how many degrees the *wheel* has spun, not how many degrees the robot

has rotated. Note 2: The “Unlimited” setting probably doesn’t do what you’d expect; we’ll see more of this when we use sensors.)

3. Can you use a move block to power only one motor?