Installing NXJ

First things first! Make sure you have installed the Java Software Development Kit (SDK) from Sun Microsystems, preferably 1.5 or later.

- Make sure your system has JAVA_HOME set to the root directory of the JDK (see step 5 below). The Sun installer should do this automatically.
- Your PATH must contain the SDK's bin directory (see step 6 below for setting PATH). Again, the Sun installer should do this automatically.

Now let's install leJOS NXJ. Choose the appropriate instructions for your system below.

Note:

The leJOS download contains the latest setup instructions. If you experience any difficult using the steps below, refer to the instructions as some procedures might have changed.

Windows

Make sure you have installed the LEGO Mindstorms NXT software. The Windows version of leJOS NXJ uses these files to upload code via USB.

1. Your first step on the path to leJOS bliss is to download the latest version from www.lejos.org.

2. Unzip the contents into a directory. e.g. c:\java\lejos_nxj

3. Now we need to set some environment variables. Select Start > Control Panel > System. Click the Advanced tab, then Environment Variables (Figure 2-1).

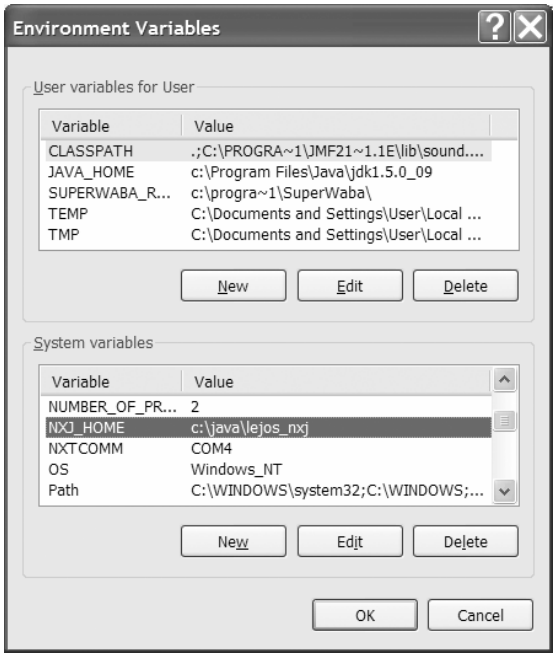

Figure 2-1 Viewing the environment variables

4. Click New to create a new environment variable. It can either be in System variables (if multiple users will use leJOS) or User variables if your account is the only one using leJOS. Type NXJ_HOME as the variable name and add the leJOS directory (see Figure 2-2). Click OK.

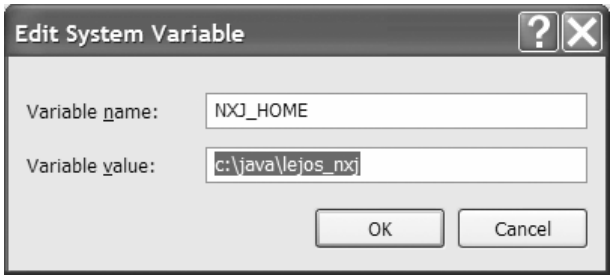

Figure 2-2 Setting the leJOS home directory.

5. While you are in the environment variables, check to make sure JAVA_HOME has been set up. If not, add this variable and type in the directory to your Java SDK.

6. Finally, add the bin directory to your path so you can use the leJOS compiler tools from the command line. Add the following to the end of your path variable (see Figure 2-3).

```
;%NXJ_HOME%\bin
```

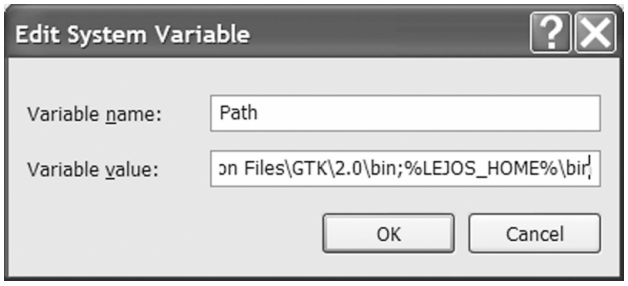

Figure 2-3 Setting the path to the leJOS binaries.

7. Now download and install the USB drivers from the following website:

http://libusb-win32.sourceforge.net/#downloads

Download the executable file that has *bin* in the name. When you run this file it will install the proper files.

That's all! You can now skip down to Uploading Firmware.

Linux

1. Download and decompress the tar file from www.lejos.org.

2. Add the environment variable NXJ_HOME and set it to the directory you installed leJOS.

3. Add the leJOS bin directory to your PATH. Depending on the privilege settings, you might need to adjust the execution permissions in the bin folder.

4. Your PATH must also contain the ant binary (ant 1.6 or above).

5. You need libusb installed so the leJOS tools can access your USB port. This can be downloaded from:

http://libusb.sourceforge.net

6. Now you need to build the distribution. Switch to the build folder and run ant. Note that depending on the privilege settings you might need to adjust the execution permissions in the release folder.

That’s all. You can now skip down to Uploading Firmware.

Mac OS X

Macintosh owners can download binary files compiled just for their system. These files are a universal build, meaning they will work on both Power PC and Intel based Mac OS X computers.

The leJOS tools for compiling and uploading Java code run in a shell environment, such as tcsh. Before you can do that, you will need to set up some environment variables for the tcsh shell.

1. Download the Mac OS X distribution from www.lejos.org.

2. Extract this file into a new location, such as /Applications/lejos_nxj.

3. If you use the administrator login, you will need to create (or edit) the file *.tcshrc* in your user home directory. Run textedit from your Applications folder.

4. Type the following two lines into the window (using the directory where you extracted leJOS), then save:

```
setenv NXJ_HOME /Applications/lejos_nxj
setenv PATH ${PATH}:${LEJOS_HOME}/bin
```

5. Select your administrator directory (/users/administrator), and type *.tcshrc* as the file name. Uncheck the box saying “If no extension is provided, use '.txt'” before you save. Then you'll get a warning box suggesting these names are reserved for the system (see Figure 2-4). Click Use '.' and it will save.

Note: If you prefer to use csh instead of tcsh, you should instead edit/create the file *.cshrc* with the same lines.

6. Bring up a Terminal window and type *tcsh*. You'll now be in a tcsh shell.

7. Type *setenv* to make sure your PATH and LEJOS_HOME variables are set up correctly. That's all! You are ready to test leJOS.

Figure 2-4 Saving the environment variables in Max OS X.

Uploading the Firmware

It is much easier and faster to upload firmware to the NXT than it was with the RCX brick.

1. First we need to place the NXT brick in firmware upload mode. The reset button is cleverly hidden in a LEGO pin hole so you don't accidentally press it. Turn on the NXT. Using a bent paperclip, insert it into the hole in the upper-right corner of the underside of the NXT brick (see Figure 2-5). Hold the button for at least four seconds to erase the current firmware and put it into firmware upload mode.

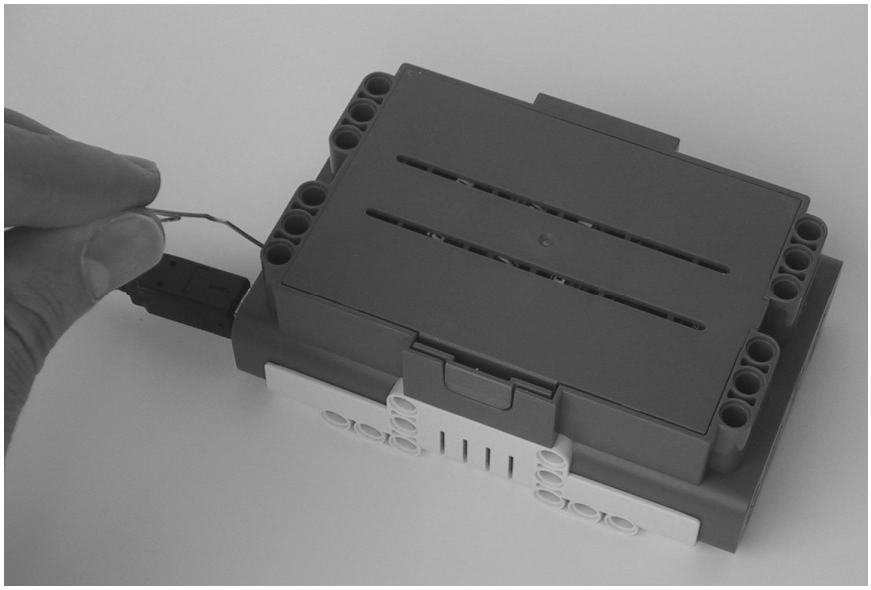

Figure 2-5 Using a paperclip to activate firmware upload mode.

2. Your NXT brick should be making a soft pulsing sound. Now we need to upload the firmware. Plug in your USB cable and type:

```
nxjflash
```

3. After a very brief moment you will see the leJOS NXJ logo and a menu system will appear. Your NXT brick is now ready to accept Java code.

Warning:

There is a theoretical limit to the number of times you can replace the firmware on your NXT before it wears out. Every time you replace the firmware, a piece of data called a lock bit is used up. This bit is rated to work 100 times (minimum) before it expires. However, don't let this dissuade you from replacing the firmware with something you want more. Most engineers agree that the lock bit will last far in excess of 100 times. Chances are you will never even notice this limitation and you probably won't replace your firmware enough to approach even 100.

Compiling and Uploading Java Code

In this section you can try compiling and uploading some sample code from the command line. Windows users can enter the command line by selecting Start > Run and then typing cmd (Click OK).

1. From a command line prompt, change to the samples\tune directory where you installed leJOS.

```
cd \java\lejos_nxj\samples\tune
```

2. You can optionally open the file Tune.java with a text editor to view some leJOS code. Compile the sample Java file:

```
nxjc Tune.java
```

4. This creates a file called Tune.nxj. Now it is time to upload this file. Plug in your USB cable (if you own a Bluetooth dongle you don't have to plug this in). Turn on the NXT by pressing the orange button and type:

```
nxj –r Tune
```

After a moment you should hear a tune play from your NXT brick. The –r argument runs the program automatically. If you leave out this argument, it will appear in the menu system, where you can run it manually.

Installing a Development Environment

As we have seen, Java programming is possible with a text editor and a command line. However, it's easier to click on buttons to make things happen rather than typing commands and optional parameters. Also, most text editors don't have many features to help you enter code. It won't tell you when you've misspelled the name of a class or forgotten a bracket.

An IDE, or Integrated Development Environment, is a tool that allows you to enter, compile, and upload code to your NXT using simple buttons. It also monitors code syntax, coloring your code so you can more easily identify the parts. This section will suggest a free, open source IDE for your leJOS NXJ needs.

One of the best open source IDEs is Eclipse by IBM (see Figure 2-6). It's free, powerful, and easy to use. It makes sense to use a more advanced IDE with the NXT since your code can grow quite large.

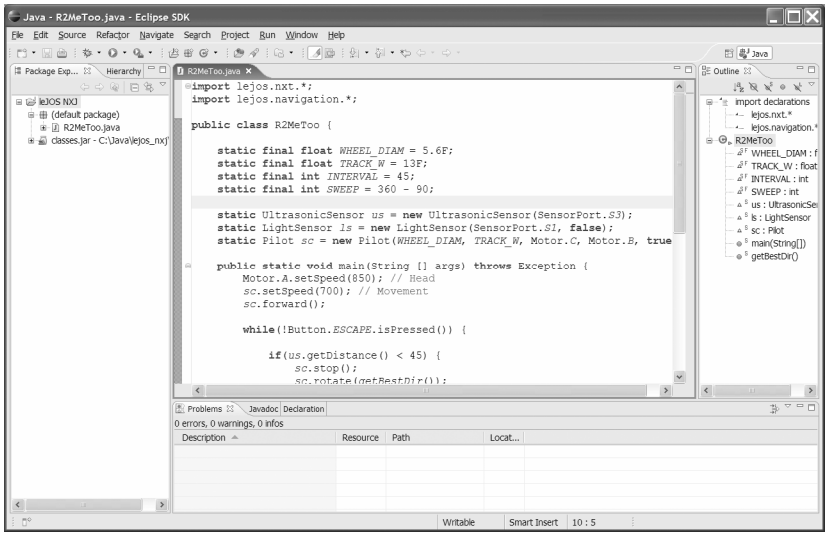

Figure 2-6 Programming in Eclipse.

Setting Up Eclipse

1. Download Eclipse from: www.eclipse.org
2. Decompress the files into a directory. This will be the permanent location for Eclipse.
3. That's it. Eclipse uses no setup and doesn't store registry settings or copy native library classes to other directories. To run Eclipse, double click the executable file in the Eclipse directory (or create a shortcut to this). To uninstall Eclipse, merely delete the Eclipse directory from your computer.

When you first run Eclipse you can browse some optional help files and tutorials. If you want to get right to Eclipse programming, close the Welcome tab.

Using Eclipse with leJOS NXJ

Now that you have Eclipse installed it's time to configure it for leJOS NXJ.

1. Set up a project in Eclipse for your leJOS NXJ code. Click on File > New > Project and you will see the new project Wizard (see Figure 2-7). Select Java Project and click next.

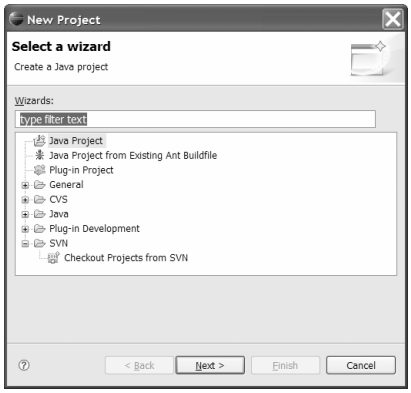

Figure 2-7 Creating a new project in Eclipse.

2. For project name enter something like leJOS NXJ. Click Next and then Finished. Eclipse creates a new folder for your leJOS NXJ code.

3. Now we need to set the Eclipse classpath to the leJOS classes. In the Eclipse menus select Project > Properties and you will see a Properties window for your project. Select the Libraries tab and select Java Build Path in the left hand frame (see Figure 2-8).

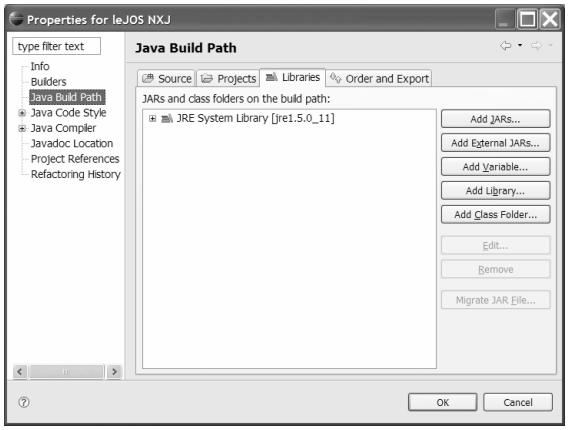

Figure 2-8 Changing project properties.

4. Click on Add External JARs… and browse to the classes.jar file in the lib directory where you installed leJOS. Click OK.

5. Now we need to set up the leJOS tools to compile and upload code to your NXT brick. Select Run > External Tools > External Tools… to bring up a new window. Select the Program item and click the New button (see Figure 2-9).

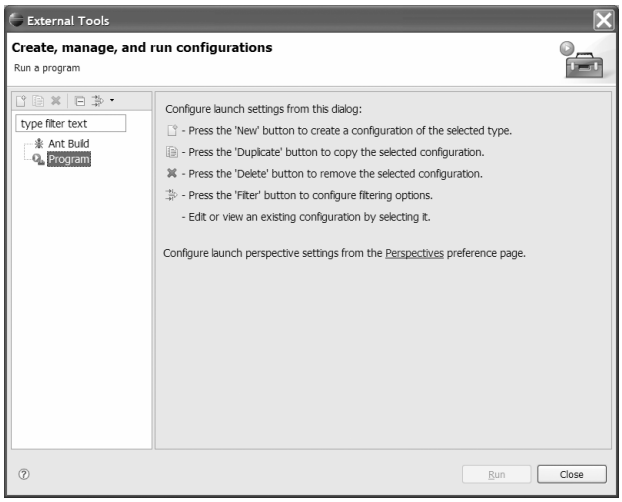

Figure 2-9 Adding leJOS tools to Eclipse.

6. First we'll create the compiler tool (see Figure 2-10). Type in NXJ Compile. For location, click Browse File System and browse to the \bin\nxjc.bat. For Working Directory click Browse Workspace and choose your leJOS NXJ project. Under arguments type in the following, then click Apply:

```
${java_type_name}.java
```

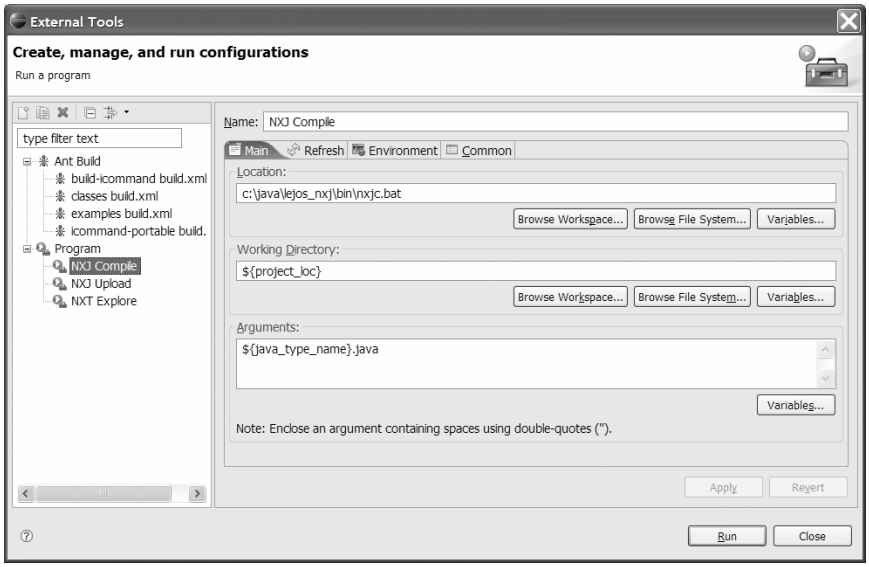

Figure 2-10 Setting up the leJOS compiler in Eclipse.

7. Now we'll create the tool used for transferring code to the NXT. Click the New Launch Configuration button again and type in the name NXJ Download. For location browse to bin\nxj.bat. For working directory click Browse File System and select your leJOS NXJ project. Finally in arguments type the following and click Apply:

```
${java_type_name}
```

8. You can also set up a tool used for exploring the files on the NXT brick. Click the New Launch Configuration button again and type in the name NXT Explorer. For location browse to bin\nxjbrowse.bat. For working directory click Browse File

System and select the bin directory. There are no arguments for this tool.

9. Select the arrow next to the Tools icon (green arrow with red tool kit), then select Organize Favorites. Click Add and add all three of the leJOS NXJ tools. Click OK. You can now organize them individually by clicking on them and selecting up or down. I prefer the order NXJ Compile, NXJ Download, and NXT Explorer. Click OK.

You can now compile and upload code to your NXT. When you select the arrow you will see the tools, ready for action. You can try using Eclipse with the example robot given below.