

## ITEC 120 Lab 4

Created by Dr. Ray

### *Reference links:*

<http://www.radford.edu/~aaray/template.java>

<http://www.radford.edu/~aaray/Robot.java>

<http://www.radford.edu/~aaray/robotDoc/Robot.html>

You need to turn in a lab report for this lab.

### **Step 1: Install java on your Robot**

Plug your Robot into the lab computer. Next, while looking at the NXT brick 's screen, turn it over, and use a paper clip to put the robot into firmware mode (there is a small button in a hole in the upper left hand corner of the robot). When you hear the brick clicking (you may need to put your ear on it to hear it), type `nxjflash` in the command prompt .

### **Step 2: Verify Lejos is on your Robot**

Turn the Robot off and then back on. Check the version level (currently .85).

### ***Task 1: Install and run a program on the Lego Robot***

#### **Step 1: Write a java program for the Lego Robot**

Intruders are about to capture your flag! Write a program that will move your Robot around a 1 foot square one time to guard the flag in the center of the square. Once you move around, the intruders will be scared and will run off! **Constraint:** use a loop to cause the robot to move around the square.

You will need to use the Robot class in order to solve this assignment. Download the Robot.java file from: <http://www.radford.edu/~aaray/Robot.java> and save it in the same directory where you will save your program.

In order to figure out what is possible with your Robot, you will need to look at the documentation which can be found at:

<http://www.radford.edu/~aaray/robotDoc>

The Robot class controls the functions on your Lego Robot. You can create a Robot by typing `Robot rob = new Robot();` in your java source file. You use the created Robot by typing the variable name, then a `.` then one of the functions listed in the documentation. For example `rob.moveForward();` moves the Robot forward one foot.

## Step 2: Compile and install your program

Start a command prompt (or use the one from task 1).

Type `nxjc filename.java` to compile your program.

Next type `nxjlink -o classname.nxj classname.`

Lastly, turn your Robot back on, then type `nxjupload classname.nxj.`

## Step 3: Running your first java program on the Lego Robot

Use the triangle pointing to the right to navigate the > down to the Files tab on the menu. Press the Orange button. Repeat the process again to select which program you want to run. Press the orange button to run your program.

If your program ran and didn't display anything, then it is because the Robot turns off as soon as it is finished executing. If you want it to wait and let you read the screen you will need to call the sleep method to tell it to wait a few seconds before it shuts off. *For example* `rob.sleep(3);`

*Hint for future assignments:*

Instead of executing the program, set it as the default. Now you can run the program simply by turning on the Robot and hitting the orange button. This helps a lot when you are constantly modifying / testing your programs.

## Task 2: Help Rob get a date

Rob is down on his luck when it comes to getting dates with the lady bots. He has his eyes on a bot named Mary and wants to impress her. Rob learned that birds of paradise do intricate song and dance routines in order to attract members of the opposite sex. He has designed a routine with four activities to impress Mary. It is your job to implement the four activities so that Rob can get a date with Mary.

Each activity should be implemented as a function. Each function should receive one parameter, the Robot object created in `template.java`. Robot's are expensive to create so you should make one and pass it as a parameter for functions that require it.

### *Activity 1*

In order to show sophistication, Rob reads a color and then moves based on the color. Red means move forward a foot, white means go left a foot, black means go right a foot.

### *Activity 2*

Rob wants to show off that he is an out of the box thinker. In order to do this he will turn right for Mary using only left turns.

### *Activity 3*

To show his sophistication and ability to more than move around simple shapes, Rob will move to each of the three points in a right triangle. The hypotenuse of the triangle is the square root of 8 and each of the other two sides is two feet long.

#### Activity 4

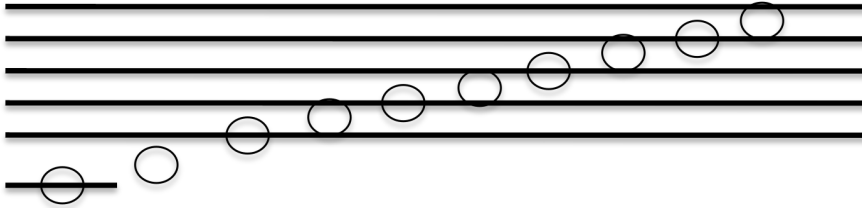
Mary loves lambs so to finish off your proposal, you need to program Rob to sing Mary Had A Little lamb to her. You can find the music for the song here:

<http://www.music-for-music-teachers.com/images/mary-had-a-little-lamb-no-keyboard.gif>

In order to play music you need to call the setBPM function (use 120 beats per minute for this problem) and the playNote function. You pass it a note to play, the type of note it is. For example Rob.playNote("A4", "q");

In order to know what notes (and types) are possible use the following picture:

### Musical Scale



C4 D4 E4 F4 G4 A4 B4 C5 D5 E5

### Musical Notes

- w – Whole Note
- h – Half Note
- q – Quarter Note

See the link at the top of this lab for the sheet music for Mary Had A Little Lamb. Use it, the scale, and the type of notes listed above to play the song.

#### Challenge problem:

Mary is impressed by your routine, but wants to see if you can mix it up and still perform the same actions. She wants you to sing to her, read a color and move based on the color, move in a triangle, then turn right using only left hand turns. Re-order your code so that you perform the dances in this order. *Note:* this should be as simple as changing the order of function calls.