1001ICT Introduction To Programming 2013-2
Laboratory 10

School of Information and Communication Technology
Griffith University

September 25, 2013

When	Teaching week 11
Goals	In this laboratory you will create a program using multiple threads.
Marks	6
Robots	Microwave-NXT

1 Preparation

Before your lab class:

- Print these lab notes. You need to refer to them *a lot* before the lab class and during it.

- Review the lecture notes section 20 on methods, particularly concerning the difference between local and global variables.

- Review the lecture notes section 24 on threads.

- Review the nxt environment documentation, particularly section 19 on Threads.

- Acquaint yourself with the configuration of the Microwave-NXT.

- You can write your program before the laboratory class.

2 Background

3 Pre-laboratory questions (1 mark)

View this movie and answer the following questions that will help solve the programming problems.

1. Describe (in English) two conditions that control whether the model microwave should be cooking (rotating the turntable).

    (a)

    (b)

2. The microwave should be cooking when (pick one):

    (a) both of the above conditions are true (and).
    (b) at least one of the above conditions is true (or).
    (c) only one of the above conditions is true (xor).

3. Describe (in English) two conditions that control whether the model microwave's light should be on.

    (a)

(b)

[ ]

4. The light should be on when (pick one):

   (a) both of the above conditions are true (and).

   (b) at least one of the above conditions is true (or).

   (c) only one of the above conditions is true (xor).

5. Write a MaSH statement that will make a program wait for one tenth of a second.

[ ]

6. Write a MaSH statement that will make the NXT play an audible tone for half a second.

[ ]

7. In a threaded program, the `main` function can't call the `run` methods directly, and the `run` methods can't call the `main` method, and they don't have parameters anyway. So how could these methods share information?

[ ]

4 Activities

4.1 nxt program 1 (3 marks)

Create a program that controls a microwave oven. The oven should operate as follows:

- A simple microwave has a simple timer that counts down from the desired cooking time to zero.

- The button on the front adds 5 seconds to the desired cooking time. For example if it is pressed three times, then 15 seconds should be added to the cooking time. It can be pressed at any time by the user, whether the microwave is currently cooking or not. Because of this, waiting for a press on the button is best done in a second thread.

- When the button is pushed, the NXT should beep.

- So long as there is time left to cook, cook for 1 tenth of a second, before checking whether there is time left to cook again.

- When "cooking", the turntable should be rotating.

Hints:

- This first version is not meant to be safe, that is, the microwave cooks whether the door is open or not. Nor does it turn the lamp on or off, play a tune when finished, or display anything on the LCD.

- Use a variable to hold the time left to cook. Remember that it needs to count time in 0.1 s intervals. So to represent 5 seconds, the variable needs to contain 50.

- Use one thread for waiting for the button, and another for cooking whenever there is time left to cook.

4.2 nxt program 2 (2 marks)

- Make the microwave safe by making sure it does not cook when the door is open.

- Make the microwave play a tune when cooking is finished.

4.3   nxt program 3 (no marks, just kudos)

- Make the lamp come on and off at the appropriate times.

- Display the time left to cook in whole seconds in the LCD.

5   After the Laboratory

- Organize the work you have done into folders on your network drive.