CMP 108: Programming for Non-Majors

Lecture Notes

9 February 2007

Prof. Katherine St. John

Lehman College & the Graduate Center

City Universtity of New York

Overview

- Announcements
- Review
- More on NQC
- Downloading Programs to the Robots

Announcements

- Blackboard
- Online help & manuals
- Reading and homework

Review

Last time:

- What is a computer?
- Overview of Lego Mindstorm Robot
- Introduction to NQC

Programming

Recall that:

- The general process is:

You write a program that looks like English (with lots of rules)	$\Rightarrow$	"compiling"	Gives a binary file the computer can understand	$\Rightarrow$	You "run" the binary to execute the program

- A program is a set of instructions for the computer to follow.
- Programs implement algorithms– step-by-step directions for performing a task.

A Simple Program

```
// tankbot1.nqc - drive straight ahead

#define LEFT OUT_A
#define RIGHT OUT_C

task main()
{
    On(LEFT+RIGHT);
    until(false);
}
```

Some Useful NQC Commands

Command	Definition	Example
`On(`*outputs*`)`	turn on outputs	`On(LEFT+RIGHT);`
`Off(`*outputs*`)`	turn off outputs	`Off(LEFT+RIGHT);`
`Fwd(`*outputs*`)`	sets to foward direction	`Fwd(LEFT);`
`Rev(`*outputs*`)`	sets to reverse direction	`Rev(RIGHT);`
`Wait(`*time*`)`	wait for time $\frac{\text{time}}{100}$ seconds	`Wait(100);`

Tankbot2

```
// tankbot2.nqc - drive and turn

// motors
#define LEFT OUT_A
#define RIGHT OUT_C

// how much time to spend turning or forward
#define TURN_TIME 200
#define STRAIGHT_TIME 100

// speed to run a turned motor
#define TURN_POWER 3
```

Tankbot2 (Continued)

```
task main() {
    // start with both motors on
    On(LEFT+RIGHT);

    // repeat the following steps forever
    while(true) {
        // turn right by slowing down the right tread
        SetPower(RIGHT, TURN_POWER);
        Wait(TURN_TIME);
        // resume going straight
        SetPower(RIGHT, OUT_FULL);
        Wait(STRAIGHT_TIME);
        // turn left
        SetPower(LEFT, TURN_POWER);
        Wait(TURN_TIME);
        // resume going straight
        SetPower(LEFT, OUT_FULL);
        Wait(STRAIGHT_TIME);
    }
}
```

Now what?

Once you've written a program, you need to download to your robot to run it.

The basic steps are:

- Type the program on the PC and save as an NQC file.
- Using the I/R tower, download the program from the PC to the robot.
- Run the program on the robot (green button).

First Activity

- Goal: To navigate a small obstacle course, making precise turns.
- Warm-up: Direct the robot to trace out a square, making 90° turns.
- Start: Direct the robot to turn 360°? Then, 90°?

NQC Demo

Use NQC to solve the warm-up exercises.

Getting Started with Your Robot

For today's lab, you need:

- an I/R tower (to download programs)
- a robot that can move forward (wheels, legs, treads,...)
- new firmware loaded on the robot

Firmware

- Your robot needs firmware specially designed to interpret C/C++/Java programs.
- The first lab has directions on how to download the firmware.
- Once loaded, you can then put your own on the robot.

Today's Lab

Quick overview of Lab 1.