CPE 470-670 – Autonomous Mobile Robots

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Lab 2 – Handout

1. Start using the NXT board

Begin by reading Sections 1, 4, and 5 from the user manual provided on the class website at:

http://www.cse.unr.edu/~monica/Courses/CPE470-670/Resources/User_Manual.pdf

2. Write your first programs

For these programs, you can use as reference the user manual (listed above), and the NXC tutorial and user guides from the class webpage:

http://www.cse.unr.edu/~monica/Courses/CPE470-670/Resources/NXC_tutorial.pdf
http://www.cse.unr.edu/~monica/Courses/CPE470-670/Resources/NXC_Guide.pdf

- **Beeper program**:

Write a program to sound the beeper for 3 seconds with 500 Hz frequency, then be silent for 1 second, and then sound the beeper for 3 seconds with 100 HZ frequency, be silent for 1 second and finally sound the beeper for 2 seconds with 1000 Hz frequency.

- **Motor program**

Write a program to turn on the motor connected to port No. 1 with 50% power, work for 3 seconds, sound the beeper, reverse the motor with 50% power for 2 seconds, sound the beeper, turn off the motor for 2 seconds, then turn it on with full power for working 3 seconds, sound the beeper and turn it off.

- **Sensor program**

Write a program for your robot so that when one of its touch sensors is triggered, it will start rotating around itself until the same touch sensor is triggered for the second time. Your program should print a message on the NXT display each time the touch sensor is triggered.

- **Obstacle avoidance**

Implement an obstacle avoidance program that behaves like this:

i) If the left touch sensor is pressed, the robot should go backwards for half a second, then turn to the right for half a second.
ii) Similarly for the right sensor
iii) If both sensors are pressed, the robot should go backwards for half a second, then make a larger turn (one second) either to the left or to the right.

Implement the same program, but now using the sonar sensors. Consider that the sensors are triggered whenever the distance given by the sonar sensors is smaller than a threshold (3 to 4 centimeters). You will have two obstacle avoidance programs.

- **Multi-tasking program**

Rewrite your obstacle avoidance program as a multi-threaded process. You should implement the following processes: *check_sensors* to detect if a touch sensor has been pressed, *move_forward* to keep the robot moving forward if no sensors have been pressed and avoid to have the robot move backward and turn when a sensor has been pressed.

Upload all your programs on your team's website before midnight on Monday, September 16. These will constitute a part of your evaluation for this lab. The website should be available by the beginning of lab time on Monday, September 16. Each team should send the link to their website, along with the team number, to monica@cse.unr.edu by 2:30pm on Wednesday, September 11.