

CS 4222
Programming Assignment II

February 9, 2013

Important Dates and Weightage

Due: Feb 23, 23:59

Late Penalty: 10% per day

Weightage: This assignment carries 11% towards the final grading.

Overview

In this homework, students will be performing the following tasks:

- 1) Collect data from different sensor boards. Particularly, students will be using the TelosB default sensors and the SBT80 sensor boards.
- 2) Understand the output of sensors and convert them into human readable units.
- 3) Communication among motes over the radio.
- 4) Programming on the Indriya testbed.

A Brief Overview of Indriya

Indriya is a 3-dimensional wireless sensor network testbed deployed in the main SoC building (COM1). The testbed is installed with 127 TelosB nodes with 50% of them equipped with SBT30, SBT80, WiEye, or TelosB default sensor boards. Indriya provides a web-based interface to upload executables, associate those executables with motes to create a job, and schedule the job to run on the testbed. Indriya's web interface can be accessed at <http://indriya.comp.nus.edu.sg>. A test application can be downloaded from Indriya's website: <http://indriya.comp.nus.edu.sg/motelab/html/SendToUART.tgz>

Tasks

This assignment is organized into two tasks as described below.

- 1 The first task is to write a program that periodically samples the three default sensors (namely light, humidity and temperature) available on

the TelosB mote that has been issued to the students. The output of these sensors are raw values, it is required to convert them into the units that can be understood by human. For example, for the temperature readings, convert them to Celsius ($^{\circ}\text{C}$). The program is expected to read the sensors and transmit corresponding readings to a PC. You are also required to include a client program to view the transmitted readings on the PC. The output is expected once in every 5 seconds containing both raw and converted values for each of the three sensors.

- 2 Write a program to periodically collect data from all the three sensors on a TelosB mote (node-A) on the Indriya testbed. This is exactly similar to the above task and you must reuse the code. However, in addition to logging the sensor readings on to the USB port, the readings must also be transmitted on the radio. The radio message must contain only the converted readings from all the three sensors and it should be destined to a nearby Indriya's node that is equipped with a SBT80 sensor board (node-B)¹. On receiving the radio message, the node-B must sample its SBT80 light and temperature sensors, convert the corresponding readings, and compare them against those readings received from the node-A. Finally, the node-B must log both the SBT80 readings and those of default sensors received from the node-A on to its USB port.

For the above tasks, make sure that you use the correct sensor components of TinyOS for reading sensors: (1) the component HamamatsuS10871TsrC to sample the default visual light sensor; (2) the component SensirionSht11C to sample both the default temperature and humidity sensors; (3) The details on the SBT80 sensor board and the code to read its sensors are available at <http://easysen.com> and http://easysen.com/support/TinyOS_2/ respectively.

Submission

Please submit the code including the Makefile to the IVLE workbin as a single tar file. The tarfile should be called *CS4222_PA2_USERNAME.tar.gz*,

¹A list of motes and their sensor boards available on the Indriya are given at the end of this document.

where USERNAME is the student ID. The submission should also contain the following.

- 1 All the logged data in Indriya will be automatically stored in a database. The user can access this database in realtime and the data will also be made available to the users on the completion of their jobs in the form of text-based data files. It is required to submit these data files from both the node-A and node-B.
- 2 Indriya also contains copies of these data files, you need specify their names for validation purpose.
- 3 A README file describing how to compile and execute the code.

If you submit multiple versions, only the last version will be graded. If the last version is a late submission, marks will be deducted based on the date of submission.

Grading

Points allocations are as follows:

30 points - read sensors and conversion of the readings

10 points - successful submission of jobs to Indriya

60 points - successful radio transmission and generation of log files by the nodes A and B

List of nodes and sensors on Indriya

Nodes on Indriya are identified by their permanent numerical IDs and we use those IDs in the list in the format of “node ID containing default sensors/node ID containing a SBT80 board”, For example, the entry “2/3” indicates that the node-2 has default sensors and node-3 is equipped with a SBT80 board. Moreover, it also indicates that nodes 2 and 3 are within the radio communication range of each other.

List of node pairs: 2/4, 11/14, 10/5, 26/34, 38/36, 56/45, 40/52, 54/51, 61/57, and 68/64.