Lab 1. Introduction

**All students do Lab1 by themselves (no partner for Lab 1)**

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# Preparation

Read Chapter 1 section 1.12 and Chapter 2 section 2.5 of the book

Get the starter project Lab\_1\_Starter\_Files from **Blackboard**

# Purpose

The general purpose of this laboratory is to familiarize you with the software development in the C programming language. We choose a problem that exercises problem-solving skills you acquired in ECE1331 that allow you to devise a solution (algorithm). However, you will code the solution in C instead of assembly.

# Requirements

The objective of this lab is to write support routines that are called by a controller to perform data analysis. The controller is collecting temperature sensor data periodically. Your task is to write three data analysis routines so the controller can call them as part of its control algorithm. The sensor data of N readings is collected in an array that is declared globally as:

uint8\_t Readings[N];

The specific routines are:

1. uint8\_t Find\_Mean() - Computes the mean (average) of the the temperature sensor data collected in the Readings array. The return result is an integer, therefore any fractional component of the computed mean must be truncated.
2. uint8\_t Find\_Range() - Computes the range defined as the difference between the largest and smallest reading.
3. uint8\_t IsMonotonic() - Checks whether the recorded readings are a non-increasing monotonic series. The controller performs some remedial operation and the desired effect of the operation is to lower the the temperature of the sensed system. This routine helps verify whether this has indeed happened.  
   Example1: If the readings are as follows:   
   Readings[N]= [100,98,95,94,90,90,89,85,80,78,75,75,75,73,72,72,65,60,54,54,45]   
   then they are indeed a non-increasing monotonic series as shown by the plot below (left), and so the routine would return a True(1).   
   Example2: If the readings are as follows:  
   Readings[N]= [100,80,40,100,80,40,100,80,40,100,80,40,100,80,40,100,80,40,100,80,40]   
   then they are *not* a non-increasing monotonic series as shown by the plot below (right), and so the routine would return a False(0):

|  |  |
| --- | --- |
| rm1.png | rm2.png |

# Procedure

The starter project provided (Lab\_1\_Starter\_Files) has a C file, Lab1.c. All your tasks are performed by writing code for the three subroutines (called functions in C) whose blank stubs are provided in Lab1.c.

You can go to <http://www.putty.org/> to download and install Putty to your system. You can then use this software to display the result of the lab.

# Demonstration

During the demonstration, you will be asked to run your program to verify proper operation. You should be able to single step your program and explain what your program is doing and why. You need to know how to set and clear breakpoints, watch global variables like the Readings array and any local variables you declare in your subroutines.

# Deliverables

A printout copy of your Lab1.c code to hand it to the TA.