Lab 1. Introduction

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

Preparation

Read Chapter 1 section 1.12 and Chapter 2 section 2.5 of the book
Get the starter project Lab1_EE319K from **Git** following the instructions provided on Canvas.

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 EE306 that allow you to devise a solution (algorithm). However, you will code the solution in C instead of assembly.

Requirements

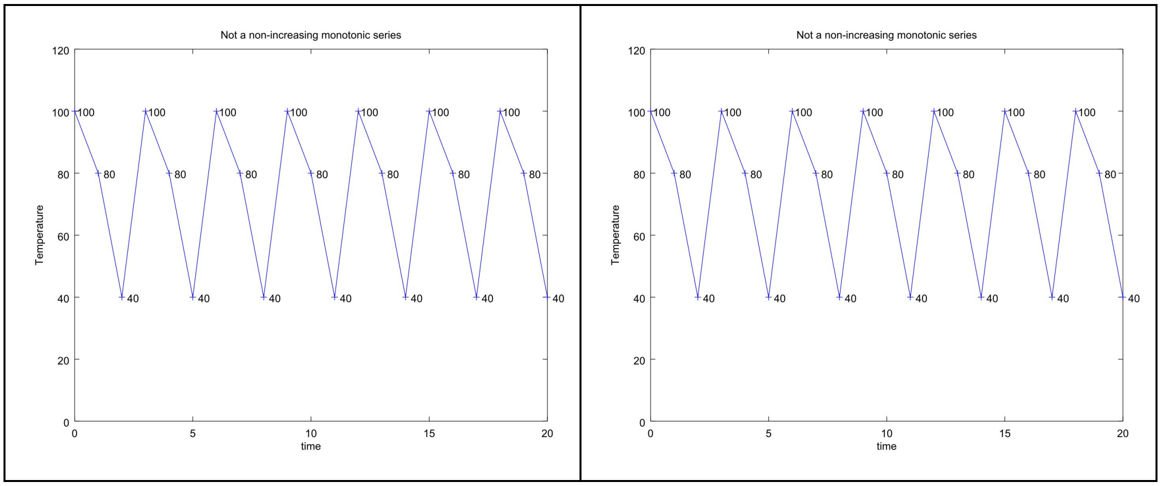
The objective of this lab is to write support routines that are called by a controller to perform data analysis. The controller is collecting temperature sensor data periodically. Your task is to write three data analysis routines so the controller can call them as part of its control algorithm. The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

```
uint8_t Readings[N];
```

The specific routines are:

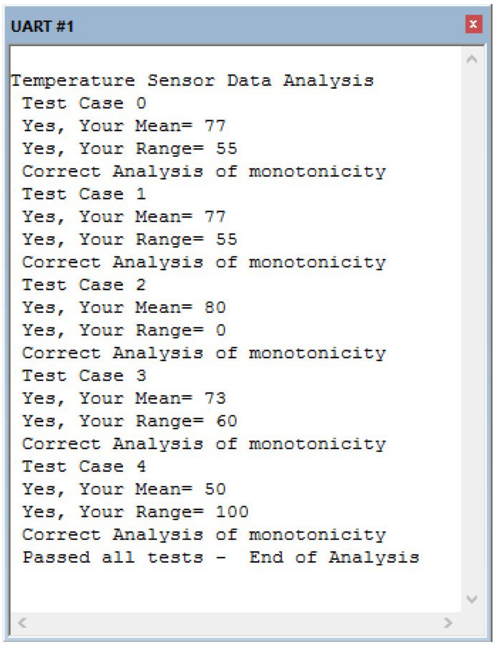
1. `uint8_t Find_Mean()` - Computes the mean (average) of the the temperature sensor data collected in the `Readings` array. The return result is an integer, therefore any fractional component of the computed mean must be truncated.
2. `uint8_t Find_Range()` - Computes the range defined as the difference 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)`:



Procedure

The starter project provided (Lab1_EE319K) has one assembly file Startup.s and two C files, main.c and 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.
To test whether your implementations of these functions are correct, you can run the project in the simulator and you should get the following result on the UART window:



```
Temperature Sensor Data Analysis
 Test Case 0
 Yes, Your Mean= 77
 Yes, Your Range= 55
 Correct Analysis of monotonicity
 Test Case 1
 Yes, Your Mean= 77
 Yes, Your Range= 55
 Correct Analysis of monotonicity
 Test Case 2
 Yes, Your Mean= 80
 Yes, Your Range= 0
 Correct Analysis of monotonicity
 Test Case 3
 Yes, Your Mean= 73
 Yes, Your Range= 60
 Correct Analysis of monotonicity
 Test Case 4
 Yes, Your Mean= 50
 Yes, Your Range= 100
 Correct Analysis of monotonicity
 Passed all tests -  End of Analysis
```

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

Items 1-2 are one pdf file uploaded to your **Git** Lab1 assignment private repo. You must have this file open during demo.

0. Lab 1 grading sheet. You can print it yourself or pick up a copy in lab. You fill out the information at the top.
1. Lab1 C source code from your Lab1.c
2. A screenshot of your UART1 window.
3. Optional Feedback : http://goo.gl/forms/rBsP9NTxSy