CMPE 443 PRINCIPLES OF EMBEDDED SYSTEMS DESIGN

LAB #002 "Simulation"

1) Preparation for Using Keil and QEMU *(10 minutes)*

This part will not be graded. It will enable you to get ready for the prelab.

You have already generated the **.axf** file from the Keil in PreLab #002. You can directly use this file on the QEMU environment.

- Open the Keil.
- Open the project you did on the PRELAB #002.
- Open Qemu Environment.

Observe that everything works as it did in the Prelab #002.

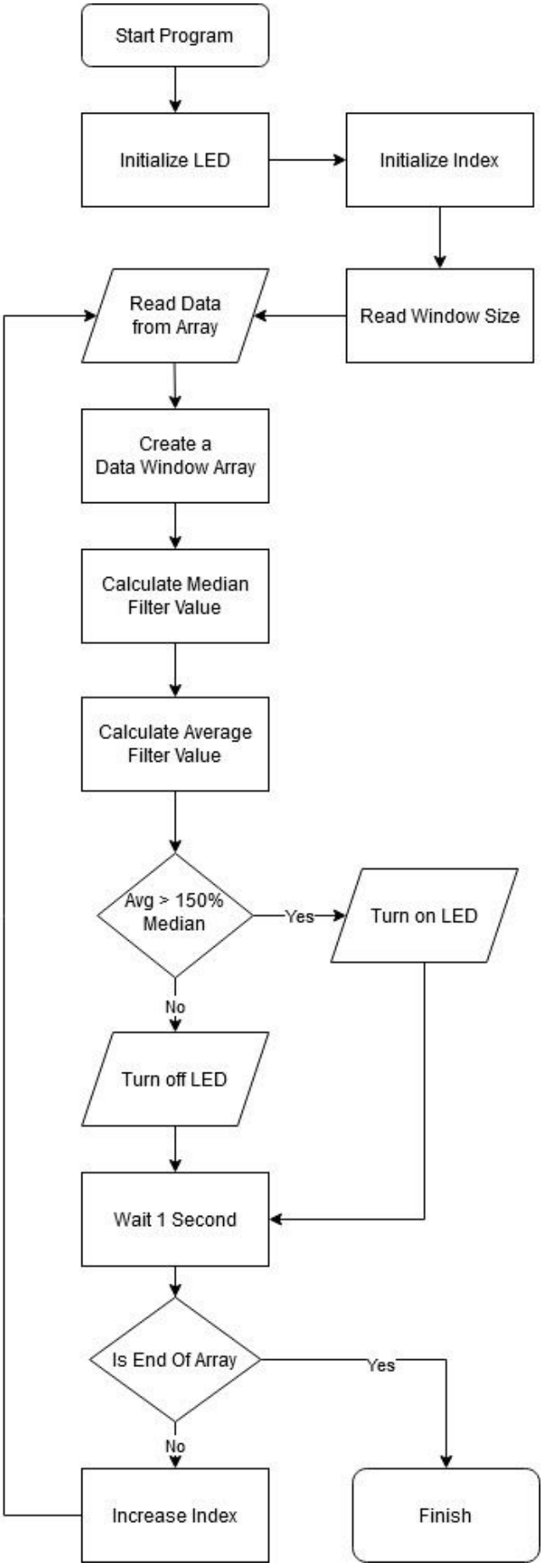
2) Simulation *(40 minutes) - 9 pts*

This part will be graded.

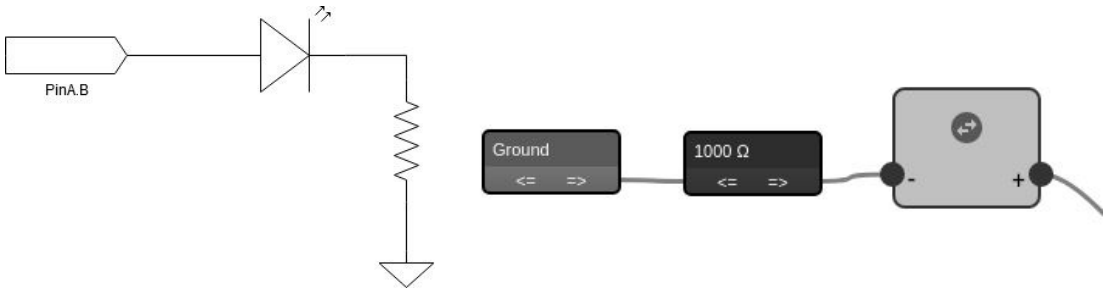
In Moodle there is a quiz for this lab. In your code, change the WINDOW_SIZE, sensorData variables values and pin & port location of the LED as given in the quiz question.

In addition to the median filter, you will add an average filter[1] to your code. Average is the arithmetic mean of N numbers. Average filter is used for taking arithmetic mean of data values in a window of size N. You will use the same windowed sensor data for both filter and when the average filtered value is more than 150% of the median filter value (Average Filtered Value > (Median Filter Value + 50% of Median Filter Value)), you will turn on the LED otherwise turn off the LED.

[1] https://en.wikipedia.org/wiki/Moving_average#Simple_moving_average


Start Program
Initialize LED
Initialize Index
Read Window Size
Read Data from Array
Create a Data Window Array
Calculate Median Filter Value
Calculate Average Filter Value
Avg > 150% Median
Yes
Turn on LED
No
Turn off LED
Wait 1 Second
Is End Of Array
Yes
No
Increase Index
Finish

The LED circuit (You will use the PinA.B as shown in the Moodle. A: Port Number and B:Pin Number):



Build your code and run that code in Qemu and Visualizer as you did before.

Answer the questions in Moodle *3 pts*

- How many optimization levels exist on the Keil compiler? _____
- Find the best compiler optimization parameter for minimizing the Code Size. _____
- How code behaves with highest level optimization? _____

You will submit three files: 6 *pts*

LAB<exp num>_<StudentID1>.c (This will be your main.c file)

LAB<exp num>_<StudentID1>.h (This will be your SensorData.h file)

LAB<exp num>_<StudentID1>.lpc-vcf (This will be your exported circuit file)

LAB<exp num>_<StudentID1>.axf (This will be generated axf file for changed variables)

Do not send a compressed file. Send the files as they are.