Lab 6: Digital Filters: Low Pass, High Pass, Median, and 60 Hz Notch

PURPOSE: To create digital filters using C++ coding instead of building them on your breadboard. The advantages to using digital filters are that they can be easily designed, tested, and changed without affecting the circuitry (hardware), whereas an analog filter can only be changed by redesigning the circuit. Another advantage is that digital filters are extremely stable and are not affected by the external environment and subject to temperature or component error like analog filter circuits.

GOAL: Today you will be adding code for High Pass, Low Pass, Median, and 60 Hz Notch filters to your previously existing code. To do this you must first add the given Low Pass Filter program to your master program and then modify it to produce the three programs described in the Tasks portion of the Lab.

PROCEDURE:

Hardware

1. You will be using both the circuit and p.c.b. from Lab 5.

Software

1. Open MPLAB and add Low Pass Filter program to your already existing master program.

TASKS:

1. You were given the code for a Low Pass Filter - now you need to modify that code to create High Pass, Median, and 60 Hz Notch Filters.

Low Pass (LP) Filters eliminate all frequencies above the predetermined cut-off frequency; while leaving the frequencies below the cut-off unchanged.

High Pass (HP) Filters are the opposite of a LP - they eliminate all frequencies below the predetermined
cut-off frequency; while leaving the frequencies above it unchanged. Median Filters are smoothing and moving filters which are used to eliminate noise while preserving the edge values of your data. 60Hz Notch Filters also eliminate noise but only noise at 60 Hz.

All of these filters will help clean up your ECG signal.

2. Once you have finished the three new filters you can add them to your master program.

3. You also need to add four new modes to your program for the LP, HP, Median, and 60 Hz Notch filters, as well as add some code for the LCD Display.

4. Once you have programmed your code you can connect leads to one of your group members and run the signal through your ECG p.c.b. and then through your four new filters. The pushbutton will allow you to switch between filters.

5. You should be able to view and ECG waveform after it has run through your filters on the oscilloscope.