EMG Thresholding Algorithm by using LabVIEW

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Abstract— In Electromyographic signal analysis it needs to use a threshold level on electromyographic signal for detection of muscles activity. EMG Thresholding is project of biomedical and rehabilitation field. It is the main step for check the threshold set level on electromyogram. This paper describes an algorithm of EMG Thresholding by using array, filtering, spectral measurements, thresholding and Wavelet Deniose in LabVIEW and analyzing the result.

Key words: LabVIEW, EMG

I. INTRODUCTION

Electromyograph (EMG) is a diagnostic tool which measures and records the electrical activity of the muscles. These electrical signals are collected from active muscles by the use of electrodes which are placed on the surface of the skin.

Generally EMG signals are variable to the amplitude of the muscle activity. There is a sequential order to perform a specific muscles activity in different muscle groups. Self-repeating periodic activity defines a period of time in which certain muscle participates in the activity. The EMG include onset and offset times to identify the time period of EMG bursts.

In this paper, we set the default threshold value and it gives the threshold peak level on the electromyograms which is helpful in prediction of muscle stimulation for upper limb as well as lower limb amputee. It is perform by using LabVIEW.

II. METHOD

This section elaborates the method which is useful to filtrate human EMG signal and apply Spectral Analysis Wavelet Denoise on it.

A. Start using LabVIEW:

- The LabVIEW Environment
- Front Panel
- Block Diagram
- Palettes: Control Palette, Function Palette, Tools Palette
- Data Types
- Property Nodes

B. EMG Signal Waveform:

Above figure 1 represent the block diagram for acquired EMG signal. First create file path and then it read a specific number of lines or rows from a numeric text file which begins at a specified character offset and converts the data in to 2D, double precision array. Next give the input in to array subset which contains index and length element. Set index 0 and Length 1 which are default values. Than provide reshape array to change the dimension size between 0 to m-1 its default set value is 1000 in these algorithm. Than it requires building waveform which modifies an existing waveform and gives the EMG signal waveform which depends on the input file path.

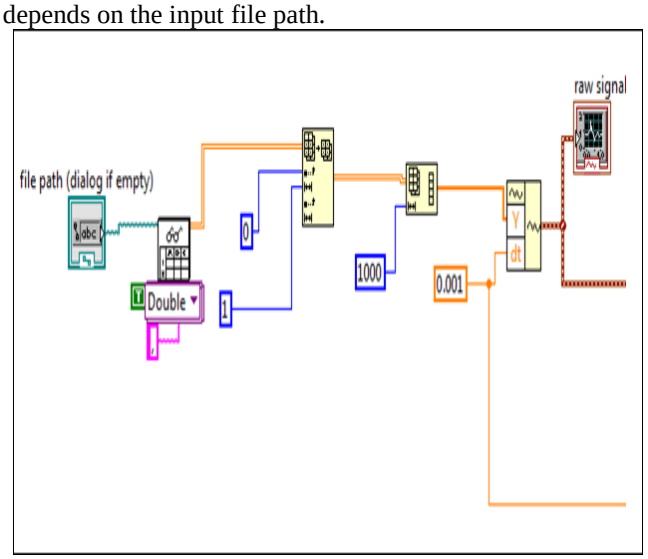

Fig. 1: Block Diagram for Acquired EMG Signal

C. Filtering of EMG Signal and Provide FFT based Spectral Measurements.

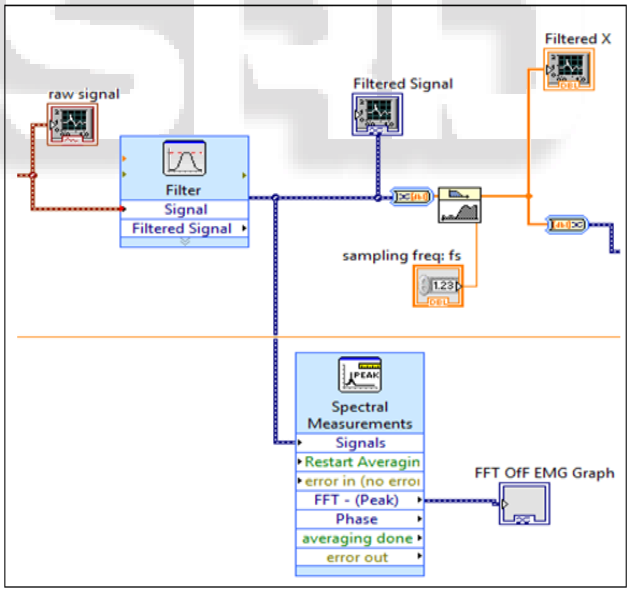

Fig. 2: Block Diagram for Filtering of EMG Signal and Provide FFT based Spectral Measurements

By using this above block diagram it display real EMG signal and fed in to low pass filter with set bandwidth 1 KHZ as set in EMG acquisition system. At this stage, it is important to display sample data by providing 200 sampling frequency. This signal performs FFT based spectral measurement which contain the Averaged Magnitude Spectrum, Power Spectrum and Phase Spectrum for a signal. This Signal also needs high pass FIR filter with Equi-Ripple characteristics.

D. Thresholding Peak Level:

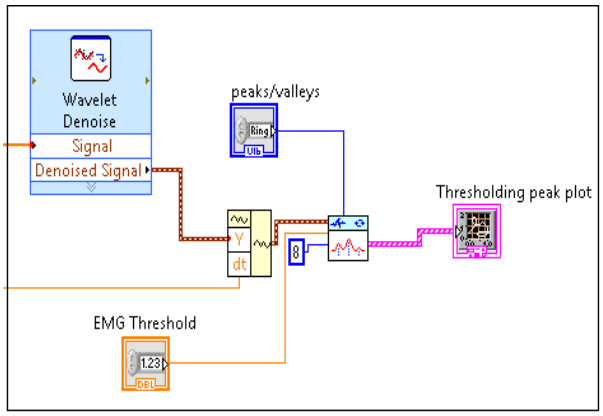

Fig. 3: Block Diagram of Thresholding Peak Plot

Above mentioned figure 3 represent the wavelet denoise, It is useful to perform noise reduction for 1D as well as 2D signal. By using Building Waveform it gives filtered Signal. This is input signal for Multi Scale Peak Detection. This function needs to provide constant Peak Valley, and width approx. 8. At this stage it needs to set threshold value for EMG Thresholding Peak Level on this filtered EMG signal. For this algorithm initially set 0.001 threshold value and it can be set as per muscle potential's need.

III. Expected Result

A. EMG Signal's Waveform:

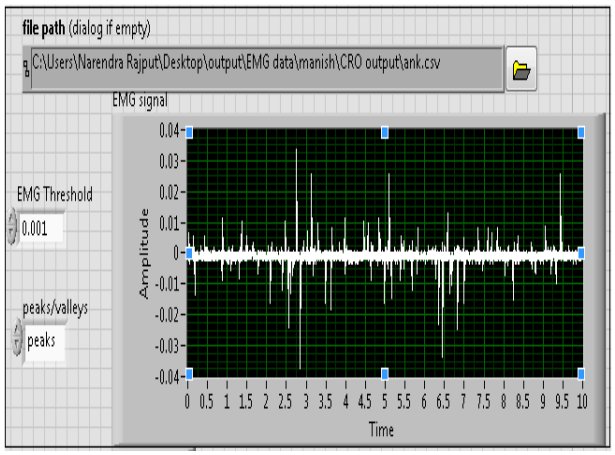

Fig. 4: Output of EMG Signal in LabVIEW

B. Low Pass Filtered EMG Signal's Waveform:

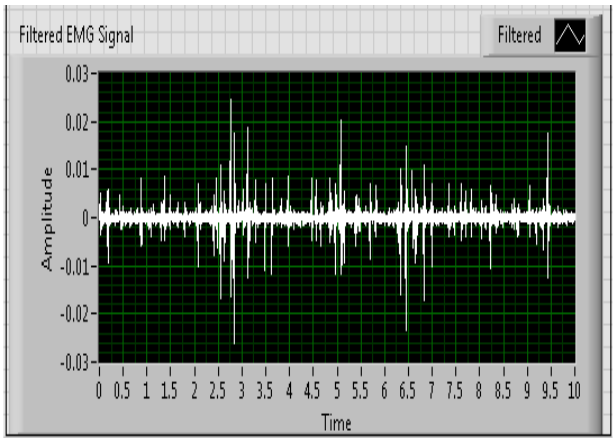

Fig. 5: Output of Low Pass Filtered EMG signal in LabVIEW

C. High Pass Filtered EMG Signal's Waveform:

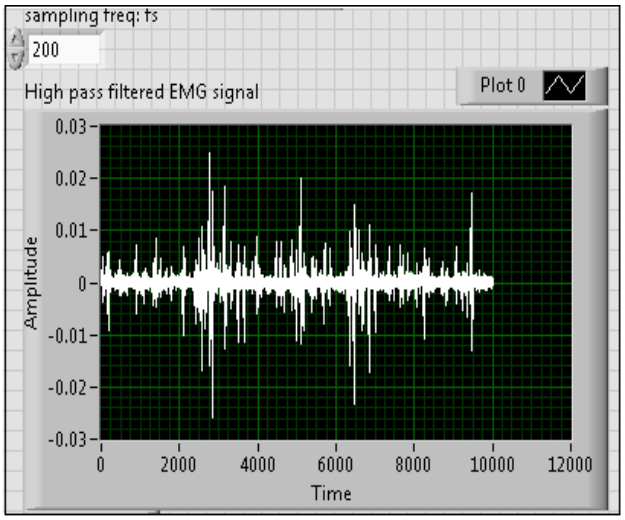

Fig. 6: Output of High Pass Filtered EMG Signal according to its Sampling Frequency in LabVIEW

D. Applying FFT on Sampled EMG Signal:

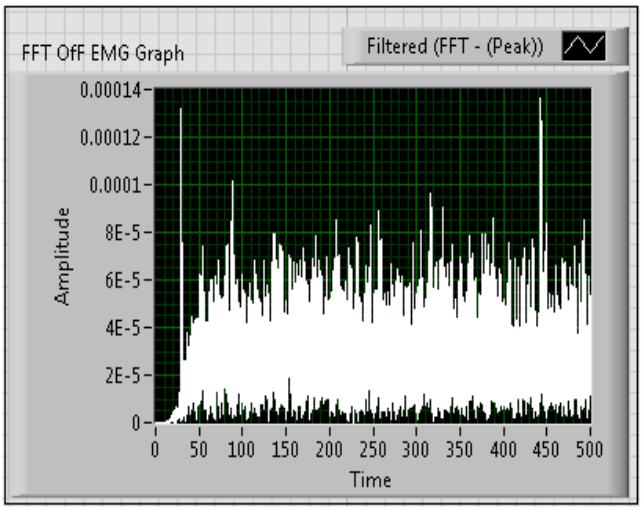

Fig. 7: Output of Sampled EMG Signal by Applying FFT (Fast Fourier Transform) in LabVIEW

E. Thresholding Peak Plot:

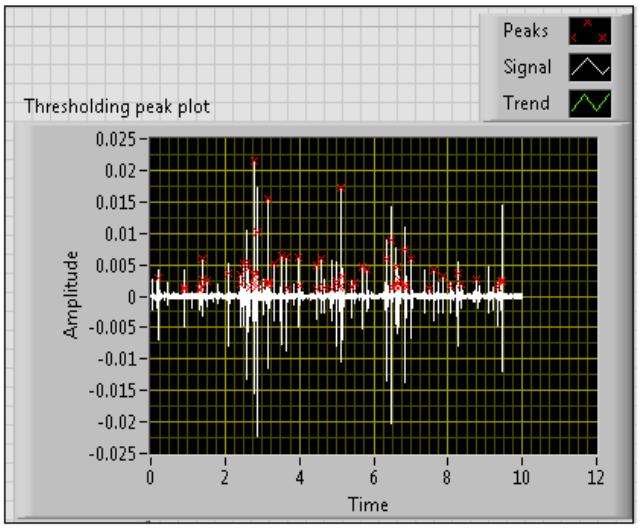

Fig. 8: Output of Thresholding Peak on EMG Signal in LabVIEW

IV. CONCLUSION

A simple algorithm for the EMG Thresholding peak on plot with the help of LabVIEW is presented in this paper .The result saw the Thresholding peak level on the EMG signal. This obtain Threshold peak level on signal can be helpful in muscle stimulation.

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