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SYSTEM ANALYSIS OF EMG SIGNAL FOR VARICOSE VEIN

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ABSTRACT

Earlier acquisition of biosignals was a difficult task. Whereas implementation in medical instruments used for acquiring biosignals from visually obtained signal which are recorded and desired patterns are recognized and they are compared with normal and specified application levels of diagnosis detecting varicose vein. These signals must be measured, analyzed and correlated such that pattern recognition plays a vital role which decides the desired waveforms from extracted from EMG signal. Peak signals at 128Hz and 256Hz are detected and extracted at various sensor points that are placed. Biosignals can be generated from different physiological movements of human like Electrocardiogram (ECG), Electromyogram (EMG), Electroretinography (ERG), Electroneurography (ENG), etc,. Acquired EMG signal by implementing in MATLAB for ordinary muscle function varies with muscle strained for hours while standing.

Keywords—Biosignal,MATLAB,EMG.

I. INTRODUCTION

Biosignals are those which may refer to both electrical as well as non-electrical signals particularly referring to time-varying signals. Acquisition of signals was hectic earlier to measure and monitor them continually. Electric current changes produce difference in electrical potential in human body tissues, organs and organ system which gives rise to biosignals such as ECG, EMG, EOG, etc,. Basically biosignal processing undergoes four stages. Acquisition of signals where these signals are in digitized form, transformation of signals, occurs when transformed signals are further specifying signal parameters. Finally, classification of signals are obtained as interpreted signal ,such signals registers difference between electrodes that are kept attached to skin with the help of differential amplifier.

Electrical activity that are evaluated and recorded which is an EMG used for diagnosis of bioelectrical signals produced by skeletal muscles. Electromyography is the instrument that performs EMG and produced signal is recorded by electromyogram. Abnormalities used for detection in medical field, movements performed by human analyzing their biomechanics can be found. New sensor technology has been developed, methods for measuring electric fields without contact of the skin. Measuring of brain waves and heart beat rates for patients with severe burns can be measured. Cleaning the surface of skin with an alcohol pad, placement of needle electrode may be difficult task because it depends on various factors to be considered such as selection of particular muscle of interest and even size of the muscle. Detecting deeper muscles is unable to penetrate action potentials of the superficial muscles but it is more effective on superficial muscles. More fatter an individual, more weaker will be the EMG signal.

To record areas which are tiny, single fiber EMG are implemented. Very local form of picture only wile be obtained for tracking the activity of muscle, because inner structure of skeletal muscles differ, so for accuracy of placing electrodes at various points are followed. Special advanced training required for performing single fiber electromyography so surface EMG is followed to monitor auditory and visual stimulus. The maximum a muscle can contract is basically being tested in measuring EMG.

Depending on application, different analytical methods are used generally for detecting muscle activation. Maximum a muscle voluntarily contracts refers to the analysis of peak signals and the generation of force exerted by those target muscles. The extent of fatigue can also be indicated by EMG when the signal mean absolute value increases, amplitude variation occurs, prolonged strain of action potential lowers the level of frequencies gradually.

II.EMG RECTIFICATION

Rectifying a signal assures that the original EMG signal does not average to zero, the original EMG signal will have positive as well as negative components. First, the signal has to be processed for calculating mean, integrating them and applying fast fourier transform (FFT) is done. While rectifying the EMG signal they may be full length or half length frequency types. Adding EMG signal (usually negative polarity) below and above baseline making the signal completely positive in case of full length. This is followed widely because it conserves majority of energy during analysis in positive polarity. Deletion of EMG signal only below baseline is done in rectifying half length. In this case, average of data will be no longer approaching itself to zero so it is used widely in statistical analysis. Rectification of full wave gives absolute value about array of data points is their only difference between the two types of rectification. When one muscle interferes with the other there occurs cross talk of muscles. Increasing the muscle contraction, generates more and more action potentials are produced. Using prosthetic devices to control signal in lower limbs for detecting EMG signals.

III. EMG FOR VARICOSE VEIN

Veins become enlarged as well as twisted referring to a condition known as varicose vein. Vein in the lower limb where appears the presence of leaflet of valves that prevents blood from flowing back which is also referred as venous reflux or retrograde flow. Generally, muscles present in leg that pumps vein to return blood back to the heart referred as skeletal-muscle pump against effect of gravity. When the varicose veins appears as leaflets of valves no longer co-ordinates

properly and they do not function referred as valvular incompetence.

Standing causes high pressure is created in superficial veins of lower limbs when they enlarge even more. Standing for prolonged time leads to swelling of leg, eczema of venous, thickening of skin referred as lipodermatosclerosis and even ulceration. Thrombosis which may be life-threatening caused due to deep varicose vein. Varicose vein is a venous disease which affects lower limb approximated nearly 30% of world's population. Reflux of blood abnormally caused on valvular tissues due to deformations of saphenous vein. Collateral pathways occurs as stenosis or occlusion of deeper veins leading to deep venous thrombosis (DVT). Limited surgery, wearing stockings occasionally during sclerotherapy.

Varicose veins distinguished as reticular appearing as blue veins and telangiectasias appearing spider veins. Seeking physicians assistance specialized vein care or vascular peripheral disease. Physicians follow vascular surgery, interventional radiologists, phlebologistor. Areas of affected skin causes redness, dryness and dryness. Because of fat below skin harden for some people, shrinking of the skin above the ankle referred as lipodermatosclerosis condition. Atrophie blanche is that irregular scar-like patches appears at ankle. Inability for walking or standing for prolonged period of time. Varicose veins affects females than males. Occurrence of acute fat necrosis for varicose veins of overweight patients. Affected veins leading to blood clotting termed as superficial thrombophlebitis. Anatomical as well as physiological properties of muscle controlled by nervous system projects EMG signal as a complex signal. Clinical syndrome for overlapping varicose veins in patients as well as other venous insufficiency leading to restless leg syndrome. Cramp may also develop while as individual making a sudden move as standing erect.

III. METHODOLOGY USED

In order to analyze data signal frequency, which has to be transferred from time domain into frequency domain. Applying a mathematical method to accomplish is fast fourier transform (FFT). Controlling an operating protocol consists of four protocol defining start and operation timing, signal processing details, device commands nature and its overall performance. Serving specific needs of every user operating protocol must be efective and system also must be flexible. Acquisition of signals by measuring of EMG signals using modality of sensor.Amplifying signals to suitable levels for processing electronically signal characteristics and remove elctrical noise as well. The digitized signals are transmitted. Extraction of signals implements the analysis of signals to distinguish them with signal characteristics from content and representing a suitable form and translate them into output commands. These strong correlations features user intent. Relevant either transient or oscillatory, extraction of signal features in present systems are triggered with respect to time and amplitude responses ,latencies and power within desired frequency bands are noted.

Translation features algorithm used to convert these features into appropriate commands for output device.The translation featture algorithm operating externally providing functions such as selection of letters, control of cursor, and so on. The operation of device given as feedback to the user as well as closing the control loop. Control for an application designed in such a away to interface with each other, provided even when low information throughput functioning effectively of such EMG signals are validated. Reducing area, refers to diminishing the size and weight of electronic devices which is more user friendly, other factors like low voltage, low power dissipation are essential factors inorder to increase the lifetime of battery.There are number of software packages available so that many users will never try their own way of FFT routines.

Understanding how FFT works which is essential to use effectively this algorithm. Sampling the issues are done foremost then resolution of frequency domain comes next, finally neglecting frequency components. Approaching fast, accurate and simple requires less time and efficiently with the help of FFTalgorithm is done. Converting process of sampling rate of digital signal is known as sampling rate conversion, we follow upsampling by increasing the rate of sampled signal. Interpolation process is also implemented such that in FFT where some unknown information from a given set of known information is a valuable tool implemented here to solve and analyze the problem.Achieving sampling rate is of two ways by converting from analog to digital using D/A converter. Relating the sampled values of signals using fourier transform is performed in case of considering them for upsampling.

IV.IMPLEMENTATION OF MATLAB

MATLAB is referred as matrix laboratory which is a multitask performing platform where environment computing, programmimg language of fourth generation that allows manipulation of matrix, plotting functions algorithm implementation that adopt according to the user interface. In many institutions which is in use already.Academia and industries use them for research. Solutions for prototype obtained faster, problem solving for a programming language is also determined. Different architectures are fine tuned, core routines in MATLAB.

MATLAB has large standard library and is much easier to use too. Execution speed is unfavourable compareson. There are elementary functions (eg: sin(x)-sine), operators and special characters (eg: *-scalar and matrix multiplication), commands for managing session (eg: clc-clears command window), system and file commands (eg: pwd-displays current directory), input/output commands (eg: fprintf-performs formatted write to screen or file), array commands (eg: linspace-creates regularly spaced vector), special variables (eg: eps-accuracy of floating-point precision), format codes for fprintf and fscanf (eg: %e-format as a floating point

value in scientific notation), structure functions (eg: rmfield-removes a field from a structure array), basic xy commands (eg: xlabel-adds text label to x-axis), plot enhancement commands (eg: gtext-enables label placement by mouse), program flow control (eg: switch-directs program execution by comparing point with case expressions), mfiles (eg: nargin-number of function input arguments),exponential and logarithmic functions (eg: log(x)-natural logarithm,ln(x)), complex functions (eg: conj(x)-complex conjugate of x),interpolation functions (eg: unkpp-computes the coefficients of cubic-spine polynomials),functions for creating and evaluating symbolic expressions (eg: ezplot-generates a plot of a symbolic expression).

V.RESULTS

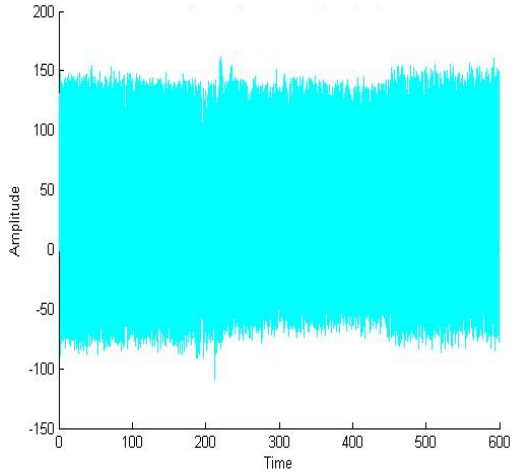

Fig:1: Original EMG before FFT

Fig:1 explains about the raw EMG signal that is taken into consideration before applying fast fourier transform is also done. Fig:4 express the raw EMG in blue and zero-phase FIR filters. Fig:5 shows integrated data with scan boundaries over scan boundaries over scale EMG.Fig:6 EMG Ps-peaks in red colour and Pd-points in green over EMG.

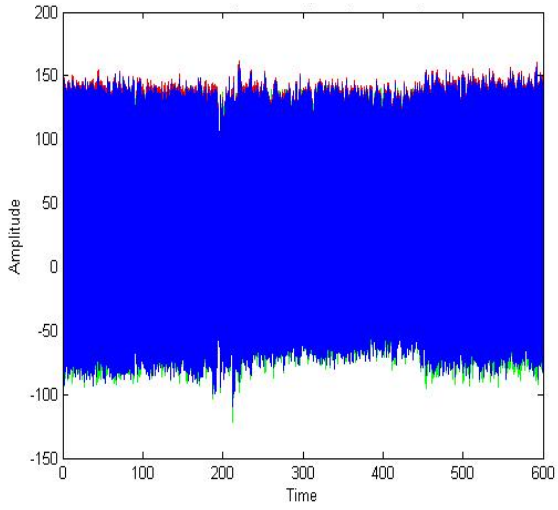

Fig:2: FFT of EMG with post filtering

Fig.-2 shows fast fourier transform is done after filtering is done

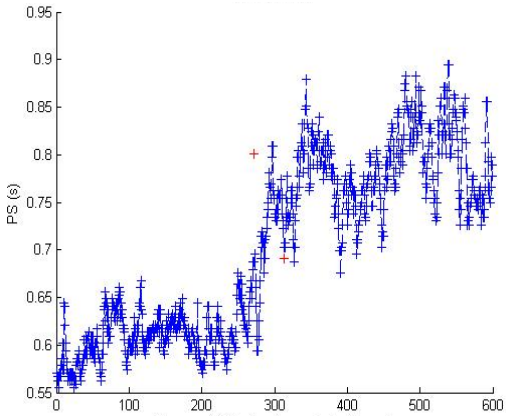

Fig:3: Peak Signals intervals

Fig:3 shows peak signal interval where the red points shows the we consider for extracting the signals

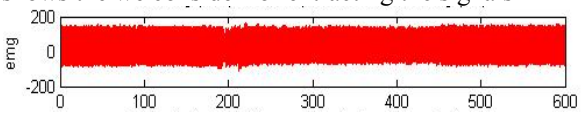

Fig:4: Raw EMG (blue) and zero-phase FIR filters

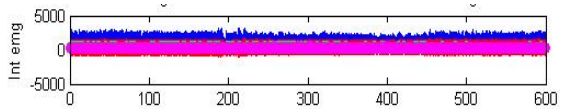

Fig:5: Integrated data with scan boundaries over scale EMG

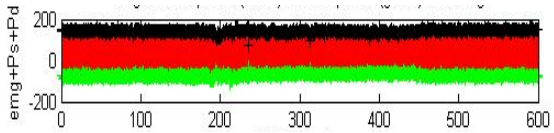

Fig:6: EMG with Ps-peaks(red) and Pd-points(green) over EMG

VI. CONCLUSION

Thus detecting the peak signals at 128Hz and 256Hz and extraction of those signals applying FFT interpolated with post filtering results in normal condition while sitting and varicose vein detection while standing position. Sensor points as detected with them. Using MATLAB this application can be extended for many number of parameters.

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