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Acquisition of myoelectric signals from the arm of person

Adquisición de señales mioeléctricas del brazo de la persona

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Abstract

Digital filtering of mioelectrical signals from a person's forearm and electronic comparison with a physical filter. Nowadays electromyogram (EMG) signals have a big huge motion of robotic applications Such, prosthesis, study activity of muscles, etc. The study of These signals is Important So They Can Be Extracted and be applied on Several use. But on This process there are some limitations. Some of them, the low amplitude (order of millivolts) and common noise on EMG signals. It make us to do an effort to Improve and / or Eliminate some trivial signals possible. So the present work it is focus on the filtering of EMG signals and then a subsequent activities in Those results Could be used in some applications of interest like Those marked above.

Filters, EMG signals

Resumen

Filtrado adquicision de señales mioelectricas de un antebrazo para adquirir la interpretacion de los movimientos de la mano. Hoy en día, las señales de electromiograma (EMG) tienen una gran cantidad de aplicaciones tales como movimiento robótico, prótesis, estudio de la actividad muscular, etc. El estudio de estas señales es importante para que puedan extraerse y aplicarse en varios usos. Pero en este proceso hay algunas limitaciones. Algunos de ellos, la baja amplitud (orden de milivoltios) y el ruido común en las señales EMG. Esto nos forza a hacer un esfuerzo para mejorar y/o eliminar algunas posibles señales triviales. Por lo tanto en el siguiente trabajo se desarrolla un circuito de adquisicion utilizando componestes comerciales.

Filtros, Señales EMG

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Introduction

The electromyogram (EMG) is a common medical procedure that uses electrodes to detect and measure electrical signals from muscle activity, which may be useful in intelligent recognition of different movements of the limb of a person. The EMG signal has been used since 1948 with the performance of the prosthetic hand. Commercial production with myoelectric prosthetic hand signals began in 1957 at the Central Research Institute of Prosthetics Moscow to drive a stepper motor. Later in this scheme myoelectric Control strategy was extensively analyzed and a simple control scheme was developed on and off [1] [3] [4] [2].

From this it has developed a wide variety of control schemes to translate the EMG signal. The variety of control schemes are typically classified according to the nature of the control, as sequence control and simultaneous control. In schemes sequential control, the EMG signals are translated using the following schemes: control on-off, proportional control, direct control, control finite state machine, based control pattern recognition, posture control schemes and schemes control regression. [1]

In the sequential control surface electrodes have been used to connect the human control signals with the prosthesis, with this it is possible to identify three to four possible locations from the residual limb to acquire signals. Surface electrodes in modern myoelectric prostheses are often embedded in the prosthesis and make contact with the skin. These electrodes detect the EMG signals from the surface of the skin and amplify the muscular action, the voluntary contractions of the muscle in the residual limb and are used to control the movement and functions of the prosthesis, this technique is preferable due to its easy access and to the non-invasive procedure, however, the prosthetic hand's dexterity is lower due to the limitation in the identification of the locations to acquire signals.

In contrast, the collection of intramuscular EMG signals is an invasive technique and requires a surgical skill to use the implantable myoelectric sensor. However, intramuscular EMG signals provide access for the collection of EMG signals from multiple locations to offer multiple degrees of control to the prosthetic limb [5] [6].

Currently there are investigations that aim to replace external electrodes with fully implantable myoelectric sensors that include a wireless interface for the prosthesis. It is intended that the myoelectric sensor will read the EMG signals of the intramuscular recording electrode amplifying and transmitting wirelessly to a receiver at the prosthetic limb, causing the implant to remain in use by rechargeable battery and an inductive energy transfer link of the prosthesis. [5]

Since we have seen some applications thanks to the treatment of myolectric signals, it is necessary to know that many of these signals contain trivial information.

In this work we will present the stage of acquisition of a myeloelectric signal by means of operational amplifiers and filtering with said amplifiers.

The myoelectric signals of the movements of the hands will be obtained, in the following figure the signal of the figure 1 is shown.

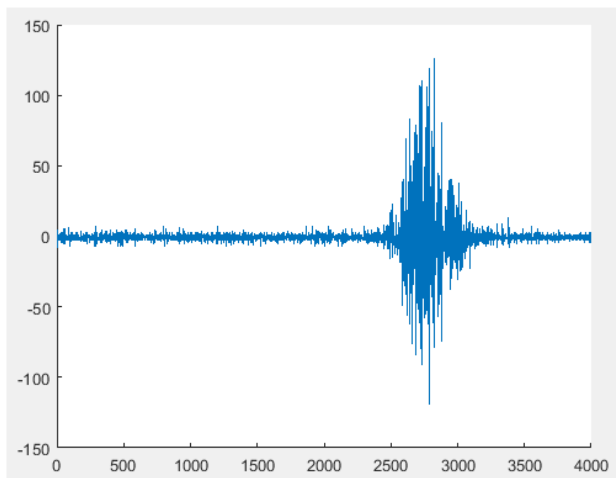


Figure 1 Acquired signal

The behavior of this signal is defined by approximately 4000 discrete values. An amplification stage was applied by means of the low pass filter instrumentation amplifier and one passed high, to attenuate some frequencies on condition of the cutoff frequency, at 50 and 500 Hz respectively for low and high frequencies.

The low pass filter allows signals located below a cutoff frequency and attenuates signals located above the cutoff frequency to soften the high frequency noise signal.

Results

In this section the acquisition circuit is developed which is applied a filter in the figure the finished circuit is shown.

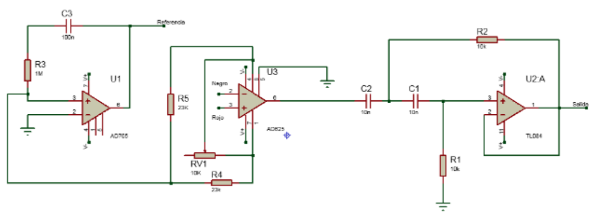


Figure 2 circuit

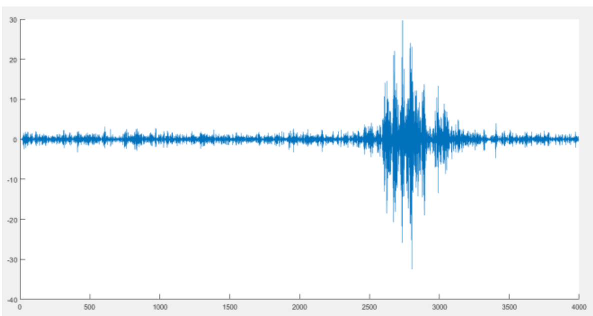
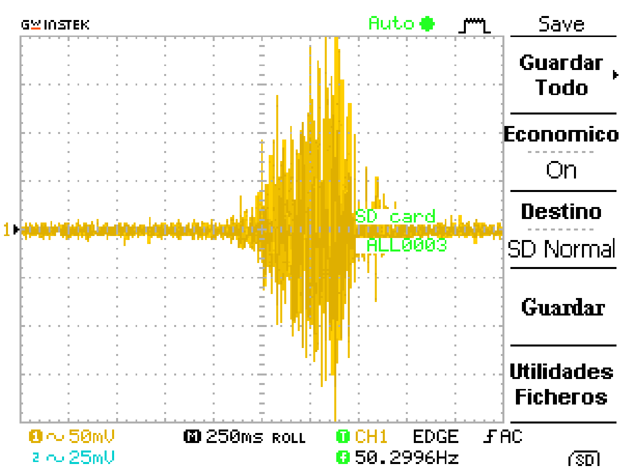


Figure 3 Resulting signal

It is worth mentioning that when applying this filter, finer results are obtained and the elimination of noise is done with greater fidelity.



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Conclusions

A myoelectric signal was acquired from the forearm which can be processed or applied digitally in a second stage of the project. The purpose of the project is better the acquisition and simplification of the circuit to facilitate reproduction.

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