EMG-Computer Interface Using Facial Muscles

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Introduction (Font: Arial 44)

With the ever increasing role of computerized machines in society, Human Computer Interaction (HCI) system has become an increasingly important part of our daily lives. HCI determines the effective utilization of the available information flow of the computing, communication, and display technologies. In recent years, there has been a tremendous interest in introducing intuitive interfaces that can recognize the user's body movements and translate them into machine commands. For the neural linkage with computers, various biomedical signals (biosignals) can be used, which can be acquired from a specialized tissue, organ, or cell system like the muscular system.

Proposed project

We usually use pointing devices such as a mouse. However, mouse operation causes a trouble for the amputees when they use personal computer. They want to live in the society without distinction from healthy person. In order that they might be accepted in the society, they should have the same capability as healthy people or young people.

The purpose project is to develop new type of click mouse cursor control system using EMG signal. When clenching the jaw will be click command is activate.

Figure 1: Human Computer Interface

System Design and Implementation:

An Ag/AgCl electrodes has been used to acquire an EMG signal, INA circuit amplify the useful signals, and reduce the common mode voltage by high CMRR, high-pass filter to eliminate the DC offset voltage and amplify the signals, inverting amplifier to amplify the signal, low-pass filter to eliminate the high frequency noise above 1000Hz, inverting amplifier to amplify the signal again, comparator to compare between the signals. Figures 3 show the circuit diagrams for this design options, in this project has been used wire rapping technique to implementation and connecting between the components. Figure 4 show practical implementation and other components. Figure 3 show the block diagrams for this design options:

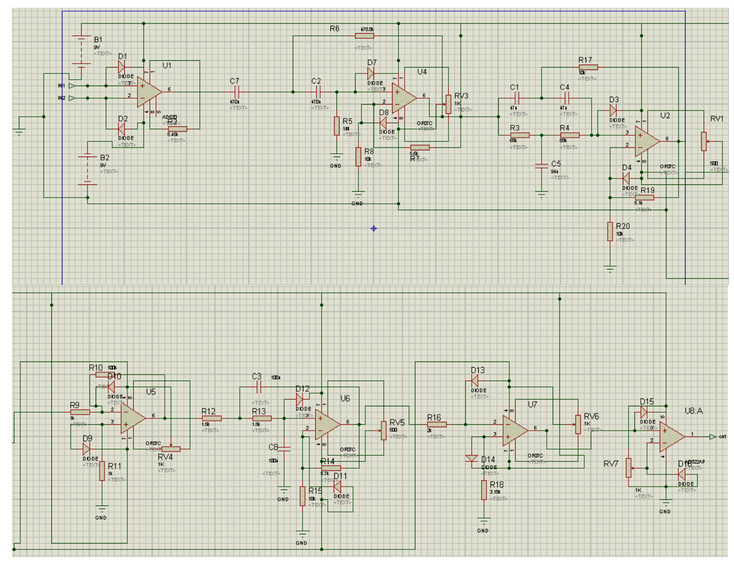


Figure 3: Circuit Diagram

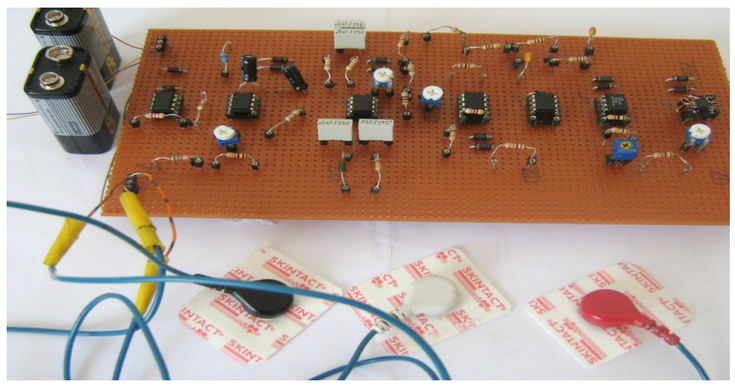


Figure 4: Practical Implementation

Project Objectives:

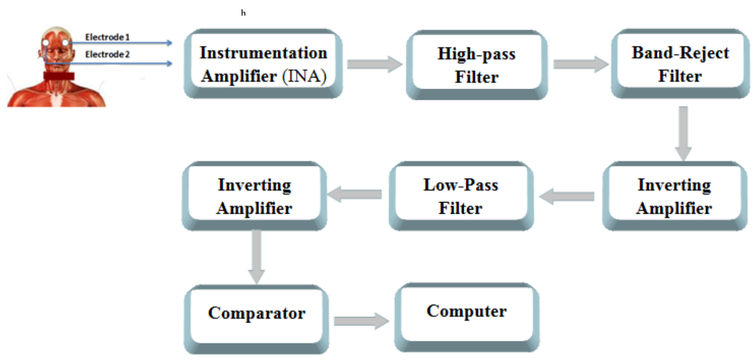
1. Improve the quality of life for disabilities people to increase integration to society and productivity by communicating/working through the computer.
2. Design an EMG portable system that sever this technique.
3. Complete the earlier project “Eye Mouse” in Palestine Polytechnic University.

Results:

1. Design and implementation for EMG computer interface using facial muscles portable system.
2. Controlling of click command (Left click) for the mouse using temporalis muscles.
3. The possibility of the user control of the more features and commands such as drag and double click commands.
4. Testing for many routine movements of the user such as eating, smiling and talking.

Project Block Diagram:

Figure 2 is the general block diagram for a project, as illustrated below, an Ag/AgCl electrodes placed on the location of the temporalis muscles to acquire the EMG signal to transfer it to the instrumentation amplifier (INA), then EMG signal processed through filtration stages represented by High pass filter, Band reject filter then Low pass filter and amplification stages represented by two stages of Inverting amplifier.



Then processed of the signal by PIC microcontroller to be suitable for the interface with the mouse of the computer

Testing and Results