ABSTRACT

The actions of the human body are possible through muscles with the coordination of the brain. Whenever the muscles of the body are to be recruited for a certain activity, the brain sends excitation signals through the Central Nervous System (CNS). Muscles are innervated in groups called 'Motor Units'. A motor unit is the junction point where the motor neuron and the muscle fibers are meeting. When the motor unit is activated, it produces a 'Motor Unit Action Potential' (MUAP). The activation from the Central Nervous System is repeated continuously for as long as the muscle is required to generate force. This continued action produces motor unit action potential trains.

The electric signal produced during muscle activation, known as the myoelectric signal, is produced from small electrical currents generated by the exchange of ions across the muscle membranes and detected with the help of electrodes. Electromyography (EMG) is used to evaluate and record the electrical activity produced by muscles of a human body. The instrument from which we obtain the EMG signal is known as electromyography and the resultant record obtained is known as electromyogram. Clinically, electromyography is being used as diagnostic tool for neurological disorders. Other than physiological and biomechanical research, EMG has been developed as an evaluation tool in applied research, physiotherapy, rehabilitation, sports medicine and training, biofeedback and ergonomics research. . In the recent past, EMG has also found its use in rehabilitation of patients with amputations in the form of robotic prosthesis. EMG proves to be a valuable tool as it provides a natural way of sensing and classifying different movements of the body.

During this research work it was focused to design a simpler circuit for extracts the myoelectric potentials generated by muscle cells when these cells are electrically or neurologically activated. A size effective circuit is facilitating to place and handle in a robotic mechanism very easily. The experiment was more focused on the hand movements of flexion and extending actions.

Myoelectric signals were extracted by a surface mount EMG circuit and it is designed with differential amplifiers, which compare and amplify very small voltage differences between the two electrodes placed on the muscles. Four independent, high gains internally compensated, low power operational amplifiers are allowed to improving the designs of EMG amplifications with advanced filtering algorithms. Thereby designed hardware circuit with suitable filtering and amplification has given some personalized realistic potential valves which all can be used as control signal of a robotic mechanism.