Update 3 of term paper

The conventional Electromyography (EMG) technique uses bipolar surface electrodes, placed over the muscle belly of the targeted group of muscles. The electrodes are noninvasive, inexpensive, and readily incorporated into the socket of the prosthesis. These surface electrode have limitations like inability to record the signal from different muscle group at a time, inconsistency in signal magnitude and frequency, due to change in skin electrode interface associated in physiological and environmental modifications and also the EMG signals may encounter noise and interference from other tissues. Apart from these limitations it is easy to use by amputee and risk free. The amplitude of the EMG signal is mostly proportional to the contraction of the remaining muscle. To enhance the quality of the signal the Myoelectric control of prosthesis or other system utilizes the electrical action potential of the residual limb’s muscles that are emitted during muscular contractions. These emissions are measurable on the skin surface at a microvolt level. The emissions are picked up by one or two electrodes and processed by band-pass filtering, rectifying, and low-pass filtering to get the envelope amplitude of EMG signal for use as control signals to the functional elements of the prosthesis. The myoelectric emissions are used only for control. In simultaneous control (muscle co contraction) and proportional control (fast and slow muscle contraction) controls the two different mode from wrist to terminal device and vice versa.

The advance method over the conventional technique of EMG signal which replace the complicated mode of switching is the pattern recognition. This new control approach is stranded on the assumption that an EMG pattern contains information about the proposed movements involved in a residual limb. Using a technique of pattern classification, a variety of different intended movements can be identified by distinguishing characteristics of EMG patterns. Once a pattern has been classified, the movement is implemented through the command sent to a prosthesis controller. EMG pattern-recognition-based prosthetic control method involves performing EMG measurement (to capture reliable and consistent myoelectric signals), feature extraction (to recollect the most important discriminating information from the EMG), classification (to predict one of a subset of intentional movements), and multifunctional prosthesis control (to implement the operation of prosthesis by the predicted class of movement) .

In pattern recognition control for a multifunctional prosthesis, multi-channel myoelectric recordings are needed to capture enough myoelectric pattern information. The number and placement of electrodes would mainly depend on how many classes of movements are demanded in a multi-functional prosthesis and how many residual muscles of an amputee are applicable for myoelectric control. For myoelectric transradial prostheses, the EMG signals are measured from residual muscles with a number of bipolar electrodes (8-16) which are placed on the circumference of the remaining forearm in which 8 of the 12 electrodes were uniformly placed around the proximal portion of the forearm and the other 4 electrodes were positioned on the distal end. A large circular electrode was placed on the elbow of the amputated arm as a ground.

For acquisition of EMG signal 50 Hz-60 Hz can be used to remove or reduce more low-frequency to increase the control stability of a multifunctional myoelectric prosthesis . EMG feature extraction is performed on windowed EMG data, all EMG recordings channels are segmented into a series of analysis windows either with or without time overlap (WL (window length) is 100-250 ms).