**Surface EMG (sEMG)**

Surface Electromyography (sEMG) is used for evaluation and recording surface electrical activity caused by skeletal muscles. Our work concerns signal, electrodes, noise, and other issues for sEMG.

The electrical signals of sEMG are produced with muscle activations. The observation of signals is shown as voltage changes with electrodes attached on the skin of users through exchange of ions across the muscle membranes. The EMG signal is acquired through differential amplification, which would stabilize the output signal, and filter noise. The range of sEMG is usually varies from 5 Hz to 250 Hz. However, the real time experiment suggests 65 – 180 Hz as cut-off frequency to avoid strong DC noise at 60 Hz.

The best electrodes used for measuring sEMG is pre-gelled Ag – AgCl (Sliver / Sliver Chloride) electrodes, due to its low impedance and high stability. [8] And its placement requires are in detail in order to achieve best performance. Firstly, it should be placed between the motor unit and the tedious insertion, along the longitudinal midline of the muscle (fig 9 in [7]). Secondly, the positive lead and negative lead should be separate with 1 – 2cm (0.39 – 0.79 inches). Finally, the reference electrodes should be placed far from the EMG detecting surface, with bipolar configuration (Fig. 13 in [7]).

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There are always some noises existing that cannot be avoided [8]. One is ambient noise, like radiated EMI surrounding users with frequency of 50 – 60 Hz. The other is transducer noise, like different impedance between the skin and electrode sensors.

Some other issues usually occur with measuring surface EMG. It evolves consistency in impedance, which is critical for the reliability of sEMG measurements. Another issue comes up with different kind of bio-signals of users, like ECG (heart rate), EEG (brain), EOG (eye). [9]

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