Abstract

The purpose of this investigation was to simulate surface electromyographic (EMG) signals generated in a cylindrical multilayer volume conductor constituted by bone (isotropic) muscle (anisotropic), fat (isotropic) and skin (isotropic) layers. This simulation was based on the distributions of the: MFs within each motor unit (MU), motor units (MUs) within the muscle, diameters of all activated MUs, conduction velocities of all activated MUs, lengths of all MFs, firing rates (FRs) of all recruited MUs, inter-spike intervals (ISIs) and the starting recruitment times of the activated MUs. A MU is composed of an alpha motor neuron and connected MFs, thus the action potential generated in each MU (MUAP) is the sum of the action potentials generated from MFs (SFAPs) belonging to that particular MU. The simulation of surface EMG signal began first by simulating SFAP and then the simulation of the MUAP. The non uniform repetition of the MUAP with a firing rate gives the MUAP train (MUAPT). Finally, the surface EMG signal is the sum of non-synchronized MUAP trains of active MUs. Four filters were used to detect the surface EMG signals. Simulations results show that the amplitude and shape of surface EMG signals depend on the filter used for recording