

Surface electromyographic (EMG) signals are known to be strongly influenced by anatomical, physiological and detection system parameters. Among the detection system parameters, we are interested in the effect of muscle fiber inclination on the electrode arrangement. The purpose of this study was to determine the best and the worst orientation of the electrodes arranged in nine detection systems relative to the muscle fiber direction and also to classify the investigated systems according to their degree of isotropy. The study was based on simulated surface EMG (sEMG) signals generated in a cylindrical multilayer volume conductor. The orientation of electrodes with respect to the fiber direction was defined by the fiber inclination angle (FIA). For each detection system, the mean power (MP) of the simulated signals was computed at different FIAs and used as a basis for evaluating the effect of muscle fiber inclination. We showed that for the FIA range of 0–180°, approximately isotropic systems had three positions to record sEMG signals under good conditions (MP was maximum). However, longitudinal and transversal highly anisotropic systems had two and one positions, respectively, at which sEMG signals were detected under good conditions. We showed also that the degree of isotropy of the nine detection systems investigated was less affected by the increase in muscle and fat thicknesses. However, with an increase in inter-electrode distance (IED), the degree of isotropy of approximately isotropic systems decreased while the degree of isotropy of highly anisotropic systems increased