Multi-Pad Electrode for Effective Grasping: Design

L. Popović Maneski, M. Kostić, G. Bijelić, T. Keller, S. Mitrović, L. Konstantinović, D. Popović

References:
IEEE TRANSACTIONS ON NEURAL SYSTEMS AND REHABILITATION ENGINEERING, Vol. 21, No. 4, pp. 648-654, Jul, 2013

Abstract:
We designed a new surface multi-pad electrode for the electrical stimulation of the forearm that is effective in controlling functional grasp in hemiplegic patients. The electrode shape and size were designed on the basis of the surface stimulation map of the forearm, determined from measurements in seven hemiplegic patients who had limited or absent voluntary movements of the fingers, thumb and wrist. The stimulation map for each patient was assessed with a conventional set of single pad Pals Platinum electrodes. Since the sites for the stimulation varied greatly between patients, the end result was a rather large multi-pad electrode. Modulating multi-pad electrode size, shape, position and individual pad stimulation parameters allows us to accommodate the diversity of the neural tissues in patients that need to be activated for functional grasp. This also allows asynchronous activation of different portions of the muscle and dynamic adaptation of the stimulation sites to appropriate underlying tissues during functional use. The validity of the determined stimulation map was tested in the same group of hemiplegic patients. The selected set of active pads resulted in fully functional and reproducible palmar and lateral grasps similar to healthy-like grasps.

Keywords:
stroke, Functional grasp, multi-pad electrode