



Towards the control of hand prostheses using intraneural electrodes

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Abstract

The development of more effective approaches to control dexterous hand prostheses is an important area of research that is currently addressed by several research groups to improve the quality of life of amputees, in the attempt of establishing a fast, intuitive, bidirectional flow of information between the nervous system of the user and the smart artificial device. Among the possible solutions to achieve this goal, interfaces with the peripheral nervous system and in particular intraneural electrodes can represent an interesting choice.

In this presentation, two main research activities on this topic will be presented. First, the recent results achieved after the implantation of thin-film intra-fascicular electrodes in the median and ulnar nerves of an amputee will be shown. The possibility of decoding motor commands suitable to control a dexterous hand prosthesis has been investigated during a 4 week trial. The results showed that the extraction of motor information (i.e., grip types) is possible with good performance and that the user was able to significantly improve his ability to provide useful motor commands over time.

Secondly, the current activities about the development of a new generation of more effective intraneural electrodes will be presented. These new devices will increase the performance of this approach in the next future and open up very promising possibilities for the development of a neurocontrolled hand prosthesis.

Recommended references with the talk

- Decoding of grasping information from neural signals recorded using peripheral intrafascicular interfaces. S. Micera, P.M. Rossini, J. Rigosa, L. Citi, J. Carpaneto, S. Raspopovic, M. Tombini, C. Cipriani, G. Assenza, M.C. Carrozza, KP.Hoffmann, K. Yoshida, X. Navarro, P. Dario.
- Control of Hand Prostheses Using Peripheral Information. Silvestro Micera, Senior Member, IEEE, Jacopo Carpaneto, and Stanisa Raspopovic. IEEE REVIEWS IN BIOMEDICAL ENGINEERING, VOL. 3, 2010.
- Double nerve intraneural interface implant on a human amputee for robotic hand control Paolo M. Rossini, Silvestro Micera, Antonella Benvenuto, Jacopo Carpaneto, Giuseppe Cavallo, Luca Citi, Christian Cipriani, Luca Denaro, Vincenzo Denaro, Giovanni Di Pino, Florinda Ferreri, Eugenio Guglielmelli, Klaus-Peter Hoffmann, Stanisa Raspopovic, Jacopo Rigosa, Luca Rossini, Mario Tombini, Paolo Dario. Clinical Neurophysiology, 2010.