

Presentation

Biomedical Informatics Session

“Decoding Neural Activity from an Intracortical Implant in Humans with Tetraplegia”

Chad Bouton, M.Sc.

Battelle Memorial Institute

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Abstract:

This work was part of a pilot clinical study that involved the placement of an intracortical implant in the primary motor cortex of human subjects. The study, the first of its kind, involved the implantation of a 96 electrode array in the human brain for up to a full year. The work described here involved two of the subjects in the study, one of which was a stroke victim, and the other had ALS. Both subjects were tetraplegic and also unable to speak. The intent of this work was to determine if intended/imagined movements would evoke neural activity that could be successfully decoded and allow the subjects to control various devices in their environment and communicate through a personal computer. Neural decoding algorithms were developed to interpret the intracortical activity in the primary motor cortex of both subjects. Adaptive support vector machine methods were developed and employed during this study. A large set of intended/imagined movements was successfully decoded and discriminated between with the first subject. Also, both imagined shoulder and wrist movements were decoded in the second subject. Finally, the algorithms developed in this work allowed, for the first time, control of a motorized wheelchair through intended/imagined movements in a human with an intracortical electrode array implant.

Biographical Sketch:

Chad Bouton is a Senior Research Scientist at Battelle. He has served as principal investigator for numerous research and development programs. He has a multidisciplinary background with expertise in sensors and signal processing. He developed new signal processing methods for cancer detection systems in the late 90s to aid surgeons in more efficiently and effectively pinpointing cancerous tissue intra-operatively. This product was awarded a R&D 100 Award in 2000. In 2004, he was awarded the Battelle Technical Achievement Award for his innovation and development of a new medical RF-based sensing technology (which entered the marketplace in 2007). He was again awarded the Battelle Technical Achievement Award in 2007 for the development of improved methods to decode signals from the human brain. This work was also awarded a R&D 100 Award in 2007 and was singled out as the R&D Magazine Editor's Choice that year. Finally, Chad has filed over fifteen patents in the US and multiple patents worldwide.