

Applications of Feedback System Engineering Principles to the Design of Brain-Machine Interfaces

Abstract

Although it is well-known that every brain machine interface (BMI) depends critically on the use of feedback, many of the algorithms in place for designing (BMIs) do not completely exploit this implication.

In this talk we discuss how novel exploitation of feedback delivered to the user can result in significant improved performance. Our approach comes from stochastic control, recursive estimation, and feedback information theory; it is independent of the specific neural sensing modality, the device to be controlled, and the specific neural delivery mechanism of feedback.

In effect, we interpret the user and the prosthetic as engaging in a dialogue about user intent, and we consider feedback delivery strategies that not only give the user information about the state of the prosthetic, but also information about the interface's belief about user intent. We will discuss some EEG-based BMI applications and develop an approach that espouses principles from stochastic control and feedback information theory coding. We illustrate significant performance improvement and low-complexity implementation. Lastly, we conclude with a discussion of future directions we plan to pursue with this methodology. Joint Collaboration with Timothy Bretl (UIUC) and Ed Maclin (UIUC)

Engineering Neuroscience & Health

Seminar Series

Presents:

Dr. Todd Coleman
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**Monday
November 24, 2008
4:00 p.m.**

Refreshments will be served 3– 4 p.m.

Locations:

Seminar is simultaneously presented

UPC: HNB 100 - LIVE
Hedco Neurosciences Building

UPC Campus Map/Directions:
<http://www.usc.edu/about/visit/upc/>

HSC: 147 - Video Conference
Center for the Health Professional

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Biography

Todd P. Coleman received the B.S. degrees in electrical engineering (summa cum laude), as well as computer engineering (summa cum laude) from the University of Michigan, Ann Arbor, in 2000, along with the M.S. and Ph.D. degrees in electrical engineering from the Massachusetts Institute of Technology (MIT), Cambridge, in 2002, and 2005. During the 2005-2006 academic year, he was a postdoctoral scholar at MIT and Massachusetts General Hospital in computational neuroscience. Since the fall of 2006, he has been on the faculty in the ECE Department and Neuroscience Program at UIUC.

His research interests include information theory, operations research, and computational neuroscience. Dr. Coleman, a National Science Foundation Graduate Research Fellowship recipient, was awarded the University of Michigan College of Engineering's Hugh Rumler Senior Class Prize in 1999 and was awarded the MIT EECS Department's Morris J. Levin Award for Best Masterworks Oral Thesis Presentation in 2002. http://www.ifp.uiuc.edu/~colemant/index_files/bio.htm

Web Cast

<http://capture.usc.edu/college/Catalog/?cid=af180d48-ceff-42b9-a35c-eb199daed320>

Information about all seminars can be found at
<http://www-clmc.usc.edu/~heiko/ENH>