5th BCI2000 Workshop, and International Workshop on Advances in Electrocorticography

Synopsis

Increasing understanding of brain function and increasingly sophisticated methods for interpreting brain signals are opening up exciting new opportunities for using these signals for communication or diagnosis. This three-day workshop series explores the current understanding of the theory and application of brain signals for these two purposes. It consists of a workshop on advances in electrocorticography (ECoG), i.e., recordings from the surface of the brain, and of the 5th workshop on the theory and application of the BCI2000 software. BCI2000 is a general-purpose software package for brain-computer interfacing applications, which including restoration of function, brain monitoring, and neurorehabilitation.

Recent developments have sparked tremendous interest in human electrocorticographic recordings to investigate the basis of normal brain function related to motor control, language, or memory, as well as of abnormal function such as epileptic seizures. This also includes a number of studies that suggest that ECoG signals are an excellent platform for Brain-Computer Interfacing (BCI) applications. BCI systems aim to provide people with severe motor disabilities with a new (i.e., brain-based) way of communicating. Other studies have demonstrated that ECoG also contains substantial information about normal and abnormal brain activity. The ECoG workshop on day two of this series (Oct. 2) reviews recent advances in this area and demonstrates examples for the beginning translation of new findings into clinical care. This includes the demonstration of a novel passive ECoG-based functional mapping technique that is receiving enthusiastic responses from initial clinical trials.

The 5th BCI2000 Workshop is held on the first and third day (i.e., Oct. 1 and 3, respectively) of this series. BCI2000 is a general-purpose system for brain-computer interface (BCI) research and related areas. BCI2000 has been in development since 2000 and is currently in use by more than 350 laboratories around the world. The present workshop is the 5th event organized by the BCI2000 project, following workshops held in Albany, New York, USA (June 2005); Beijing, P.R. China (July 2007); Rome, Italy (December 2007); and Utrecht, The Netherlands (July 2008). The first part of the BCI2000 workshop (Oct. 1) consists of discussions that describe relevant technical aspects of the BCI2000 system. The second part of the BCI2000 workshop (Oct. 3) consists of hands-on practical tutorials that implement the two most common BCI approaches currently used in humans. In these tutorials, participants can use BCI systems to control a cursor on a computer screen and to spell words just by thinking. Six BCI systems will be available throughout the day, and participants will operate them under supervision of tutors.

Dates

Thursday, October 1 - Saturday, October 3, 2009

Venue

The Sagamore Conference Center
Bolton Landing, New York, USA

Organization

Research
Gerwin Schalk, Ph.D.
Research Scientist
Laboratory of Neural Injury & Repair
Wadsworth Center
Albany, New York, USA

Clinical
Anthony Ritaccio, M.D. FAAN
Professor of Neurology and Neurosurgery
Department of Neurology
Albany Medical Center
Albany, New York, USA

Faculty
P. Brunner, N. Crone, J. Hill, E. Leuthardt, R. Oostenveld, A. Ritaccio,
S. Schachter, G. Schalk, B. Stacey, J.R. Wolpaw

5th BCI2000 Workshop

Day 1, Thursday, October 1

Draft Program

9:00a-10:00a **The BCI2000 Framework**
Gerwin Schalk, Ph.D.
This talk gives a technical overview of the BCI2000 framework.

10:15a-11:15a **Implementing a Signal Processing Filter in BCI2000 Using C++**
Jeremy Hill, Ph.D.
In this tutorial, the participant learns how to implement new signal processing functionality in BCI2000 using the C++ programming language.

11:30a-12:30p **BCI2000 and Python**
Jeremy Hill, Ph.D.
In this tutorial, the participant learns how to incorporate Python scripts into the BCI2000 pipeline to execute in real time.

12:30p-1:30p **Lunch Break**

12:30p-1:30p **Lunch talk: BCI and Virtual Reality**
Christoph Guger, Ph.D.
g.tec, Inc.

1:30p-2:30p **BCI2000 and Matlab**
Robert Oostenveld, Ph.D.
In this tutorial, the user learns how to integrate Matlab functions to execute in real time within BCI2000.

2:45p-3:45p **BCI2000 and FieldTrip**
Robert Oostenveld, Ph.D.
In this tutorial, the user learns how to combine FieldTrip functionality with BCI2000 for implementing synchronous and asynchronous processing.

4:00p-5:00p **Overview of Available BCI2000 Components**
Gerwin Schalk, Ph.D.
This lecture will describe the data acquisition, signal processing, and feedback components currently implemented in BCI2000, and will discuss how they can be used to implement different types of experiments.

5:00p-5:30p **Q&A**
All faculty
In this session, the BCI2000 faculty will answer your questions about how to use BCI2000 for your research experiments or clinical application.

International Workshop on Advances in Electrocorticography

Day 2, Friday, October 2

Draft Program

Morning Session: Principles of ECoG Signals and Their Interpretation

8:00a-8:45a	**Keynote: Overview of Emerging Technologies for Diagnosis and Treatment of Epilepsy** *Steven Schachter, M.D.*
8:45a-9:00a	Break
9:00a-9:45a	**History and Basics of ECoG Recordings** *Nathan Crone, M.D.*
9:45a-10:00a	Break
10:00a-10:45a	**Detecting Detailed Aspects of Behavior in ECoG Signals** *Gerwin Schalk, Ph.D.*
10:45a-11:00a	Break
11:00a-12:00p	**ECoG Brain Dynamics in High-Resolution Recordings** *Robert Oostenveld, Ph.D.*

Afternoon: Current Trends in Clinical Application of ECoG Signals

1:00p-1:45p	**Using ECoG Signals for Seizure Detection and Prediction** *Brian Litt, M.D. / Bill Stacey, M.D.*
1:45p-2:00p	Break
2:00p-2:45p	**Using ECoG Signals for Rehabilitation** *Eric Leuthardt, M.D.*
2:45p-3:00p	Break
3:00p-3:45p	**Instrumentation for Emerging Clinical Applications** *Peter Brunner, M.S.* *Christoph Guger, Ph.D. (g.tec, Inc.)*
3:45p-4:00p	Break
4:00p-4:45p	**Using BCI2000 with ECoG Signals for Real-Time Brain Mapping** *Anthony Ritaccio, M.D. F.A.A.N.*
4:45p-5:15p	**Q&A** *All faculty*

5th BCI2000 Workshop

Day 3, Saturday, October 3

Draft Program

8:00a-8:45a **Keynote: Brain-Computer Interfaces for Communication & Control**
Jonathan R. Wolpaw, M.D.

8:45a-10:45a **Configuration, Conduction, and Analysis of mu/beta-Rhythm Experiments**
Peter Brunner, M.S., Christoph Guger, Ph.D.
In this tutorial, the user learns how to use BCI2000 to support brain-based control of a cursor on a computer screen. Six EEG-based BCI systems are available for participants throughout this tutorial.

10:45a-11:00a Break

11:00a-12:30p **Configuration, Conduction, and Analysis of P300 Experiments**
Peter Brunner, M.S., Christoph Guger, Ph.D.
In this tutorial, the user learns how to use BCI2000 to support spelling using P300 evoked potentials. Six EEG-based BCI systems are available for participants throughout this tutorial.

12:30p **Conference ends**