Sensorimotor Neurophysiology of Active Sensing

Tutorial

Abstract

This tutorial is comprised of three 50-minute lectures on topics selected to provide the key background information needed to appreciate neural mechanisms for processing somatosensory information. Concepts include efference copy, receptor adaptation, spinal circuit operations, and multimodal cortical processing. Collated, hard copies of lecture notes will be provided. Each speaker will also give an introduction to his or her research program and invite questions.

Motivation

Many haptics investigators have little or no formal training in neurophysiology. Thus the goal of this tutorial is to have active investigators of sensorimotor neurophysiology provide up-to-date information on key topics.

Primary Objectives

To convey a deeper understanding of basic neural mechanisms for processing somatosensory and motor signals.

Target Audience

Investigators with backgrounds in engineering or psychology, but little or no training in neurophysiology.

Speakers

Dr. Martha Flanders (organizer)
Department of Neuroscience
University of Minnesota
Email: fland001@umn.edu
Short biography: Dr. Flanders got her PhD in Neuroscience at Michigan State University. She did postdoctoral training at The Neurological Sciences Institute in Oregon, before joining the faculty of Physiology and Neuroscience at the University of Minnesota. Her research has been supported for more than 20 years by the US National Institute of Neurological Disorders and Stroke, and she has more than 70 peer-reviewed journal articles. She is currently a member of the Editorial Board of IEEE Trans Haptics.

Dr. Steve I. Perlmutter
Dept. of Physiology and Biophysics
Univ. Washington
Email address: perl@uw.edu
Short biography: Dr. Perlmutter received his PhD in Neuroscience and Physiology from Northwestern University, where he studied head eye and neck reflexes. He did postdoctoral training at the University of Washington and then joined the faculty at the University of Washington. There, he conducts unique experiments that involve electrophysiological recording from the spinal cord during wrist and arm movements, and is developing neuroprosthetic devices to facilitate recovery from spinal cord injury.

Dr. Stephen I. Helms Tillery
Harrington Dept. of Bioengineering
Arizona State University
Email address: stillery@asu.edu
Short biography: Dr. Helms Tillery got his PhD in Neuroscience at Univ. Minnesota, with a thesis on representations of arm posture in the monkey somatosensory cortex. He conducted postdoctoral research on the basal ganglia and cerebellum, and then became involved in studies of cortical control of prosthetics. He is the Director of the

SensoriMotor Research Group at ASU, which is supported by the US National Science Foundation and National Institutes of Health.

Schedule		Description
8:30-9:30	Martha Flanders	***Overview*** Receptors, spinal cord, dorsal column nuclei, cerebellum, thalamus and cortex, efference copy, neural comparison and feature extraction
9:30-10:30	Steve Perlmutter	***Receptors and Spinal Cord*** Action potential generation, receptor function and adaptation (rapid vs. slow), ascending somatosensory projections, spinal reflex circuitry
10:30-11:30	Steve Helms Tillery	***Cerebral Cortex*** Primary somatosensory cortex and perception, other somatosensory areas, interactions with other cortical areas