Journal of Sensors

Special Issue on

Wearable and Implantable Sensory Systems for Brain Monitoring

CALL FOR PAPERS

Brain monitoring techniques allow physicians and researchers to study human activities, brain disorders, and brain-computer interfaces (BCIs). BCI is a growing field of research that aims to facilitate human communication and interaction with the environment by directly measuring the hemodynamic activities in the brain. Many research facilities and medical centers are using wearable imaging techniques like magnetoencephalography (MEG) and wearable photoacoustic tomography (wPAT) as a standard portable brain imaging system.

Using sensing techniques such as functional near-infrared spectroscopy (fNIRS) and electroencephalogram (EEG) or by combining both EEG and fNIRS, a more complete picture of brain activity can be obtained. Portability and implantation are required to enable accurate long-term brain monitoring, especially when the study requires recording during regular daily activities. Implantable small size complementary metal-oxide semiconductor (CMOS) image sensors and high-density probe arrays integrated with CMOS readout are hot research topics in the search for a high-resolution brain imager. Brain tissue damage during the insertion of a sensor and tissue heating as a result of the consumed power pose several challenges to overcome in order to achieve the goal of a high-resolution implantable monitoring system. Signal processing operations—including preprocessing, noise reduction, artifact rejection, source localization, connectivity, classification, and data visualization—are essential to create high-quality brain activity monitoring and detection of neurological disorders. The early detection of neurological disorders (such as epilepsy, autism, and Alzheimer's disease), as well as real-time monitoring of cognitive loads and collaborative learning, shows the potential of using wearable and implantable sensors for brain monitoring and of BCI technologies as a viable medical tool for next generation brain monitoring.

Innovations at system level, circuit level, and device level and within signal processing are required to overcome the challenges and achieve this goal. Several portable and implantable brain monitoring systems and techniques have been explored during the recent years. This special issue aims to recognize this emerging field and motivate more research activity towards high-resolution portable and implantable sensors for brain monitoring. Both original research and review articles which describe the current state of the art in wearable and implantable brain monitoring from both hardware and signal processing perspectives are welcomed.

Potential topics include but are not limited to the following:

- Ultra-low power circuits building blocks for portable brain monitoring
- Nontraditional sensors and techniques adopted for brain monitoring
- System demonstrations for brain monitoring sensor applications
- Integrated circuits and sensors for portable brain monitoring
- Wearable wireless sensors for real-time brain monitoring
- Signal sensors for brain activities monitoring, features extractions, and visualizations
- Brain signal recording, processing, and machine learning techniques
- Neuroimaging techniques for BCI
- Microelectromechanical systems (MEMS) and microsystem tools for sensing brain activities

Authors can submit their manuscripts through the Manuscript Tracking System at https://mts.hindawi.com/submit/journals/js/wismh/.

Papers are published upon acceptance, regardless of the Special Issue publication date.

Lead Guest Editor
Mohamed Atef, Assiut University, Assiut, Egypt
moh_atef@aun.edu.eg

Guest Editors
Hassan Mostafa, Zewail City of Science and Technology (ZC), Sheikh Zayed, Egypt
hmostafa@zewailcity.edu.eg

Moumen El-Melegy, Assiut University, Assiut, Egypt
moumen@aun.edu.eg

Tiago H. Falk, INRS-EMT, Montreal, Canada
falk@emt.inrs.ca

Salam Gabran, Novela Neurotech, Ontario, Canada
salam@novelaneuro.com

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