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Current Challenges of Brain Computer Interface Developments in Daily Life and Clinical Applications

Abstract

As the proliferation of technology dramatically infiltrates all aspects of social life, the development of strategies and techniques to enhance human–computer interfaces is becoming increasingly important. Brain-computer interface (BCI) is the new concept of neuro-technology developments in the neural engineering field which is based on a direct communication pathway between the human brain and an external device. Several novel BCI developments have been primarily applied in the laboratory and clinical settings. However, there still exists challenges for the current BCI developments:

(1) Lack of new sensors and technologies to measure high-quality neural, physiological, behavioral, and contextual data in real-world environments,

(2) Request advanced signal-processing and machine-learning algorithms to jointly analyze the real-time physiological data,

(3) What are the sensible real-world applications of BCIs?

(4) Deal with the human variability both across different individuals and within the same individual over time.

In this talk, I will introduce the latest BCI developments to overcome part of the major challenges. Combining artificial intelligence, BCI, internet of things, big data, and cloud/edge computing can leverage the benefits of these technologies. Furthermore, I will show the newly dry EEG sensors and the miniaturized biomedical circuits and systems design for developing the wearable BCI devices depending on different applications. Theses device are currently being applied to the ongoing clinical studies of neurological diseases such as sleep, migraine, and neural rehabilitation including the aspects of assistive diagnosis, syndrome prediction, and treatment feedback. We do hope the latest BCI developments can offer more opportunities to revolutionize human–machine interaction to improve human life quality and enhance understanding of human functions in complex real-world settings including daily life and clinical applications.

Research Interests:

- Neural Engineering
- Neuro-informatics
- Brain Computer Interfaces
- Computational Neuroscience
- Biomedical Signal Processing
- Tele-health Monitoring and Care Systems
- Neural Networks and Neuro-fuzzy Systems
- Machine Mining and Pattern Recognition