WEARABLE MACHINE INTERFACE SYSTEM FOR TRACKING AND CONTROLLING MENTAL STRESS USING WRIST-WORN WEARABLE DEVICES

Summary

Wrist-worn wearable devices provide rich sets of pulsatile physiological data under various modalities and circumstances. An unexploited capability is that the pulsatile physiological time series collected by wrist-worn wearable devices can be used for recovering internal brain dynamics. Inferring the underlying neural mechanisms and reconstruction of the mental-stress-related brain dynamics could potentially be accomplished entirely through wrist-worn wearable devices. The method is validated by analyzing electrodermal activity (EDA) pulsatile data in the context of mental-stress-related arousal, and can be extended to other pulsatile physiological signals (e.g. cortisol, heartbeat data). The outcomes will be (1) a portfolio of wrist-worn wearable-device-based brain decoders that can be optimized to exploit the constraints of a given clinical application and wrist-worn wearable device data collection capabilities; (2) a toolbox of bio-inspired controllers that can have inhibitory and excitatory effects for maintaining a neural state within a desired range.

Problem Addressed

- Cumbersome nature of day-to-day neural state of monitoring with EEG headsets (e.g. social settings).
- Need for automated stress management as stress increases cardiovascular disease risk
- Inability to acquire real-time neural state feedback from loved ones (e.g. elderly parents, young children) students and employees

Competitive Advantages

- Seamless recovery of neural stimuli from non-brain signals using wristband like wearables
- Capable of being integrated into existing devices (smartwatch, fitness tracker or standalone functionality
- Control mechanism for maintaining a neural state within a desired range.

Applications

- Wearable electronics
- Detect human stress & anxiety automatically (e.g. workplace, piloting, driving)
- Learning experience evaluation including e-learning
- Remote elderly or care recipient monitoring

Meet the Inventor

Dr. Rose T. Faghih
Assistant Professor, DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

Contact

George Gillespie
Technology Transfer Associate
iopm@Central.uh.edu | 713-743-1053
Case ID: 2018-021