Docket #: S21-348

One Gram Penny-Sized Wireless EEG Recording Patch for Long-term Mental Health Monitoring

Technology Reference
CZ Biohub SF ref. no. CZB-229S
Stanford ref. no. S21-348

Researchers at Stanford have developed a wearable patch that allows for continuous mental health monitoring via electroencephalogram (EEG) recording.

EEG technology was developed during the advent of neuroscience nearly a century and a half ago. EEG technology works by recording and analyzing surface electrical signals on more than a dozen sites on the human head. These signals correspond to electrical impulses sent by groups of neurons in the cortex, which is the outermost layer of the brain. In the modern day, EEG is used to diagnose many neurological conditions including epilepsy, sleep disorders, and other psychiatric conditions. While very useful in medical practice, EEG technology has drawbacks, including the use of heavy or bulky wires to deploy multiple electrodes. This caveat makes the use of EEG for long-term neurological monitoring impractical using currently available technology due to discomfort caused by bulky equipment.

Stage of Development
Research -

in vitro

Stage of Research
The inventors have developed a lightweight, wearable patch that can record EEG signals. This patch contains one or more electrodes that record electrical signals produced by neurons in the cortex. The patch also contains an analog digital converter (ADC) to record the signals picked up by the electrodes. Subsequently, the

ADC then passes along these signals to a digital controller which is configured to encode EEG data into a single-bit series so it can be transmitted effectively. Finally, the patch then transmits signals through a radio frequency (RF) transmitter to an external receiver where they can be analyzed.

Applications

- Long-term monitoring of numerous neurological and mental health conditions by EEG
- This invention can enable further research into recordable electrical patterns detectable by EEG that may provide additional diagnostic methods for neurological or mental health conditions.

Advantages

- Lightweight, weighing only a single gram as well as relatively small (approximately the size of a penny)
- Patch format allows this technology to be wearable, which in turn allows long-term monitoring with little quality of life disruption to patients as compared to currently available technology which is bulky and requires wires.

Publications

- C. Chen, J. Yang, J. Sands, M. A. Khan and A. S. Y. Poon, "Next-Generation Wearable Wireless EEG Recorder: The future of accessible neural applications, from mental health monitoring to a noninvasive brain–computer interface," in IEEE Solid-State Circuits Magazine, vol. 14, no. 4, pp. 37-50, Fall 2022.

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