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Editorial

Brain Computer Interface (BCI) Technology

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Brain Computer Interface (BCI) is a direct interface or communication path between human brain and computers. In BCI technology, it is possible for machines to interact immediately with the cognitive state of human brain, measure its activity signals using electrical electrodes in most cases, and interpret these signals for controlling external devices [1].

Depending on how close electrodes get to brain tissue, there are three main types of Brain Computer Interface (BCI) [2]: Invasive BCI interface where micro electrodes are implanted in human scalp. Partially invasive BCI interface that placed on the exposed surface of the brain, and finally, non-invasive BCI interface such as Electrocardiogram (EEG), Magneto encephalography (MEG), Electrooculography (EOG), and Magnetic Resonance Imaging (MRI), uses external sensors or channels. Figure 1 [3] illustrates the difference between invasive and non-invasive BCI interface.

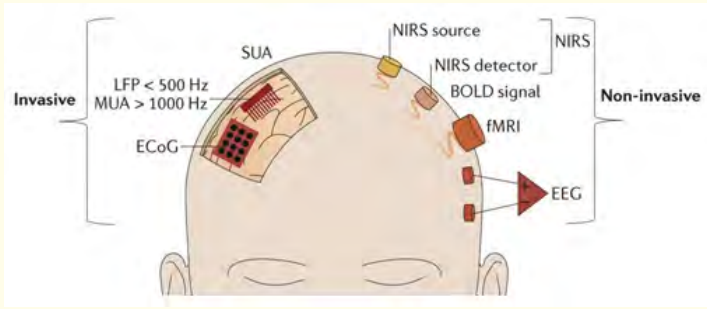

Figure 1: The Difference between Invasive and Non-Invasive BCI.

The early history of BCI interface has been started with Hans Berger's discovery of EEG signals since1924 [4]. In 1965, a simple brain machine experiments were implemented using EEG and analog signal processing by Alvin Lucier, but the "BCI term" had not been provided yet [5]. Jacques Vidal produced the "BCI term" for the first time in his publications in 1973 [5]. While, in 1977, Vidal's experiment of EEG control to cursor graphical object on a computer screen was applied [6].

Actually, the First BCI application for a human being was released in 1998 by Philip Kennedy. In 2001, a research team including John Donoghue from Brown University established a trading company to design a commercial BCI technology which is called BrainGate. Furthermore, Columbia University Medical Center had a successful and improved medical BCI researches [4]. Since 2013, DARPA has funded BCI technology for supporting the University of Pittsburgh Medical center [7] Paradromics [8] Brown [9] and Synchron [10] among others.

However, Brain Computer Interface (BCI) applications have been obviously grown in the past decades, and covered more important and useful services in our modern life. On the other hand, the current intensive work in BCI research is merged with the computerized artificial intelligence techniques, daily coming challenges are appeared to researchers, and consequently move us towards smart life era style.BCI applications including but not limited to the followings [1, 4]:

- A communication tool for serving and helping disabilities
- Predicting and monitoring several diseases such as epilepsy, Alzheimer and depression.
- Lie detection and trust assessment.
- Person, gender, and other security prediction or identification.
- Sleep, mood, and emotion monitoring, detection and therapy.

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