BCIPlayer

A Direct Brain-Computer Interface for Multimedia and Environmental Controls

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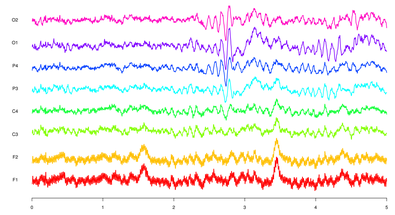
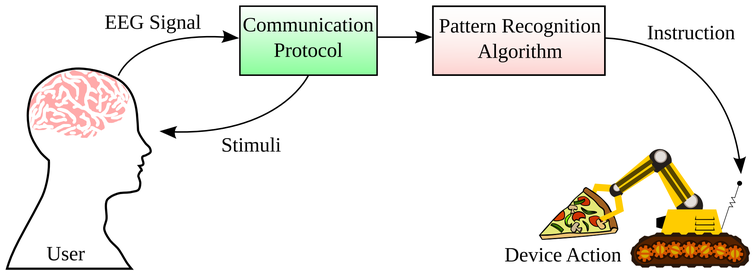
What are Brain-Computer Interfaces?

Brain-Computer Interfaces (BCI) are technologies that aim to **establish a direct channel of communication between the human brain and a computerized device**.



Non-invasive BCI achieve this using a cap lined with sensitive **electrical sensors that are capable of detecting changes in a person's mental activity**, a technique known as **Electroencephalography (EEG)**. EEG does not require dangerous and expensive surgical interventions and is also relatively **inexpensive, portable and easy to use**.

The EEG signals are then combined with a **communication protocol, filters and pattern recognition algorithms in order to construct a useful BCI system**, capable of **controlling any number of computerized devices**.



What Impact Could BCI Have?

BCI may have a number of potential uses; however, an immediately useful application is the development of **assistive technologies for people with severe motor impairments**.

There are many causes of sever motor impairments, including stroke, traumatic brain injury, spinal cord injury, ALS and other neurodegenerative diseases.

For these people, even a somewhat slow BCI may prove to be an invaluable tool.

Having the **restored ability** to perform basic functions, like controlling a music player or TV or send a text message or adjust the thermostat **could result in tremendous improvements in quality-of-life.**

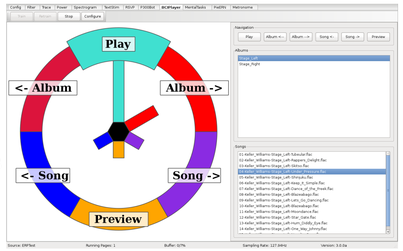
How Does BCIPlayer Work?

BCIPlayer **relies on a well-known technique** for eliciting changes in EEG that can be used to pass messages, **known as the P300 response** .

The P300 response occurs when **the user attends to rare-but-expected stimuli**.

In BCIPlayer, we present a **circular, pie-shaped menu** of options for the user to choose from.

Each section of the menu "pops out" in a random order. The user needs only to attend to the item that they wish to select.

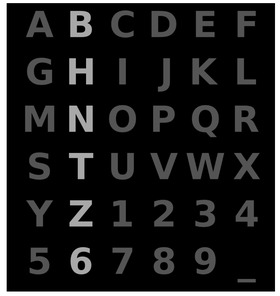


After a short calibration phase, a **pattern analysis algorithm can identify the P300 response** corresponding to the selected item.

When a P300 is identified, a **bar grows toward the menu item until it is selected**.

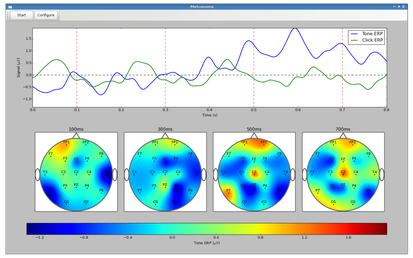
What Makes BCIPlayer Different?

Several BCI systems are currently available. However, none of these systems has become a commercial or practical success. There are **four primary innovations that make our BCI system more likely to succeed**:



1. BCIPLayer is **not a toy**. It is **designed to help people with motor impairments perform actual tasks** that they want to do now.

2. The interface for BCIPlayer is **more pleasurable to use than other systems that involve flashing** and/or flickering.

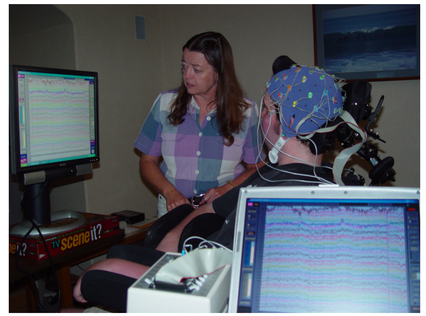


3. We have developed **advanced machine learning algorithms that make BCIPlayer faster and more reliable** than competing BCI systems.

4. We have pioneered several new filtering algorithms that make BCIPlayer **more robust to the noise and interference that is encountered when using a BCI in real-world environments**.

What is The Market For BCI?

There is currently very **little data on how many people may benefit** from assistive BCI**.**



However, we do know that there are **millions of people who currently suffer from severe and disabling motor impairments**.

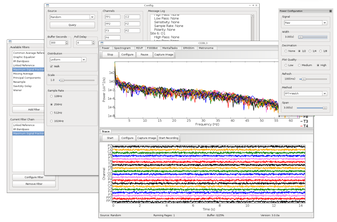
As many as 30,000 people have ALS, 40,000 are in a vegetative state and as many as 450,000 suffer from cerebral palsy, in the USA alone. It is unknown how many of these people, and people with other diseases, may benefit from BCI.

The **first target audience for our BCI are neural rehabilitation centers** that specialize in neurological diseases and trauma.

As these facilities identify people that can use this technology, we believe that **a market for individuals will expand**.

Why The CSU BCI Laboratory?

The CSU Brain Computer Interfaces Laboratory is **uniquely positioned to develop the next-generation of BCI technology** for several reasons:



1. We have been a **leader in BCI research for over 20 years**.

2. We have a **multidisciplinary team** with participating specialists from computer science, occupational therapy, human development, mathematics, biology and engineering.

3. In recent years we have developed a number of **novel algorithms and interfaces** and have begun **testing them under realistic conditions**.

4. We have created a **state-of-the-art software platform**, The Colorado EEG and BCI Lab (CEBL), **for rapidly developing new BCI technologies**.