Brain Computer Interface

The Human brain is partly made up of around 100 billion “Neurons”. There are two types of neurons: Sensory and Motor Neurons. Sensory neurons carry information from our sense organs to the brain and the Motor Neurons carry information from nerve cells in the brain to our muscles, giving us the ability to control muscle activity such as speaking or moving. Neurons are in charge of everything we do and everything we think. Neurons work together by sending each other signals that allow us to have such functions as memory, thought, movement and also all our senses. Due to the neurons required for that being in different areas of the brain, the connection between them can be severed by damage caused to the brain, or even sometimes the Neurons themselves can outright be killed or disabled. This damage can occur both naturally and by accident. Natural causes include diseases such as Parkinson’s, Alzheimer’s and Strokes. This damage can also occur from blows to the head/brain or Spinal Cord Injury. The lost connection can make a person lose access to that part of the brain and all the functions it was responsible for – making it look like they have lost that function. In reality, the function is still there, but it loses its ability to communicate to the rest of the brain. While the brain will try compensating for the lost connection such as by strengthening some of the weaker neuron to neuron connections and also by forming new ones, this is greatly increased and accelerated thanks to the advancements in technology.

A brief analysis of what happens to Neurons:

-For Parkinson’s disease neurons that produce dopamine die of in the area of the brain responsible for controlling our body movements. This results in difficulty in moving.

-In Alzheimer’s disease protein builds up in the part of the brain that controls memory. This causes the neurons to die and as a result people lost their ability at remembering and doing everyday tasks.

-Getting hit in the head (common injury in contact sports), or damage caused by a stroke can outright kill neurons.

-Injury to the spinal cord can break the contact between the Motor neurons and muscles leaving them with no or limited communication. This can cause severe injuries such as paralysis which is the complete loss of movement or paresis which is a weakening of the muscles.

Dopamine is a chemical released by neurons that acts as a neurotransmitter to send signals to other nerve cells in our central nervous system.

Example of BCI Implementation

Brain-Computer Interface (BCI) allows us to monitor and determine a person’s intentions by analysing the signals generated by the brain. Thanks to advancements in this field we now have the ability to help regain some of the lost functions. A great example of someone who was using BCI to help them function was Stephen Hawking. Just by blinking or even just twitching his cheek muscle, he was able to operate an interface that allowed him to express himself and communicate to the outside world. There is around a half a billion people in the world with speech disabilities. This is just a small example which doesn’t include lost functions such as hearing and vision loss, or even movement. A company which uses BCI to help people is Cognixion. Cognixion is a neurotech A.I. company that created a mobile app to help people with speech and or movement disabilities to communicate using their mind. The app uses eye-tracking technology to navigate a screen with your eyes and allows the person to select letters or words etc. by blinking or holding their sight on it. This advanced version of the app can also use facial recognition to detect emotions such as smiling or laughing. The desired output is then spoken by the voice using a programmed voice. The “Pro” version of the app is designed for people with movement disabilities while the more basic version is designed for people with just speech. The basic version allows the person to simply tap words or functions on the phone screen which will then also be spoken out by the AI. In the future, Cognixion has plans to develop direct brain-software technology that will allow a person to control computers using just brainwaves by use of a headband with electrodes attached to the scalp.