BRAIN COMPUTER INTERFACE

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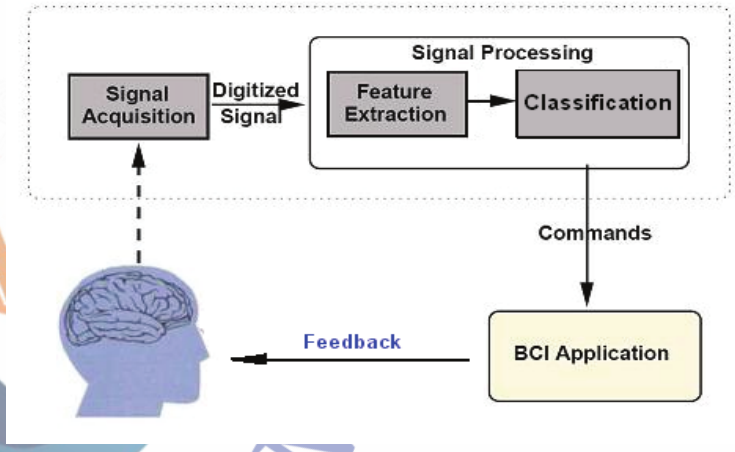
I. Introduction

Brain computer interface is a fast growing emergent technology in which researchers aim to build a direct channel between human brain and the computer. An interface is a shared boundary in which information is shared across two or more separate components of a computer. BCI which is also called neural-control interface is a direct communication pathway between a wired brain and an external device. Information flow is bidirectional in it. This technique is beneficial in the useful functioning of people disabled by certain neuromuscular disorders such as cerebral palsy, stroke or spinal cord injury. Wheel chair control is the best example this technique. This measures the signal produce by central nervous system.

II. What is brain computer interface(BCI)

BCI is a sequential collection of instrumentation consisting of hardware and software which communicates with the brain. The hardware components of interface records signals and software component analyzes the signal and convert into a command such that it control the device or send feedback signal to the brain. To get the signals from the brain, electrodes are attached to the scalp. For higher resolution signals, electrodes can be implanted directly into the brain itself. An electrode is a solid electric conductor that carries electric current into non metallic solids or liquid or plasmas which is used to make contact with a nonmetallic part of a circuit. These electrodes read the signals created by brain. Thereafter wires from each electrode transmit their measurement to a computer attached. These electrodes read the signals by measuring minute difference in the voltage between neurons. The signal produced due to difference in potential is then amplified and filtered as per requirement.



III. Types of brain computer interface

Mainly there are three types of BCI (i) invasive (ii) partial invasive (iii) non invasive. Invasion : In this type of BCI devices are implanted directly into the grey matter of brain by neurosurgery. The signal produced by such invasive devices are very strong but it is prone to scar tissue build up. Drawback of this type of BCI is that the body can lost its ability to react to a foreign object in the brain. Partial invasion : Invasive devices are applied inside the skull but outside the grey matter of brain. An electrode grid is being implanted by surgery in the skull. Electrocorticography (ECoG) is an example of such BCI. An ECoG records the activity of brain inside the skull but from the surface of membrane that protect it. Signal received are less strong than invasion BCI. Non-invasion: This is the most useful method for neuron signal imaging. In this method device is applied outside the skull, just on the scalp. Electroencephalography(EEG) , Magnetoencephalography(MMG) , functional Magnetic Resonance Imaging(fMRI) are the best imaging techniques using this method. These techniques are now a days acquired a great importance in the medical field. Application of BCI: This technique find a great application in the field of medical. It can allow paralyzed people to control prosthetic limbs with their mind. Even deaf people can also express their thoughts and views by display on the computer. It is successfully used in Lie detecting test. Every technique has its another aspect. Disadvantages are also associated with it. Research regarding this technique is still in the beginning stage. Some ethical issues are also affecting the research area. If used in non invasion, electrodes outside the skull detect very few electric signals from the brain. Now a days interest in BCI field is increasing as it includes multidisciplinary scientists e.g. neuroscientists, mathematicians, engineers. Its design and development will definately bring benefits to the daily lives of disabled people. In near future BCI system may become a new mode of human machine interaction with levels of everyday use similar to other current interface.