**BRAIN COMPUTER INTERFACING AND ASSISTED ROBOTICS THERAPY IN STROKE REHABILITATION PROCESSES**

A stroke is a brain attack due to blocked or burst brain vessels in the brain, which impairs mostly motor functions. Stroke also affects breathing and heart functions, visions, speech, balance and other functions of the body. Stroke is a form of neural disorder in that the lack of blood supply due to damaged blood vessels cuts off some neurons from their needed oxygen supply leading to the death of these neurons. The performance of the body part associated with the damaged neuron(s) is affected (deteriorates) due to incomplete information for functioning.

The identification of neural-disorders and development of completely medical based treatments for damaged neurons is a problem that is yet to be completely solved. This is due to the varying nature of the brain behavior from one human to another, thus creation of generalized test to identify diseases caused by neural disorders is a seemingly tough task. The same applies to the development of treatment procedures for diseases due to neural-disorders. The response to patients of similar neural-disorder, to similar treatment procedures do differ. This raised the question of methods of treating stroke.

The neurons generate signals that encode information of body activity. These signals are read off as a summation of brain signals and can be decoded using novel algorithms that extract parameters indicative of the encoded information within the brain signals. Brain computer interfacing (BCI) over the years has worked towards the mapping of signals from individual neurons or brain signals (summation of brain signals) to parameters indicative of the information encoded within the signals of which acceptable results have been produced.

Traditional stroke-rehabilitation is approached from the perspective of continuous, repetitive exercises that tend to force the use of impaired body parts. This is based on the ability of the brain neurons to alter their connections through repetitive tasks so as to compensate for damaged neurons and body functions. This ability of the brain is often called neuro-plasticity. In this method, there is no means of feedback indicating successful rewiring of the neurons of the brain during forced, repetitive tasks.

A better solution would involve having a feedback system that shows extent of change in the wiring of the neurons of the brain during and after each exercise session. The brain being made up of billions of neurons makes it almost impossible to identify the exact architecture of neuron connections or changes in the connection architecture.

The ability of neuro-plasticity possessed by the brain also makes it able to change the characteristic of generated signals before and after neuro-plasticity. Rather than monitoring each neuron of the brain or neurons around damaged neurons, it is easier to monitor changes in the brain signal during exercise session that are meant to induce neuro-plasticity. The change in brain signal is called brain signal modulation. The association of brain signal modulation and neuro-plasticity makes monitoring of brain signal modulation a solution for generating feedback indicating progress in neuroplasticity and thus improvement in stroke rehabilitation.

This study is aimed at showing the development of a system that indicates willful modulation of brain signals using brain computer interfacing tools as a means of feedback on stroke treatment.