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# **Functional Electrical Stimulation for Rehabilitation in Hemiplegic Patients**

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**Abstract -** There are billions of neurons that connect together in the human brain. People's thinking and their emotional state affect the interaction between these neurons. Each interaction between these neurons creates an unacceptable discharge through our existing technologies. However, the activity generated by thousands of simultaneous exhausts of synthesized waves can be measured. The sequence of interactions between these neurons is the result of different brain states. These interactive forms produce waves of varying amplitudes and frequencies. These waveforms can be used to determine the emotional state of the brain. The objective of this project is the rehabilitation of hemiplegia through FES (Stimulation of electrical function). There are many different techniques for detecting electrical activity in the brain. Electric stimulation (FES) is an effective technique for rehabilitation functions. Paralyzed patients are unable to perform daily activities. This system can be used for individuals with stroke and injuries. The technology used in manual rehabilitation is often used to restore pseudo-neurons. Studies have shown that repetitive motor practices and moving activity in the real world environment are beneficial for motor rehabilitation in stroke patients. The electrical stimulation function causes larger muscle spasms by providing electrode stimulation. By applying stimulation through the electrode, capture and release actions are achieved. The level of stimulation for hands and legs of the paralysis can be adjusted using the control button. This stimulation (frequency) adjustment makes the patient feel comfortable.

**Keywords-** Electromyograms (EMGs) , Embedded System, Nerve System, Functional Electrical Stimulation.

## **I. Introduction**

The experiment requires that someone act as a controller and the second person is controlled. The two electrodes are placed upon the "*ulnar nerve*" at the back of the forearm, and the third is placed at the backside of the hand to acting as a ground signal. The controlled person has two electrodes connected to their ulnar nerve, and after a few inputs from the first test subject movement are transferred to the second subject.

The brain signal from the motor casing can be read as electric discharge. The '*ulnar nerve*' is near to the skin to stimulate it by using other people's brain waves making the test subjects

inadvertently move their last three fingers. Moving the hands of the first subject up side and down side will not control the second object, because the brain waves are not engaged to perform the action.

## **II. Concept**

In the field of rehabilitation, functional electrical stimulation (FES) is more used and study on this technique and makes more advances in our day to day life. In FES, muscle is stimulated by applying a electric current to our skin to the relevant muscles to control movements of human body joints known as elbow flexion and extension. For the better efficiency of rehabilitation it requires better communication of information on muscle which is generated by the therapist or we can say use gel or another kind of lubricant to make better connectivity of electrodes to the muscle. This system contain motor function training based on two person communication (controlled and controller) , In this System Ideal EMG pattern can be record from the controller and directly fed into the machinery which calculate the pattern of the motor control after that machinery generates output in the same pattern which is generated by the controller now the system contraction with muscle through stimulation by the pattern which is generated by the controller.

The nervous system is a very complex network of nerves and cells that carry messages from our brain and spinal cord to various body parts. The nervous system includes two nerves system that is Central nervous system and Peripheral nervous system. The Central nervous system is made up of the brain and spinal cord and The Peripheral nervous system is made up of the Somatic and the Autonomic nervous systems.

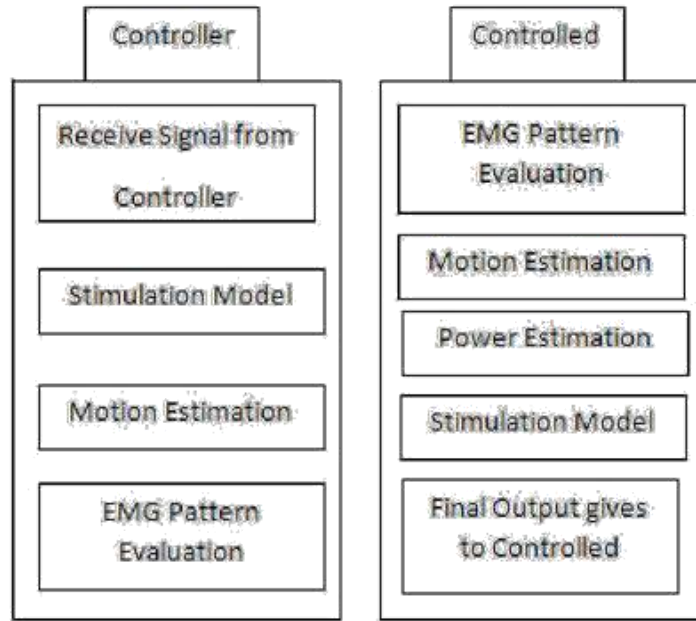
## **III. Proposed System**

FES treats spasticity in stroke patients with upper limb. The rehabilitation function uses an EMG controlled stimulator with a pair of surface electrodes that record both EMG and electrical stimulation. The major limitation of the EMG-induced electrical stimulation system is the inability to control the voluntary EMG-induced electrical stimulation after induction of pre-programmed electrical stimulation. Currently, FES systems are used to improve the function of patients with disabilities. The feasibility of using accelerated electrical stimulation is controlled for the elbows, wrists and fingers that allow functional tasks in patients with chronic bleeding. Neuroprosthesis for Capture the neuroprosthesis applied by FES to artificially create muscle spasms to accomplish reaching and grasping tasks in subjects who lost voluntary control of the muscles due to illness or injury. It uses short pulse bursts with a pulse width of 0-250 microseconds and a pulse amplitude of 10-150mA to produce muscle contraction by stimulating motor neurons or reflexes.

1) Use of Implant FES: These devices should only be used when the patient attains stable neurological status and does not require any further functional improvement. It is usually applied to SCI subjects for two years or more after injury.

2) Use FES Surface System: This system introduces FES training during early recovery stage because technology does not require neurological stabilization

From these two FES technologies consumes more power and it can be placed by a trained person, but in our method it can work on simple 9V DC Battery and can be handle by a common person. Algorithm shows the complete concept behind the FES system.



**Fig 1: Concept of direct rehabilitation based on FES and EMG**



**Fig 2: Figure shows the hardware simplicity.**

The main limitation is that the maximum pulse width is fixed at 300 microseconds and frequency at 20 hertz then the amplitude is adjusted to reach the excitation threshold for each muscle. Functional ability despite the fixed stimulation system open loop and surface electrode open. Good hand movements can be made by voluntary movements of shoulders and elbows allowing subjects to write and train can improve pen control and writing speed.

#### **IV. Conclusion**

This study investigated methods of using electrical stimulation and EMG signaling to provide assistance in the operation of hemiparesis patients. It has been pointed out that our system to stimulate the fingers and muscles relaxes the hands in both body and hemiplegic tissues generally does not reduce finger flexing activity, as can occur by inhibition. Reciprocal Instead, stretching the fingers frequently increases the activity of the fingers, perhaps due to the elastic reflectivity. Thus, stimulating the extraction of the fingers sufficiently to provide the full extension of the fingers is not an appropriate method to inhibit spasmodic muscles in the hemiplegia. Here we Test the Project on Human to control Human, the main benefit of the project to control human without their brain use. In this study, patients with hemiplegia used their remaining ability to rehabilitate their hands by adjusting the control knob to provide appropriate stimulation. Objects can successfully operate the FES system with surface electrical stimulation. We can further improve the system by designing an orthopedic grip or positioning sensor.

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