Using Analyzed Data From EEG Readings for Electrical Stimulation of Limb Muscles: An Innovative Approach to Neurorehabilitation

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Paralysis is a medical condition that results in the loss of the ability to move some or all parts of the body. Even though treatments for some kinds of paralysis exist, there's currently no certified treatment for paralysis. Paralysis can be caused by various factors such as stroke and spinal cord injuries (SCIs). In this study, we aimed to explore the usage of muscle stimulation based on Motor Imagery (MI) as a potential treatment for paralysis caused by SCIs. MI involves the visualization of motion without physically executing it. Our research has shown that the electrical activity in the brain changes during MI, and these changes may be measured using a non-invasive method through electroencephalogram (EEG) via a brain-computer Interface (BCI). We conducted experiments on 7 normal people as a proof of concept while making the movements covered in the study both physically and mentally (MI) to measure brain activity with the use of a BCI. The readings were classified according to the affected side of the body. The classification accuracy was found to be 54%. Moreover, we used Electric Muscle Stimulation (EMS) to control a person's hand based on another person's brain electrical activity as proof of concept. Movements such as supination, pronation, and various forms of grasps were covered within the study. Overall, our findings suggest that MI and BCI technologies have the potential to be effective treatments for paralysis. Further studies in this area can also lead to the development of more advanced treatment options.

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