Activity-Dependent Human Brain Surface Stimulation for Recovery from Stroke and Other Brain Injuries

This technology improves or restores neural function in the brain for patients recovering from stroke. This system is a closed-loop stimulation that detects residual movement or muscular activity, and patterns to two brain sites, controlled either by preprogrammed sequences or contingent on neural or muscular activity or movement.

What is the Problem?

Approximately 700,000 people in the United States suffer a stroke each year, and a large proportion of those people suffer motor or other deficits as a result. Current rehabilitation approaches lead to limited recovery of function, and there have been few developments of novel and effective pharmacological or surgical options for rehabilitation. Nevertheless, recent advances in neural technologies and the understanding of the human brain have sparked new investigations into the potential of brain-computer interfaces that directly record and/or stimulate the brain. Using these recent advances in neural technologies for stroke recovery poses an interesting challenge and opportunity.

What is the Solution?

The solution is a system that promotes neuroplasticity in the brain of a patient to improve or restore neural function. This method is based on closed-loop stimulation of the human brain surface for engineering long-term neuroplasticity in the brain to promote recovery from stroke, traumatic brain injury, or developmental neurological conditions (e.g., Cerebral Palsy). This is done by detecting residual movement or muscular activity in a limb of the patient, such as a paretic limb. A stimulation pattern is generated based on the detected movement or muscular activity. Then the brain is stimulated with this stimulation pattern. Delivering stimulation based on the detected residual movement or muscular activity of the limb is expected to induce neuroplasticity for restoring neural function, such as control of the limb. This can also be achieved by detecting brain signals and delivering contingent stimulation or delivering pairs of successive stimulus patterns to two brain sites, controlled either by preprogrammed sequences or contingent on neural or muscular activity or movement.

What is the Competitive Advantage?

Technology ID
BDP 8696

Category
Device/Other
Selection of Available
Technologies

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Current rehabilitation approaches lead to limited recovery of function, such as physical therapy. This method retrains the brain such that the patient will regain the ability to control their limbs after a stroke.

Patent Information:

References

1. David J. Caldwell, Jeffrey G. Ojemann, and Rajesh P. N. Rao(43678) , https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6692891/, Frontiers in Neuroscience

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