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Neuromodulator for Simultaneous Stimulation and Signal Reception

IP Status: Pending US Patent; **Application #:** 15/863,288

Safer Deep Brain Stimulation

A deep brain stimulation (DBS) electrode system allows simultaneous neuromodulation and reception of the neuronal response. The method provides electromagnetic (EM) stimulation (using at least three probes for simultaneous modulation) in pulsed and/or continuous wave configuration with different wave forms. A multi-strip multichannel array electrode generates rotating electric fields, and the system can manipulate the amplitude and frequency of electromagnetic waves. The technology can also determine how neurons respond to the DBS treatment: The stimulation is combined with simultaneous reception of the neuronal response using phase sensitive detection. Selective stimulation of neurons in DBS based on neuronal response makes this treatment ideal for diseases such as Parkinson's and epilepsy. This technology reduces tissue damage and provides selective, localized and efficient stimulation of neurons, resulting in safer, more efficient and more effective DBS.

Study Neuronal Activity in Healthy and Diseased States

Currently, no neurostimulation systems can provide simultaneous stimulation of the nervous system as well as signal reception. Pulse frequency and amplitude for currently available DBS devices are adjusted based on the patient's behavior. The inability to accurately target specific neurons and adaptively stimulate based on neuronal feedback limits the efficacy of current neurostimulation systems. This new technology, which borrows concepts from MRI systems, allows greater control of electromagnetic signal delivery via several independent degrees of freedom. The device determines the location of the implanted electrode in the brain based on the response of the neuronal population, and its simultaneous transmit and receive capabilities provide feedback and enable a closed loop system. In addition, the device allows the study of neuronal activity in both healthy and diseased (i.e., epileptic seizures) states.

BENEFITS AND FEATURES:

- Improves safety, efficiency and efficacy of current DBS devices
- Simplifies neurosurgical procedures
- Electromagnetic stimulation in pulsed and/or continuous wave configuration generates controllable electric field components
- Simultaneous reception of the neuronal response using phase sensitive detection gears treatment toward specific neuronal populations
- Three probe minimum (multi-strip/multi-channel array design) means efficient neuromodulation with less tissue damage
- Feedback loops in phase with input signals monitor detection and reception and provide control over stimulus placement or modulation

APPLICATIONS:

Technology ID
20160259

Category
Engineering & Physical Sciences/MRI & Spectroscopy
Life Sciences/Diagnostics & Imaging
Life Sciences/Human Health
Life Sciences/Medical Devices
Life Sciences/MRI & Spectroscopy
Life Sciences/Neuroscience
Agriculture & Veterinary/Veterinary Medicine

Learn more

- Neurostimulation systems
- Deep brain stimulation (DBS)
- Neurosurgical procedures
- Treatment of Parkinson's, epilepsy, etc.

Phase of Development - Proof of concept; modeling and designing working prototype

Researchers

Shalom Michaeli, PhD
Associate Professor, Department of Radiology
External Link (www.med.umn.edu)
J. Thomas Vaughan, PhD
Professor, Department of Radiology
External Link (www.cmrr.umn.edu)
Lauri Lehto, PhD
Research Associate, Department of Radiology