Docket #: S23-409

Method and apparatus for autonomous parameter adaptation of non-invasive multichannel stimulation

The Tass Lab has invented non-invasive, Vibrotactile Coordinated Reset (vCR) stimulation devices and methods to safely and efficiently treat brain disorders characterized by abnormal neuronal synchrony such as Parkinson's disease.

For a more effective vibrotactile therapy, the Tass Lab developed a closed loop, self-tuning algorithm that calibrates and optimizes Coordinated Reset (CR) treatment based on assessments of the patient's symptoms. The invention automatically and autonomously calibrates relevant stimulation parameters (stimulus intensities, stimulation frequency, temporal jitter, amplitude, CR sequences) for non-invasive and invasive multichannel CR stimulation and related stimulation. Parameter adjustment is optimized via a reinforcement learning algorithm with the goal to learn the best-performing stimulation pattern for each assessment outcome based on the history of both assessment outcomes and delivered stimulation patterns. The automatic/autonomous calibration and optimization provide a more effective treatment with better desynchronization effects (symptom relief), sooner and with less treatment time than prior methods.

Stage of Development – Proof of Concept Prototype
Simulations testing the reinforcement learning algorithm is ongoing and will be incorporated in the Vibrotactile Coordinated Reset (vCR) Glove pilot, and FDA approval study.

Related Technologies:
17-270: Safe and efficient vibrotactile multi-channel stimulation for the treatment of brain disorders

23-357: Apparatus for efficient vibrotactile stimulation, especially vibrotactile fingertip stimulation
23-359: Apparatus for efficient vibrotactile and electrotactile fingertip stimulation
23-360: Apparatus and method for efficient long-term multi-channel non-invasive stimulation for the treatment of disorders of the nervous system
23-373: Apparatus and method for efficient multichannel vibrotactile stimulation with compound pulses
23-406: Apparatus and method for efficient combined vibrotactile and electrotactile stimulation for the therapy of disorders of the nervous system
23-407: Apparatus for efficient electrotactile fingertip stimulation for the treatment of disorders of the nervous system
23-408: Apparatus and method for efficient wireless synchronization of multi-site non-invasive stimulation for the treatment of disorders of the nervous system

Applications

- **Vibrotactile Coordinated Reset (vCR) Glove** (fingertip stimulation) for **non-invasive treatment of Parkinson's disease** and other movement related disorders.
- Works with and connects to invasive treatments such as **deep brain stimulators, spinal cord stimulators, epicortical stimulators**, etc.

Advantages

- **Easier, faster implementation and calibration** - automatically/autonomously calibrates relevant stimulation parameters for non-invasive and invasive multichannel CR stimulation and related stimulation technique.
- **More effective treatment - symptom relief seen sooner** and with **shorter stimulation sessions** in computational studies (faster wash-in and shorter sessions).
- **More precise** vibrotactile and/or electrotactile stimulation - **stronger physiological effects** with **less vibration power/amplitude**.

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