Docket #: S10-419

Seizure Prediction and Neurological Disorder Treatment

Stanford researchers have developed an efficient system and method for accurate short time seizure prediction and effective therapeutics. The therapeutics is based on close loop intermittent neurostimulation in an array of surgically implanted electrodes in the epileptogenic region. The optimal parameters required to predict seizures and close loop neuromodulation are computed using recorded or induced seizures. The phase, amplitude, and the location of electrode where high frequency stimulation is applied are automatically controlled based on recorded activity.

This system is composed of several components: array of surgically implanted electrodes, electronic interface, detection module, seizure prediction module, neuromodulation module, and external switching model. It is flexible and can switch between three different regimes: a) Basic calibration, b) Seizure prediction regime and neuromodulation, or c) Seizure prediction regime. This invention is applicable to treat patients with neurological disorders such as epilepsy, and can be adapted to provide neuromodulation in Alzheimer's, and Parkinson's Disease as well as depression.

Stage of Research:
- System tested in rats with promising results
- Results show that short time prediction (1 min) is possible with high accuracy if electrodes are located at the focal point where seizure develops

Applications

- Epilepsy,
- Other Neurological disorders such as Alzheimer's and Parkinson's Disease,
- Depression

Advantages

- Accurate warning before the seizure starts
- An effective, efficient stimulation of the required area will impede the development of seizures
- The lifetime of the system will be enhanced due to reduced energy requirement for stimulation (non-continuous stimulation only in the selected electrodes)
- Alternative to resection in resistant epilepsy
- Previous methods regarding seizure prediction and neuromodulation did not identify two major issues:
    - The position of electrodes regarding the focal point where the seizure starts to be generated is extremely important
    - The timeline for which an accurate prediction can be made has generally not been solved

Publications

- Aur, Dorian. Understanding the Physical Mechanism of Transition to Epileptic Seizures, Journal of Neuroscience Methods, Volume 200, Issue 1, 30 August 2011, Pages 80-85.
- Aur, Dorian. The Physical Mechanism in Epilepsy – Understanding the Transition to Seizure. Available from Nature Precedings. 15 December 2010.

Patents

- Published Application: 20120150257

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