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A Brain Pacemaker for Epilepsy

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Inventors

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Intellectual Property Status:

US 8,197,395 B2

Invention Description

Approximately 50 million people in the world suffer from epilepsy, one third of which have seizures that are not responsive to anti-convulsant medication. The seemingly unpredictable nature of epileptic seizures present debilitating limitation in the familial, social, educational and vocational activities of the afflicted. Thus presenting an unmet, dire need for the ability to prevent epileptic convulsions and regulate chaotic brain activity.

Researchers at Arizona State University have developed a framework for regulating the epileptic brain. This invention identifies chaotic dynamics known to be responsible for seizure activity and applies an automatically generated adaptive low-amplitude feedback signal (electrical, magnetic, chemical, optical, cryogenic), preventing prolonged dynamical entrainment of critical brain sites and thus the route of the epileptic brain towards seizures. Such a framework has outstanding potential to drastically improve the quality of life for those currently afflicted with epilepsy and constitutes the basis for the development of a brain pacemaker device for the treatment of epilepsy.

Potential Applications

- A novel treatment for epilepsy–the ability to detect pathology in brain dynamics, timely intervene, and prevent epileptic seizures from occurring
- Evaluation of efficacy of antiepileptic therapy- assesses efficacy of therapies including pharmacotherapy, vagus nerve stimulation, deep brain stimulation, and transcranial magnetic stimulation
- Treatment of related brain dynamical disorders – applicable to related brain dynamical disorders such as strokes, sleep apneas, migraine attacks, and parkinsonian tremors
- Analysis of complex biological systems – dynamic transitions observed in heart attacks and/or fibrillation

Benefits and Advantages

- Preventing occurrence of epileptic seizures by efficiently controlling the epileptic brain
- Minimal side effects of intervention due to the minimum dose of intervention required
- Cost effective treatment. This is due to the nominal amount of energy necessary to power stimulation, thus resulting in prolonged battery life
- Possible application to the control of other dynamical brain disorders with intermittent crises
- Application to control of crises in other systems with pathological internal feedback mechanisms

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