Precise Electrical Stimulation of the Human Brain

Medical Motivation:
Stimulation of the human brain to modulate primary motor function (e.g., Parkinson’s disease) and higher cognitive brain function.

Non-invasive

Brain stimulation

Invasive

Transcranial Direct Current Stimulation (tDCS)

tDCS Applications, e.g.

- Tinnitus
- Stroke rehabilitation
- Mood disorders

Project: Optimizing injected current patterns using regular electrode arrays

- Preprocessing
- Segmentation
- Mesh Generation

Patch electrodes

Sponge electrodes (EGI)

Generate tDCS Forward solution

Comparison of EGI and patch electrodes

Potential distribution mapped on anatomical surfaces (V/m*m)

Deep Brain Stimulation (DBS) for Parkinson's Disease

Symptoms
Brain stimulation
Medication

Project: Simulation based programming of DBS device

- Collect patient data
- Volumetric atlas
- Simulation
- Put on data server

Patient-specific model for stimulating the subthalamic nucleus

Optimizing Stimulation Parameters using an IPad

Reduces DBS programming time from 4h to 4 min!

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