DBP: SIMULATION OF DEEP BRAIN STIMULATION

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Conventional 4 contact DBS Leads

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Scientific Goals

1. Accurate, patient-specific, multi-scale bioelectric field models of neuromodulation therapy.
2. Deployment of mobile platform for DBS decision support.
3. Development of virtual DBS surgery platform
2015

NIH awards a 5 year, Multi-PI R01 (Butson & Okun) to perform a clinical trial of an ImageVis3D Mobile decision support system for post-operative DBS programming

Gordon Duffley (BME grad student in Butson Lab) works with Dr. Jens Krüger to create a new version of ImageVis3D Mobile

The new version of ImageVis3D Mobile is being tested by nurses in clinic and at patient homes in a two phase clinical trial.
Recent Progress

2015
NIH awards a 5 year, Multi-PI UH3 (Butson, Schiff, Henderson, Giacino, Machado) to perform a clinical trial of central thalamic DBS for traumatic brain injury
Andrew Janson (BME grad student in Chris’ Lab) works with SCIRun developers to create a virtual DBS surgery system.
The virtual DBS system uses interactive meshing, allowing the ability to move or add DBS leads, compute bioelectric fields, compute neural activation and visualize response within ~10 seconds.
Recent Progress

2015

NSF awards a 2 year US-IGNITE grant (Butson) to integrate near real-time, multiscale modeling and remote volume rendering into ImageVis3D Mobile

Daria Anderson (BME grad student in Butson Lab) has developed a new tensor-based system for predicting neural activation. Johannes Vorwerk (post-doc) will take over technical integration in April.

This system will transmit interactive models over the Utah Education & Telehealth Network (UETN) from servers at SCI using remote volume rendering.
Challenges & Future Directions

1. Near real-time, multi-scale bioelectric field modeling.

2. Integration of models with outcomes and imaging databases.

3. Infrastructure and methods to support population health studies in neuromodulation.