TRD 2: Simulation and Estimation

Integrated Software Tools

Visualization
Image and Geometric Analysis
Modeling, Simulation & Validation
Simulation and Estimation

SCIRun Toolkit

SCI Run Solution
BrainStimulator Toolkit
Forward/Inverse Toolkit
BioMesh3D Toolkit

CIBC
ImageVis3D
FluoRender
map3d
Cleaver
Seg3D
ShapeWorks

TRD: Sim&Est

THE UNIVERSITY OF UTAH
www.scc.utah.edu
TRD 2: Simulation and Estimation

Aims

1. Bioelectric intrinsic source simulation and estimation for heart and brain
2. Electric/magnetic stimulation for heart and brain
3. Streamlined model-building
4. Quantification of uncertainty
Impact of Modeling Speedup on Stimulation

How does model-building speedup affect prediction accuracy?

IGA TRD tools will be used to study modeling tradeoffs

DBP: VEPL with N. Trayanova, J. Blauer, et al.
Catheter Measurement of Tissue Health

How can we increase accuracy of catheter measurements?

Myocardial EGM

Lesion EGM

ROC curve for tip angle

Blauer, et al. (2014) J. Cardiovascular Electrophysiology

Progress:

Tissue tomography

DBP: Marrouche
Deep Brain Stimulation Variability

How does multi-faceted variability affect prediction accuracy?

DBS Lead Locations for 60 Parkinson’s Disease Patients Across 8 Centers


Need faster model-building, quantification and visualization of uncertainty

Progress:
NINR R01 will fund clinical trial

See DBS posters

DBP: Foote & Okun
Can TMS selectively stimulate distinct cerebellar networks?

fMRI based parcellation of cerebellum

Identify network stimulation strength

Individualized head model  Position coils  Stimulate target  Model induced currents

DBP: M. Halko, A. Pascual-Leone et al. BIDMC

*tDCS: see poster*
Targeting Neuromodulation Using Cortical Electrodes

Applying our transcranial modeling and optimization to cortical surface arrays for epilepsy studies

NSF/NIH Grant Submitted: Ojemann (U Wash) PI, CIBC (UU + NU), Ball (Freiburg Germany)
Reproducible, community-based research

BrainStimulator: in alpha release

See BrainStimulator Demo
Reproducible, community-based research

Newly formed **Consortium for Electrocardiographic Imaging (CEI)**

Core Team

R. MacLeod and D. Brooks

L. Wang, RIT

P. van Dam, Radboud,

O. Doessel, KIT, Germany
Reproducible, community-based research

Consortium for Electrocardiographic Imaging (CEI)

Algorithm and Data Exchange Activities

Edgar database planning

March meeting in Germany

ISCE session in April

Hackathon at CinC

See Forward/Inverse ECG poster, SCIRun 5 demo