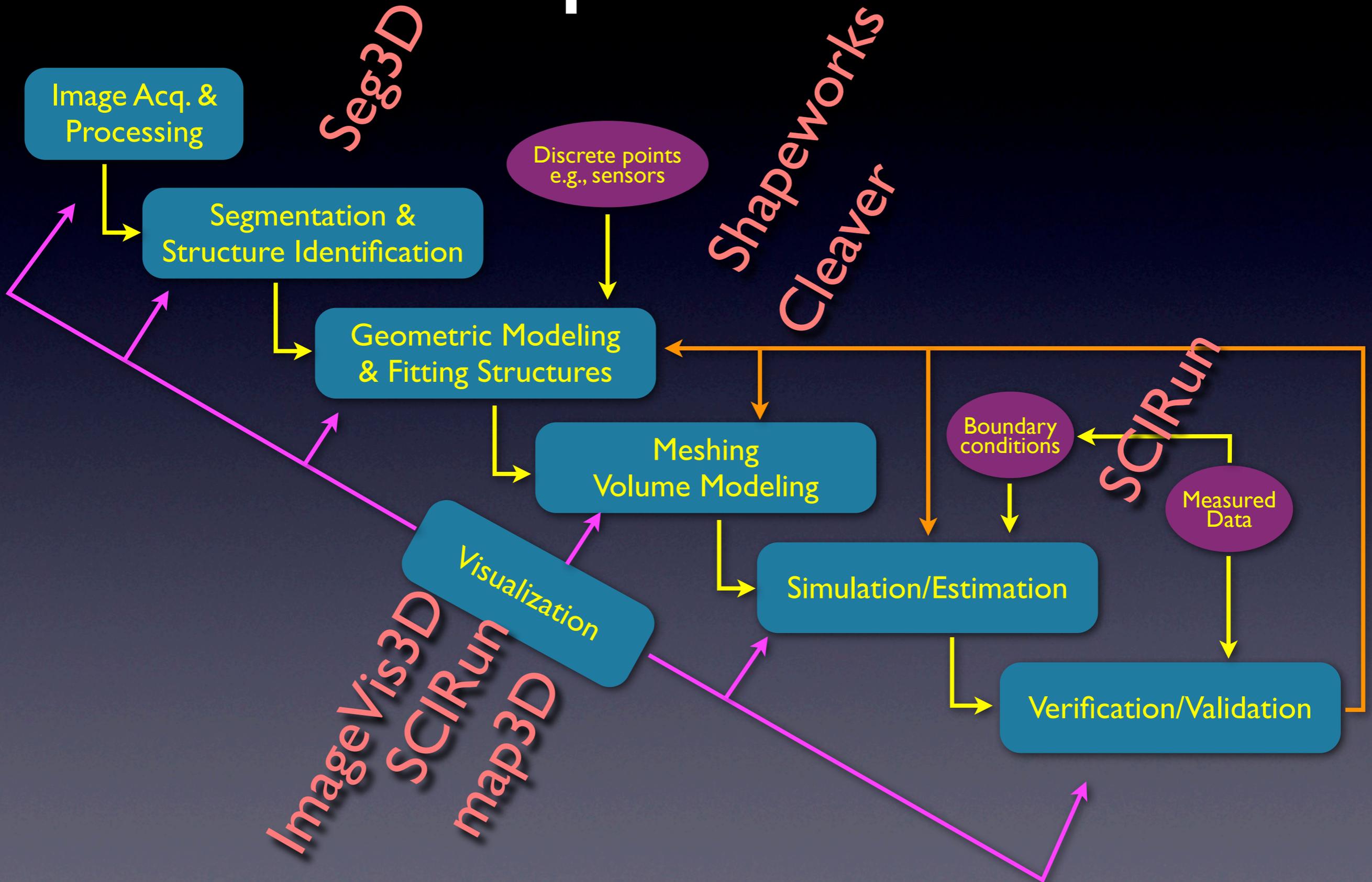


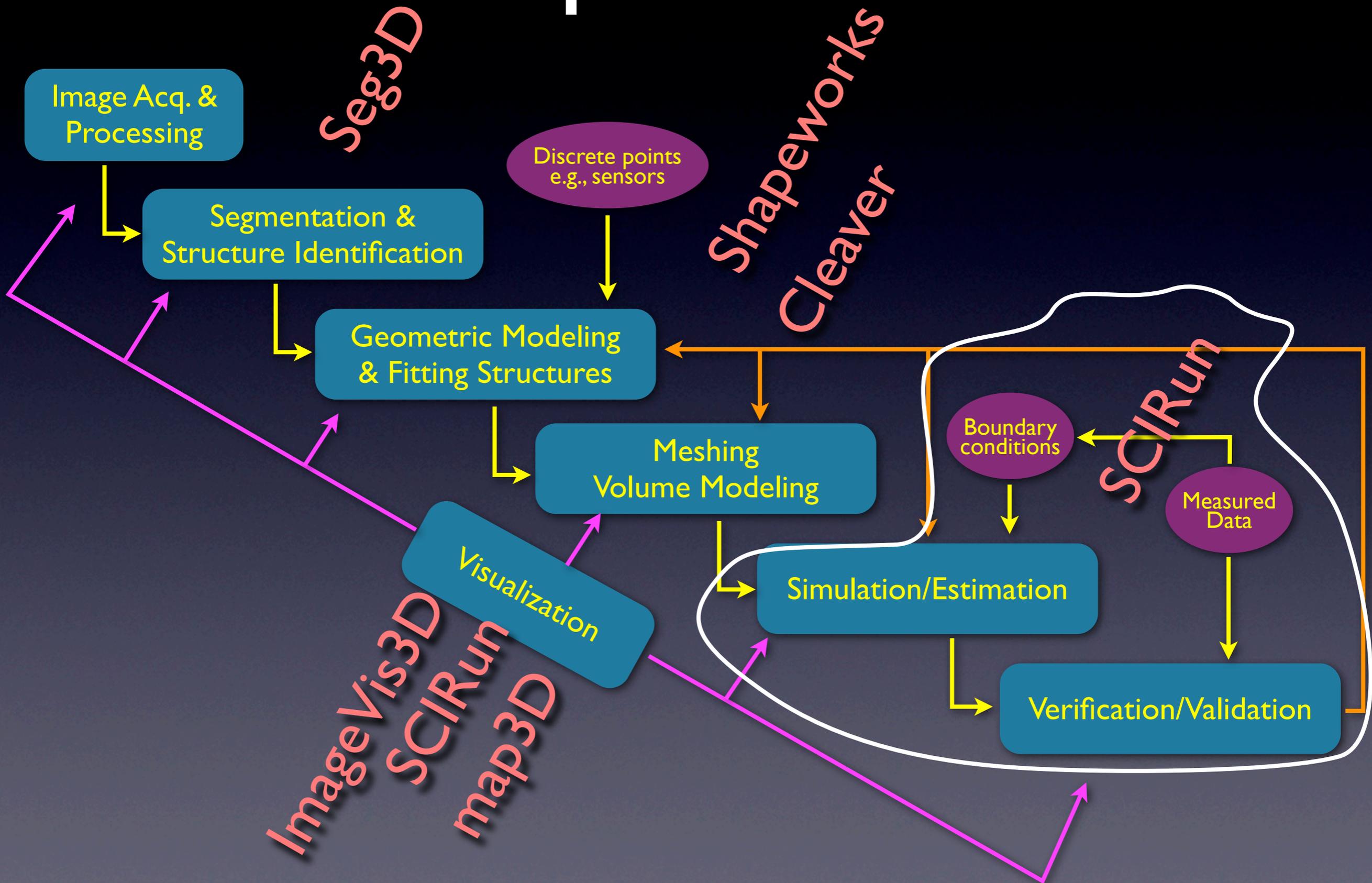
Case Study IV: Stimulation of brain potentials from transcranial stimulation

Moritz Dannhauer, Jess Tate and Rob MacLeod

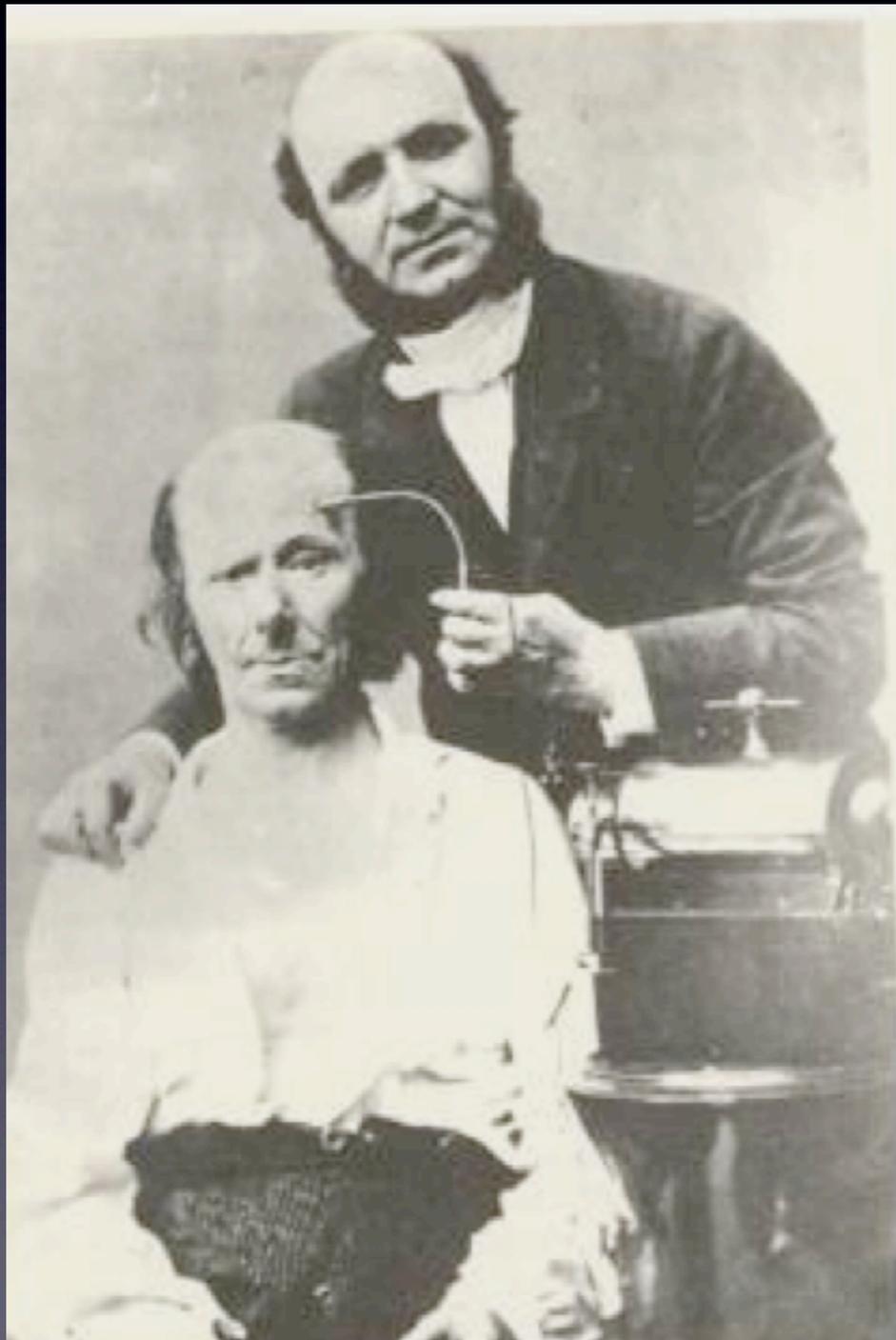
Pipeline



Pipeline



“Faradization”



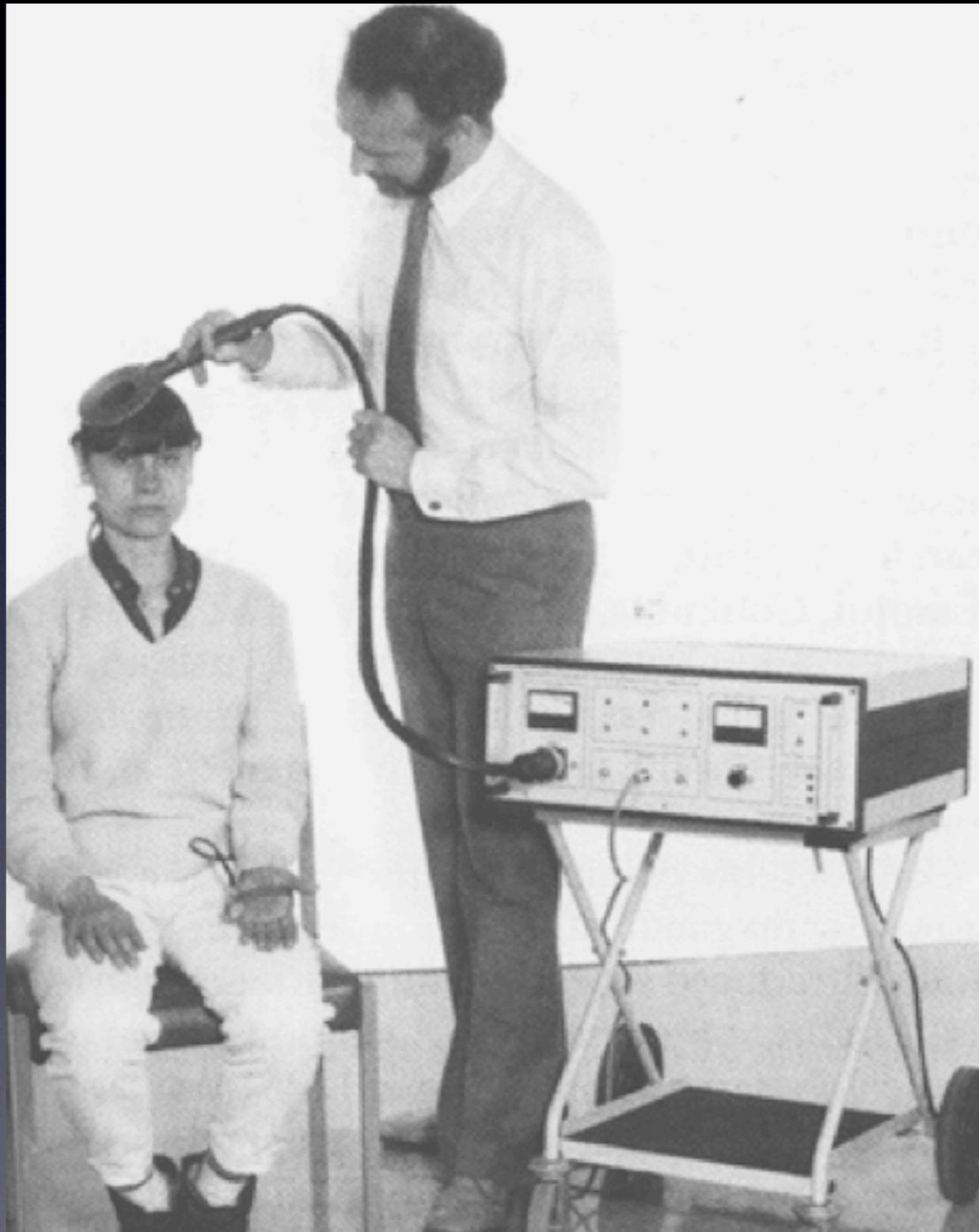
Duchenne de
Boulogne
(1806-1875)

Transcranial Stimulation: Beginnings



Sylvanus P. Thompson,
1910

Transcranial Stimulation: Modern Era



Anthony Barker,
1985

Stimulation Approaches

Magnetic

Electric

a TMS

Hand-held coil

camera device

b tDCS

Anode

CIBC SCIRun Simulation

DC current applied via pair of electrodes; current induced in conductor

Time-varying current in coil

Time-varying magnetic field

Induced current in conductor

Medical Motivation

Epilepsy

Traumatic Brain Injury

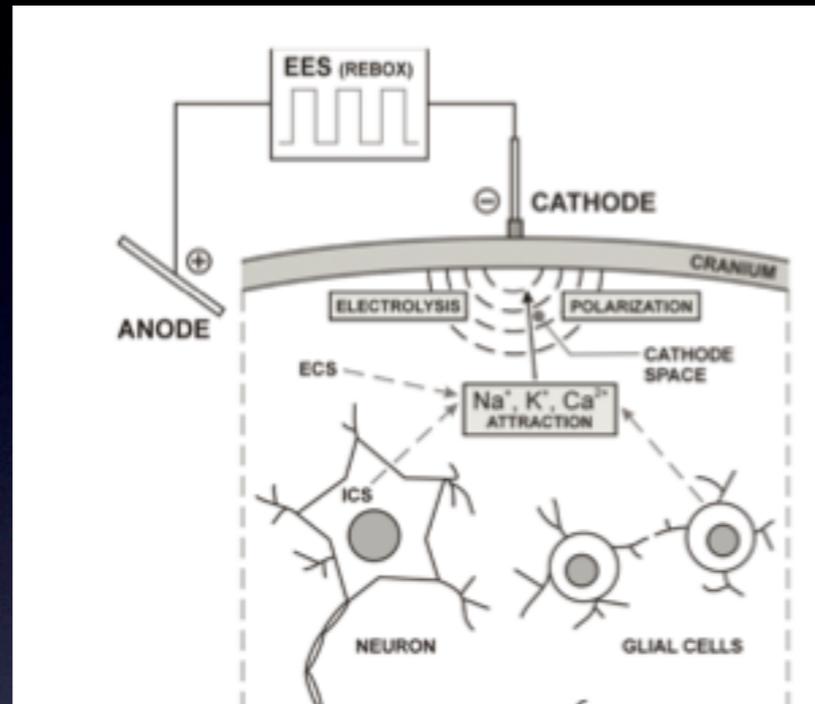
Neurological diseases

Eye-sight rehabilitation

Mood disorders

tDCS Goals

Clinical Goal

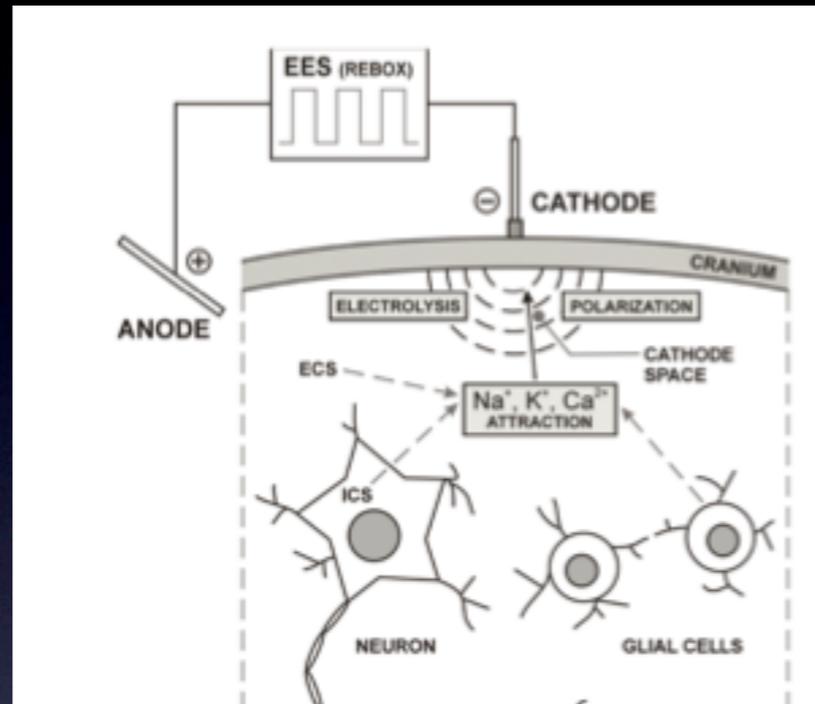


Technical Goal

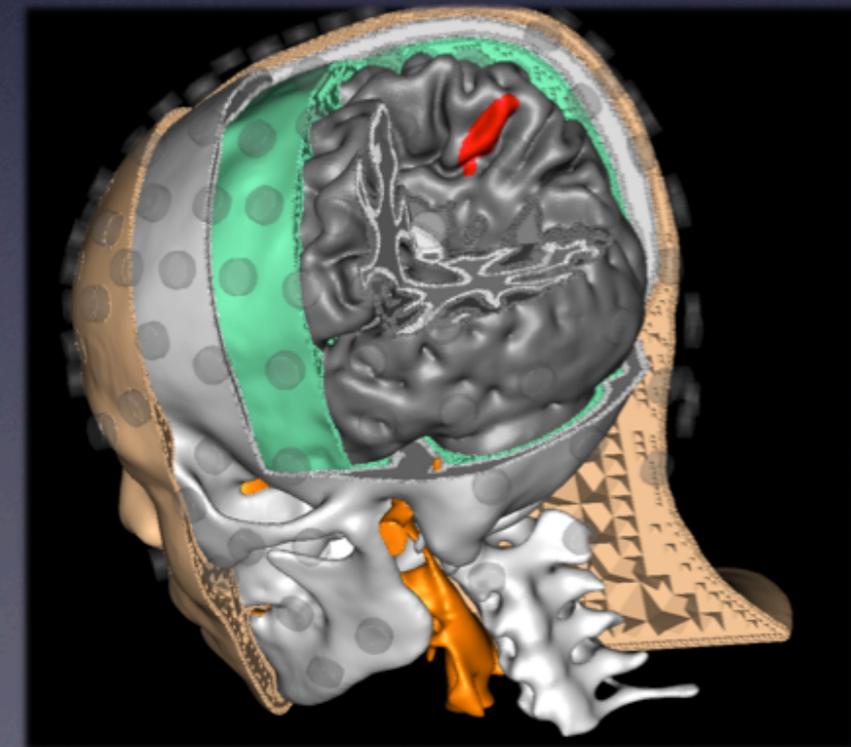


tDCS Goals

Clinical Goal



Technical Goal



Modeling



CIBCseg3D



Segmentation

Multimodal integration

CIBCCleaver



Meshing

Tetrahedral mesh

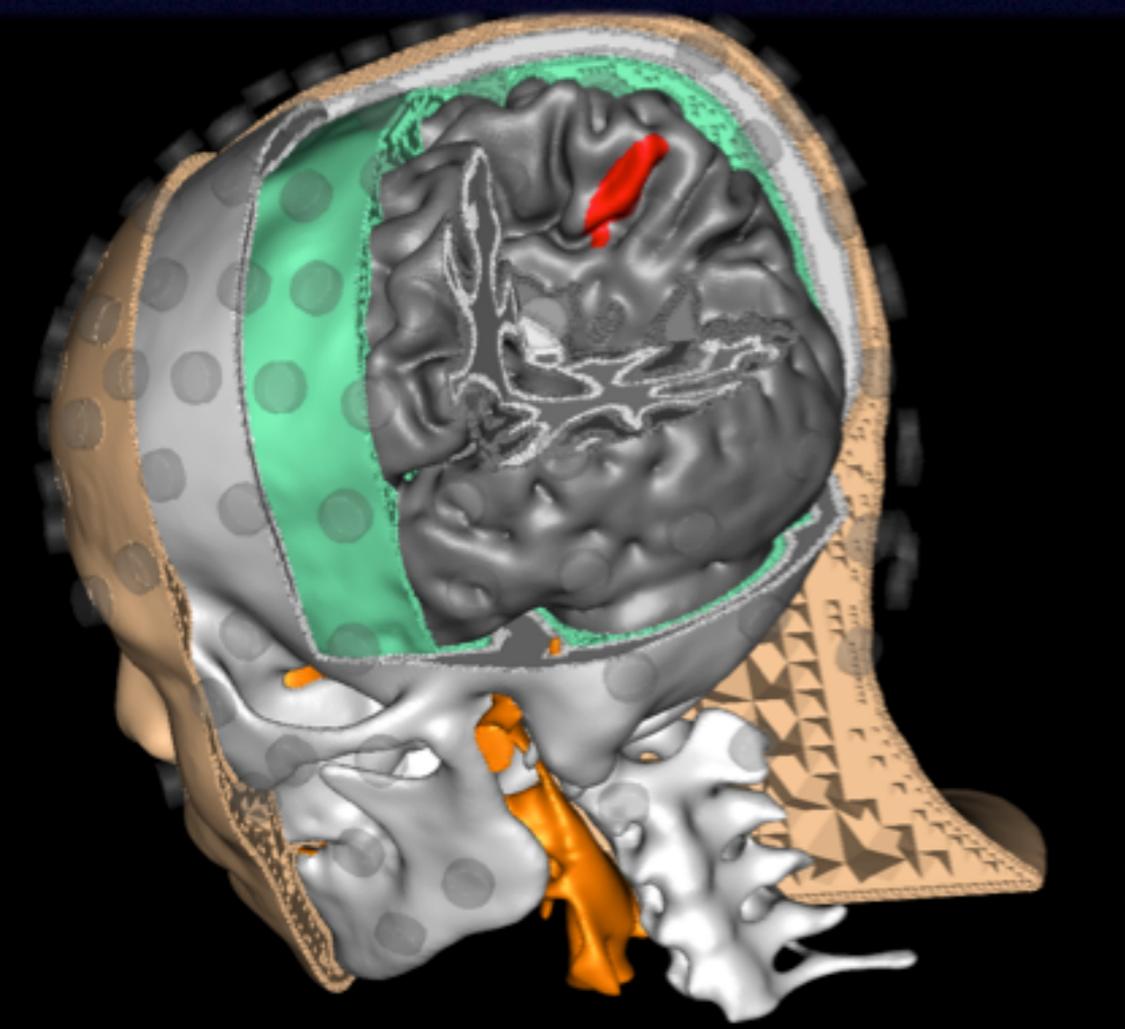
CIBCSIRun



Simulation

tDCS Simulation

Modeling



CIBC Seg3D



Segmentation

Multimodal integration

CIBCCleaver



Meshing

Tetrahedral mesh

CIBCSIRun



Simulation

tDCS Simulation

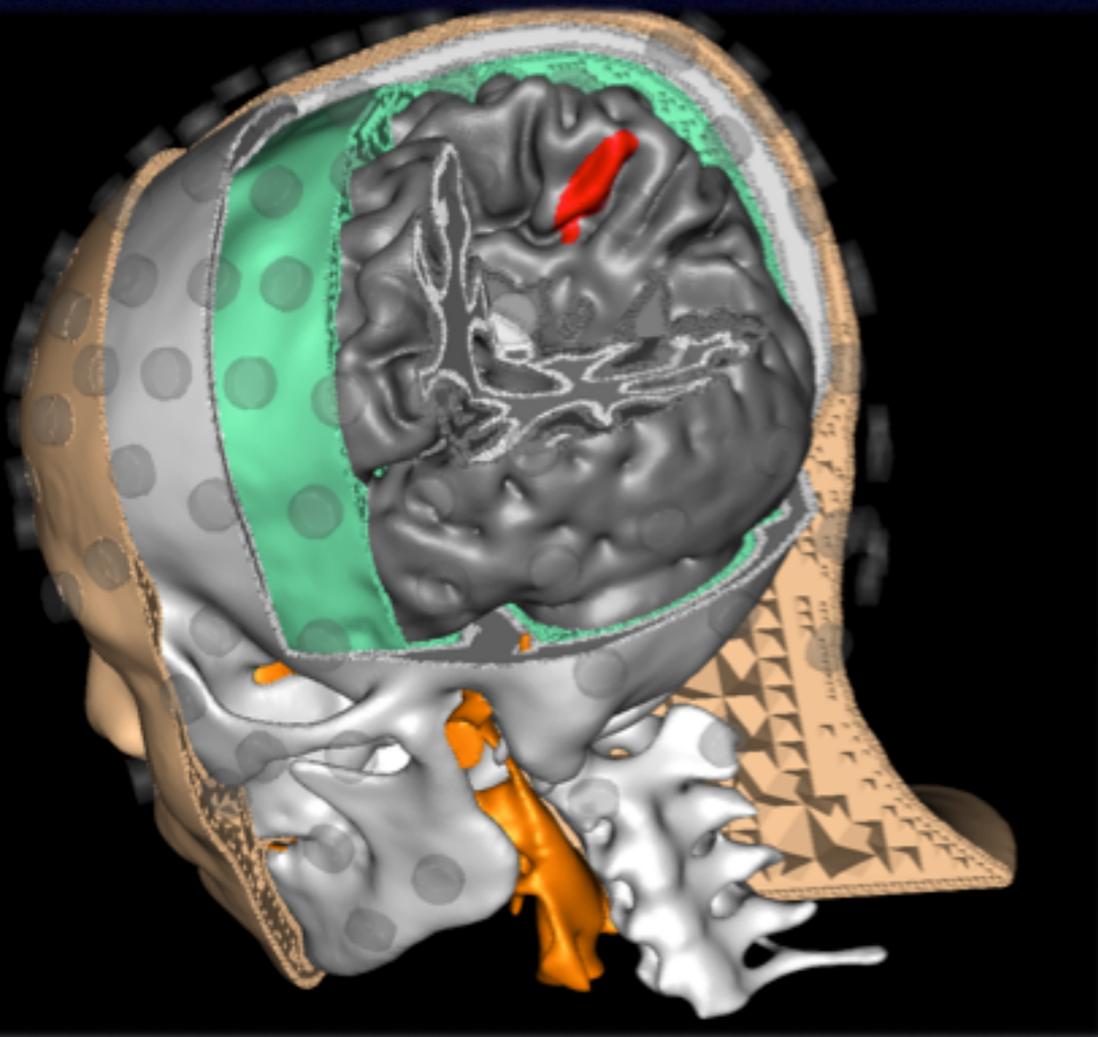
Modeling



MRI

CT

DTI



CIBCseg3D



Segmentation

Multimodal integration

CIBCCleaver



Meshing

Tetrahedral mesh

CIBCSCIRun



Simulation

tDCS Simulation

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Meshing

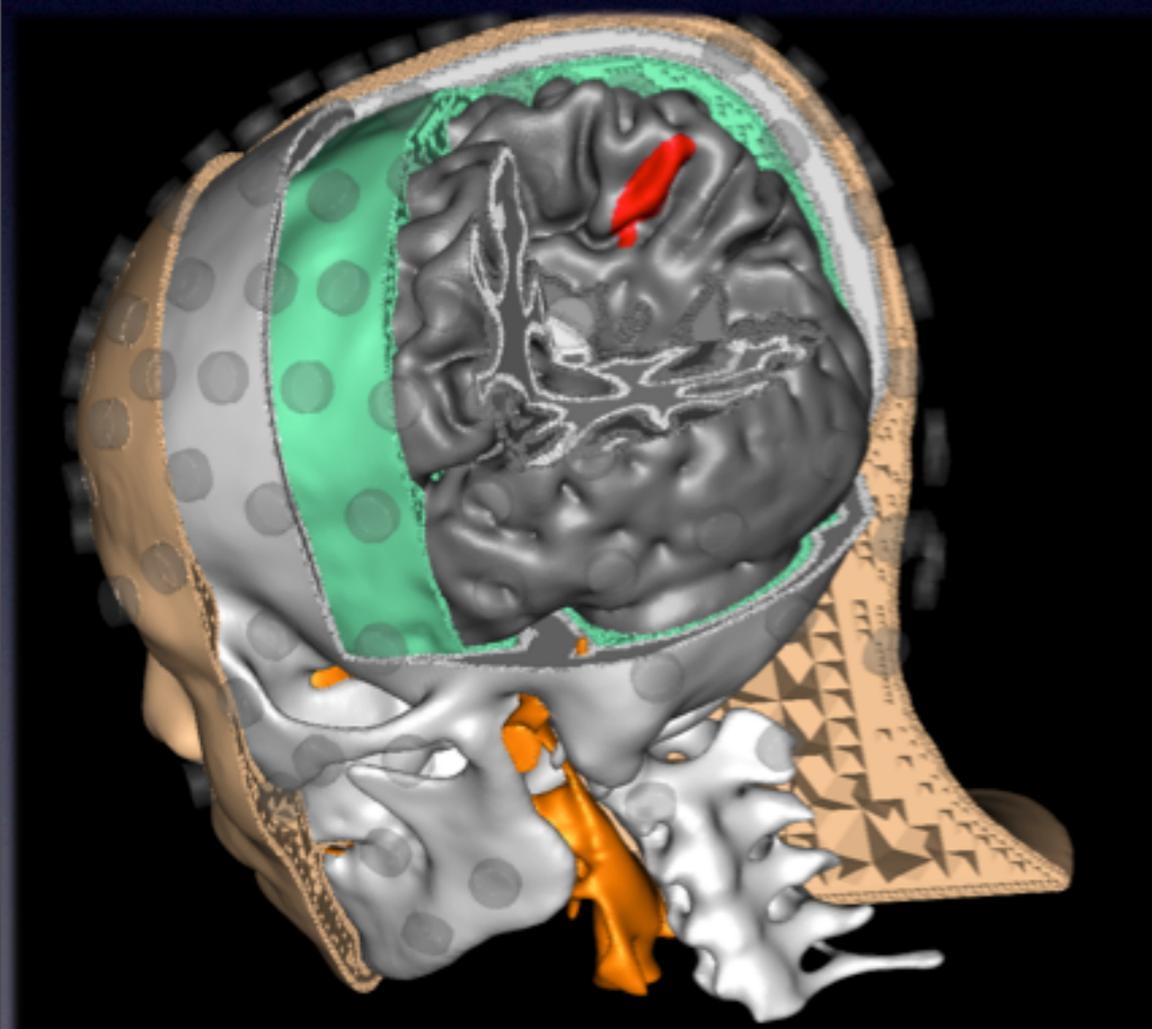
Tetrahedral mesh

CIBC SCIRun



Simulation

tDCS Simulation



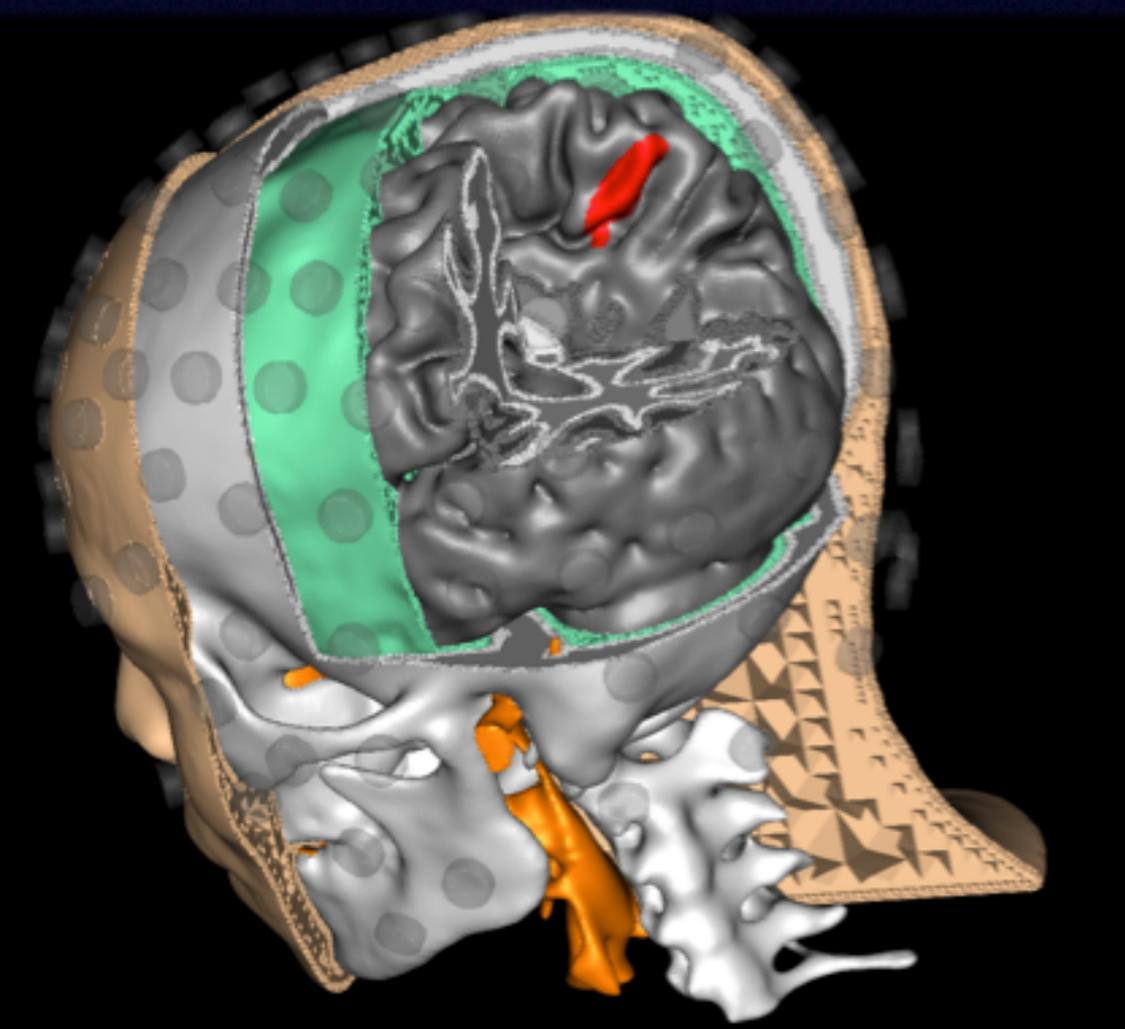
Modeling



MRI

CT

DTI



Multimodal integration



Tetrahedral mesh



tDCS Simulation

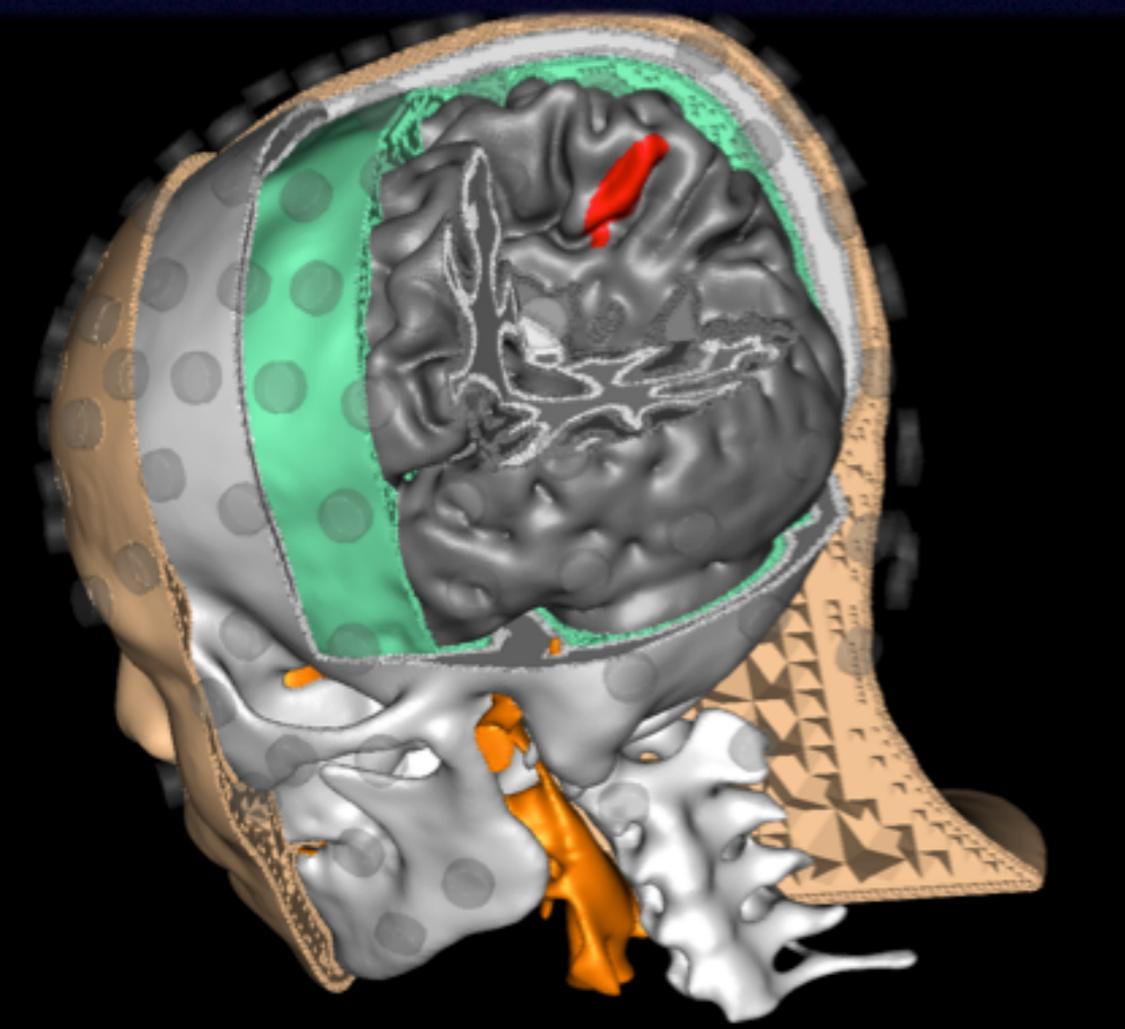
Modeling



MRI

CT

DTI



Multimodal integration



Tetrahedral mesh



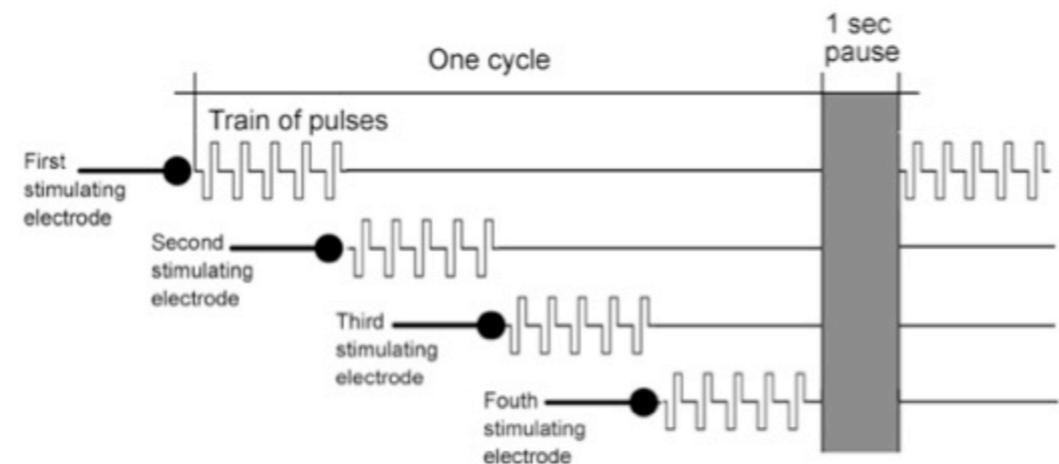
tDCS Simulation

Eye-sight rehabilitation

Treatment:

Non-invasive repetitive transorbital ACS (rtACS)

(10 days, approx. 20- 40 min daily, treatment of *intact* and *damage* eye)

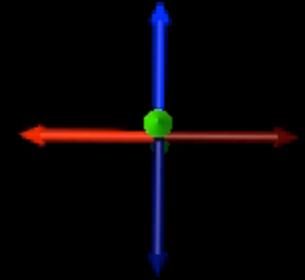


Stimulation parameters:

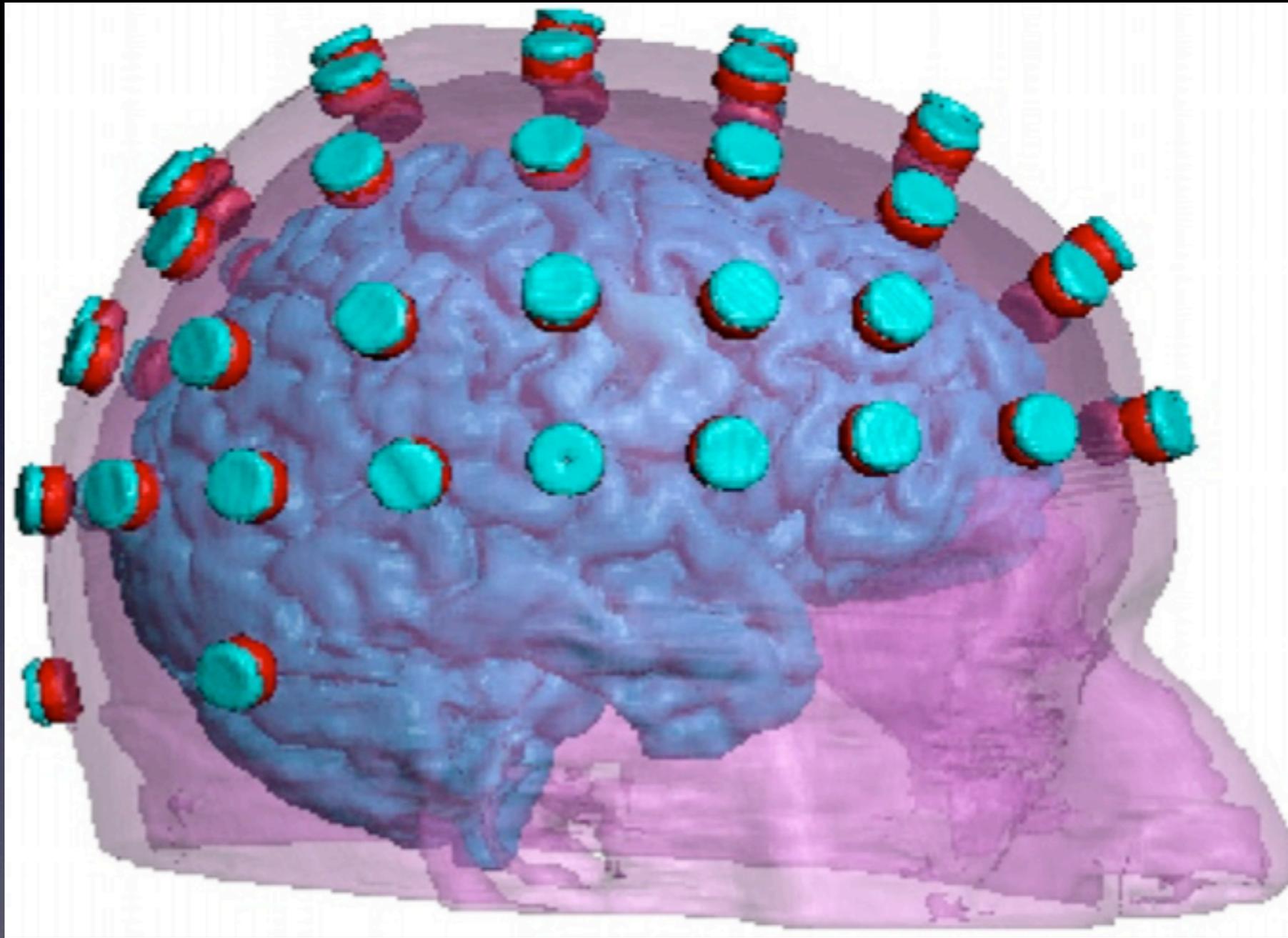
- Determine current thresholds for phosphene perception
- Obtain phosphene threshold (max. current intensity = 1000 μ A)
- Frequencies in α -range

Eye-sight rehabilitation

Stimulating the left eye using tDCS



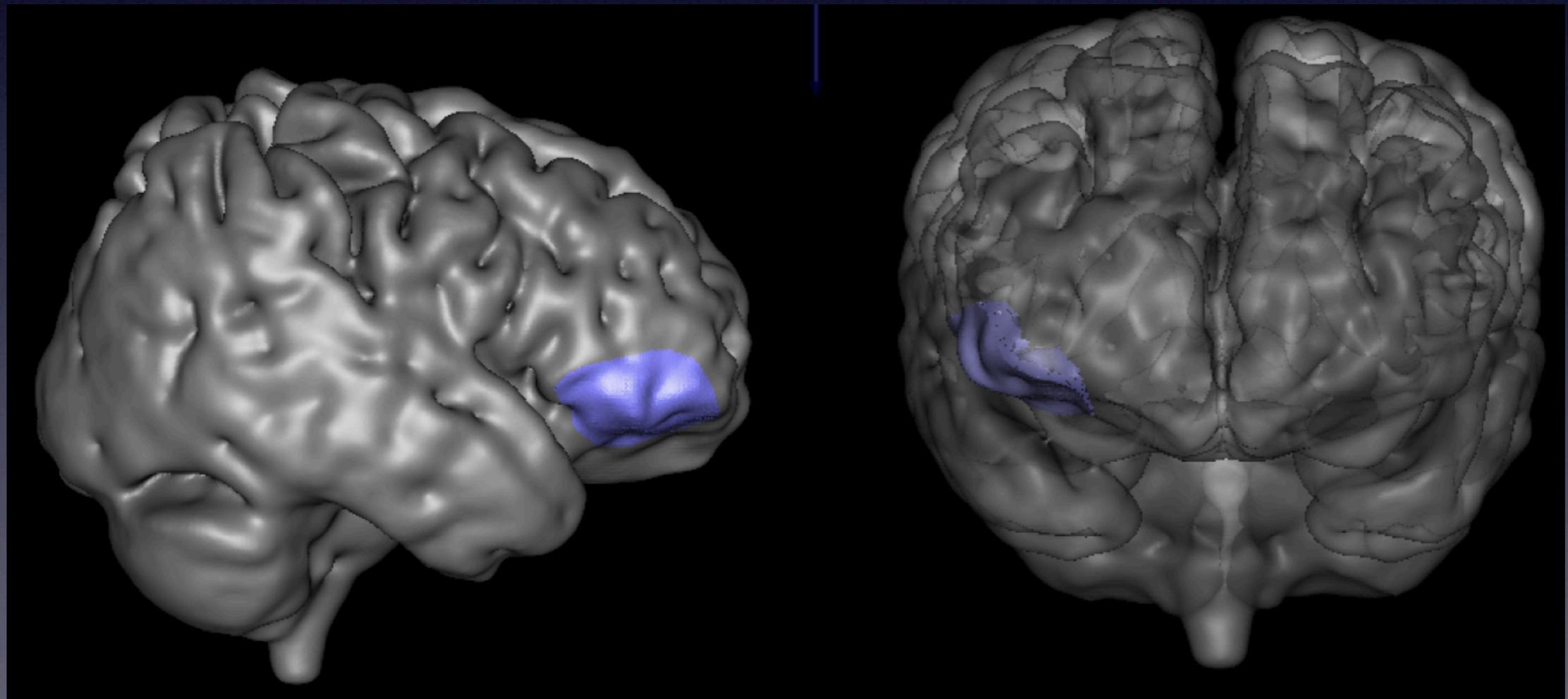
Current Optimization



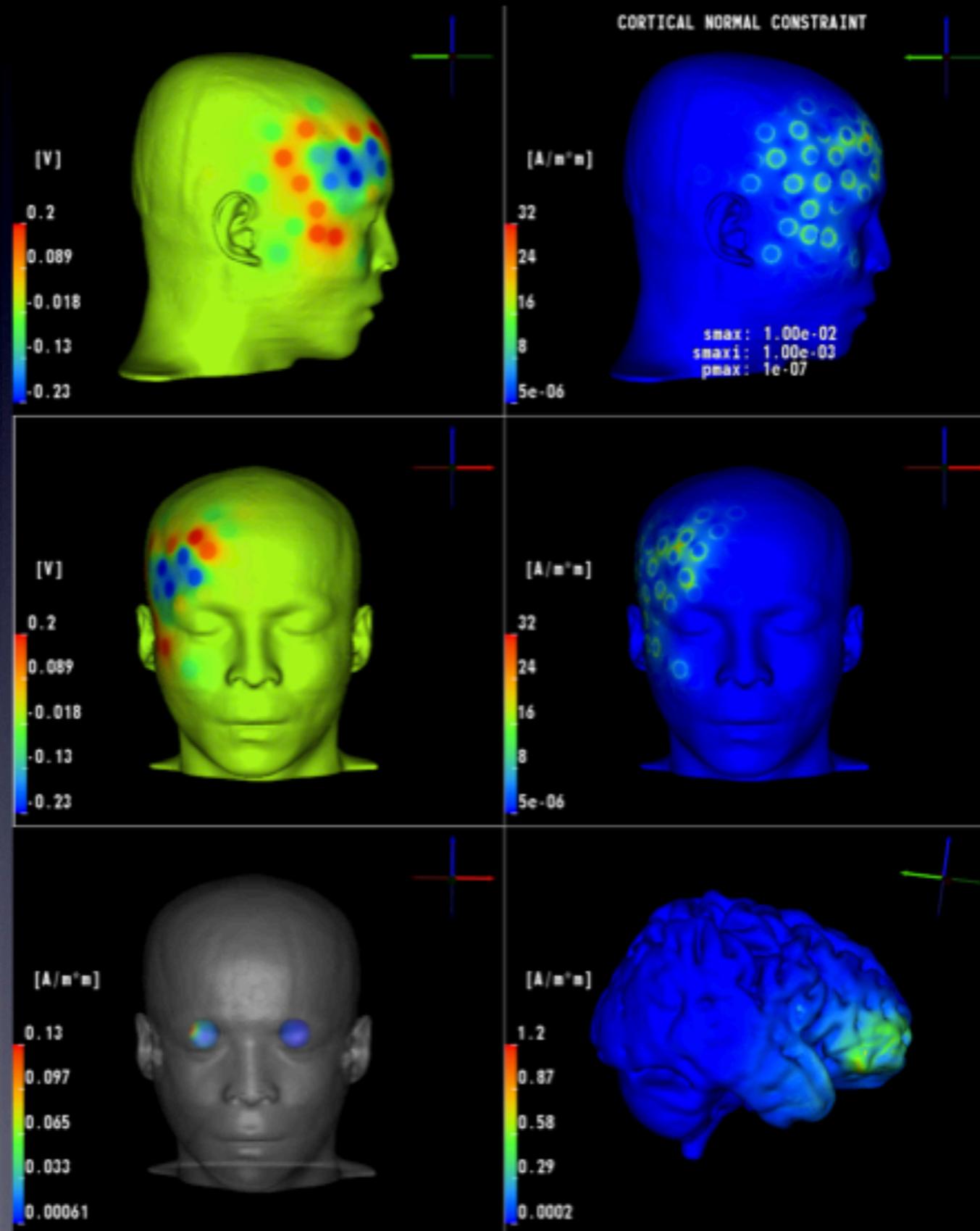
Simulation to optimize the system

Mood disorder: Depression

- Broadman area 47



Stimulation of BA 47



Summary

- tDCS/TMS are growing stimulation techniques
- SCIRun provides simulation environment