Infrastructure, Training, and Service

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Software Developers

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Software Infrastructure

- **Build tools**
  - IncrediBuild (windows), CMake, Qmake
- **Current build systems**
  - Windows, OSX, Linux, Osx
- **Unit testing**
  - googletest, cxxttest, and Lua scripting
- **Regressing testing**
  - Ctest/CDash
- **Revision repositories**
  - gforge and github
- **Libraries (opensource)**
  - Boost, eigen, ...
- **Documentation: videos, tutorials, doxygen**
  - SCIRun module documentation effort
SCIRun is a Problem Solving Environment (PSE), for modeling, simulation and visualization of scientific problems. SCIRun now includes the biomedical components formally released as BioPSE, as well as BioMesh3D.

Overview

SCIRun is a problem solving environment or “computational workbench” in which a user selects software modules that can be connected in a visual programming environment to create a high level workflow for experimentation. Each module exposes all the available parameters necessary for scientists to adjust the outcome of their simulation or visualization. The networks in SCIRun are flexible enough to enable duplication of networks and creation of new modules.

Many SCIRun users find this software particularly useful for their bioelectric field research. Their topics of investigation include cardiac electro-mechanical simulation, ECG and EEG forward and inverse calculations, modeling of deep brain stimulation, electromyography calculation, and determination of the electrical conductivity of anisotropic heart tissue. Users have also made use of SCIRun for the visualization of breast tumor brachytherapy, computer aided surgery, teaching, and a number of non-biomedical applications.

SCIRun Acknowledgement

Acknowledgement: SCIRun is an Open Source software project that is principally funded through the SCI Institute’s NIH/NIGMS CIBC Center. Please use the following acknowledgment and send us references to any publications, presentations, or successful funding applications that make use of NIH-NIGMS CIBC software or data sets.

“This project was supported by grants from the National Center for Research Resources (5P41RR012553-14) and the National Institute of General Medical Sciences (8 P41 GM103545-14) from the National Institutes of Health.”
SCIRun 4

• ECG Forward/inverse toolkit
  • Updated documentation
  • Tikhonov module expansion
  • Beta testing effort:
    • Petr Stovicek (Czech cardiologist)
    • Peter Johnston (Australian mathematician)
    • Azar Rahimi (Rochester Institute of Technology PhD student).
    • Peter van Dam (Dutch researcher)
    • Eric Voth (mathematician at St. Jude)
SCIRun 5

- Monthly releases
- Highlights
  - Qt network editor
    - Undo/redo
    - Multithreaded network execution
    - Command line parameters
  - Renderer: Spire
  - Python scripting
  - Basic module port
- Future
  - Headless mode
  - Logging
  - Provenance
  - All module integration
Previous Training

• Chris Johnson chaired the Symposium on Biomedical Visualization at the Experimental Biology 2012 Conference (May 2012)
• VIS 2012
  • Chris Johnson Co-Chair the LDAV Symposium
  • SCI Inst. booth
• EMBC 2012: Software tools for Image Based Modeling, Simulation, and Visualization (Aug 2012)
• MICCAI Workshop (MeshMed) on Mesh Processing in Medical Image Analysis (Oct 2012)
• Hands-on user interaction
  • Local: Moran Eye Center, Weber State College
  • Baylor College of Medicine (Wah Chiu’s group)
  • Univ. of Utah, Mechanical Engineering
Training

• Upcoming

• NIH R25 Department of Health and Human Services: Short Courses on Mathematical, Statistical, and Computational Tools for Studying Biological Systems (Summer 2014)
Service and Outreach

• Research Collaborations:
  • Kevin Jones, MD – Osteochondroma
  • Kitware – ITK
  • CardioSolv – CARP
  • Numira
  • Natalia Trayanova – Computational Cardiology Lab, Johns Hopkins University
  • Bruce Smaill – University of Auckland
  • Skin Segmentation (Seg3D)
    • Memorial Sloan Kettering Cancer Center in NYC: segment reflectance confocal stacks taken from human skin (from Unilever Corp).
    • Caliber I.D.: Melanoma

• Corporate collaborations:
  • Hydrographic consulting company (ImageVis3D)
  • External defibrillation simulations (SCIRun)
  • Aribex: specialized image reconstruction prototype (Seg3D)
  • Schlumberger – shale rock analysis