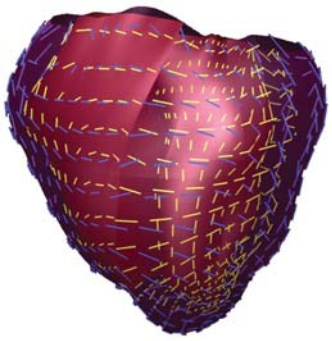
Continuity 6

NBCR

http://www.continuity.ucsd.edu/

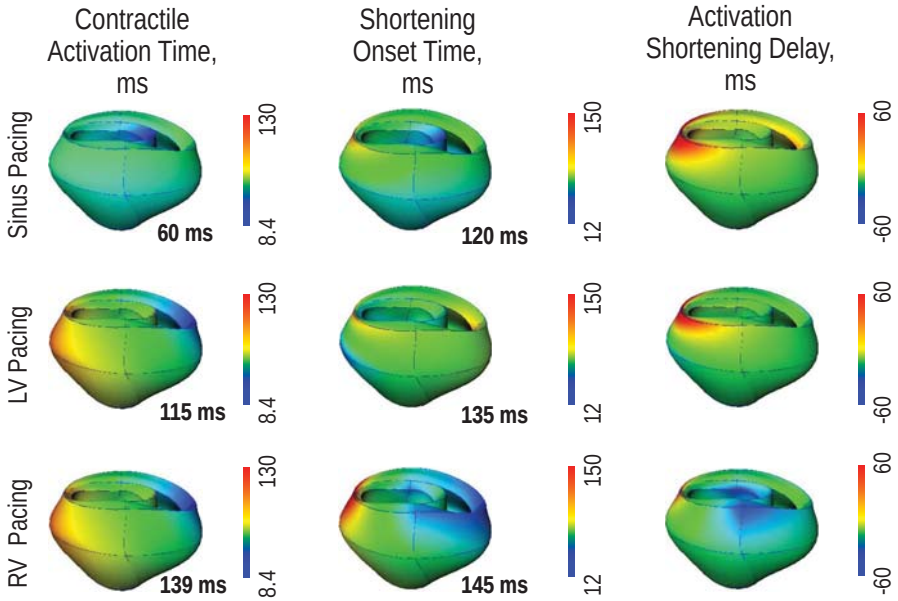
Continuity 6 is a problem-solving environment for finite element analysis in bioengineeeing and physiology, especially multi-scale modeling applications in cardiac biomechanics and electrophysiology. Continuity 6 also has facilities for least-squares fitting of geometric meshes and parametric models to experimental data including medical, morphological and histological images, physiological and biomechanical measurements.



Continuity 6 is portable and object-oriented making use of the very high-level open-source language, Python, for scripting and component integration. It is designed to facilitate interoperability with desktop tools such as Microsoft Excel and MATLAB. The distribution includes a suite of examples and data including anatomic, material and cellular models.

Continuity 6 has a separate computational server and GUI client that uses the Déjà Vu 3-D viewer, which was also developed by investigators of the National Biomedical Computation Resource. Continuity 6 can run under Windows or Linux in stand-alone mode (client and server together) or in client-server mode between the desktop and a remote server. For large-scale applications, the server also supports scalable parallel computations on Linux clusters using the Message Passing Interface (MPI).

Continuity 6 *at work*



Legend

Effects of left and right ventricular pacing compared with normal sinus rhythm on the temporal sequences of electrical activation (left column) and mechanical shortening (middle column) in a three-dimensional model of the canine heart. Activation-shortening delays (right column) are heterogeneous, even during normal sinus rhythm. From Usyk, Taras P. and McCulloch, Andrew D. (2003). *Journal of Cardiovascular Electrophysiology* 14(10):S196-201.

↳ Key Features

- Nonlinear finite-element methods for large deformation biomechanics
- Collocation methods for monodomain reaction-diffusion models of excitable media
- Least-squares fitting of high-order meshes and fields
- Python based client-server interactions
- Large-scale modeling on distributed memory platforms
- Supported on Microsoft Windows and Linux

↳ Application Areas

- Soft tissue biomechanics
- Deformable modeling from biomedical images
- Nonhomogeneous strain analysis
- Anisotropic action potential propagation
- Integrative multi-scale modeling of cardiac electromechanics

↳ Reference

Usyk, Taras P. and McCulloch, Andrew D. (2003). *Relationship Between Regional Shortening and Asynchronous Electrical Activation in a Three-Dimensional Model of Ventricular Electromechanics*. Journal of Cardiovascular Electrophysiology 2003. 14(10):S196-201.

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