Docket #: S09-333

Software subroutines to construct 3D vascular geometry for blood flow simulation

Developed at the Taylor Lab, Simvascular is an open source software package encompassing an entire cardiovascular modeling and simulation pipeline from image segmentation, three-dimensional (3D) solid modeling, and mesh generation, to patient-specific simulation and analysis.
These subroutines work together with the open-source software system, Simvascular , to enable three-dimensional simulation of blood flow in the aorta and coronary arteries. This specific code can more efficiently and objectively model 3D simulations of blood flow in human arteries using more realistic 3D vascular geometries.

Related Technology from Taylor Lab:
S08-409 "Software subroutines for modeling cardiac pressure-volume relationship and coronary blood flow"

Applications

- **With open source Simvascular software** - enables 3D simulation of blood flow using realistic geometry, especially for diseased arteries
- **Research and education** - e.g. understanding mechanisms of artery disease, designing devices or planning interventions

Advantages

- Enables **non-invasive** diagnostics of heart disease
- **Personalized medicine,** specific to patient

- **Improved approach** - Previous methods to construct vascular geometry, are time-consuming and relatively subjective (e.g. 2D lofting techniques)
- **More efficient and more objective** than other 2D based methods.
- **3D** vs. 2D

Publications

- US Patent US20100241404A1 - Patient-specific hemodynamics of the cardio vascular system
- Xiong, Guanglei, C. Alberto Figueroa, Nan Xiao, and Charles A. Taylor. "Simulation of blood flow in deformable vessels using subject?specific geometry and spatially varying wall properties." *International journal for numerical methods in biomedical engineering* 27, no. 7 (2011): 1000-1016.
- Xiong, Guanglei, Gilwoo Choi, and Charles A. Taylor. "Virtual interventions for image-based blood flow computation." *Computer-Aided Design* 44, no. 1 (2012): 3-14.

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