

Rapid 3D Prototyping and Customized Hollow Models for Medical Interventions and Training

Category

3D Medical Informatics

Problem

Current 2D medical imaging technologies do not adequately represent the complex 3D relationships in the heart

Technology Overview

A rapid 3D prototyping process for creation of patient specific, hollow models using medical images

IP Status

- ▶ Available for Exclusive or Non-Exclusive Licensing

Advantages

- ▶ Clinicians can plan and practice procedures
- ▶ Customized device development
- ▶ Improves medical education

Contact

James Parrett

james.parrett@cuanschutz.edu

Ref#CU2218H

CU Innovations
303-724-0221

cuinnovations@ucdenver.edu

Problem: Structural heart disease (SHD) affects approximately 5 million people in the United States, with approximately 1 million of those cases requiring surgical intervention each year. Furthermore, as the population ages, aortic stenosis among many other cardiac conditions will dramatically increase. The 2D medical imaging technologies used today limit medical images to being only virtual, not tangible, and allowing for confusion, mistakes, and clinical inefficiencies in surgical interventions. While rapid prototyping currently allows for computer-generated surface models to be converted into solid physical models, these solid models are less than ideal for the general improvement of cardiologists' understanding and classification of the many forms of heart and vascular disease, as well as for study, practice, planning and intervention in specific cases. Hollow models, revealing the detailed inner anatomy of the heart, would allow both researchers and clinicians to gain a clearer, more tangible grasp of cardiac structural abnormalities, resulting in improved clinical outcomes and advancing the study of SHD.

Solution: A research team at the University of Colorado has developed a process to transform routinely obtained cardiac tomographic angiography, magnetic resonance angiography, and 3D transesophageal ultrasound images into a prototyping-ready format, so that high-quality hollow models can be produced using 3D printing technology. These cardiovascular structural models are patient and disease specific, accurate, and clinically useful, and will become increasingly cost-effective as 3D desktop printers become commonplace. Cardiologist can use this technology for testing, procedure training and intervention preparation. With this technology, physicians can be trained more effectively before inserting new devices into patients, and cost of development will be reduced, with better patient outcomes leading to lower healthcare costs. This technology can be adapted to a diverse array of products and services that are all enabled by the ability to product these 3D models, including implantable devices that are genuinely customized to patients' unique anatomy.

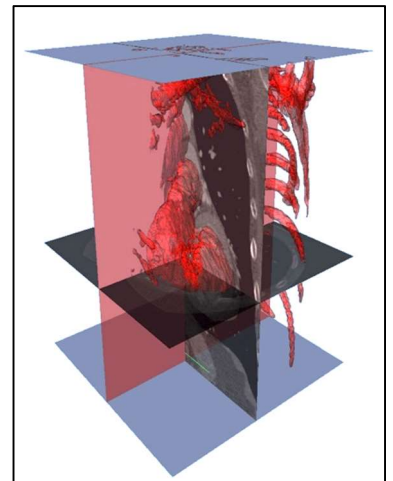


Figure 1. A sample workspace showing image planes and aligned mesh model

Advantages and Value Propositions:

Globally, the structural heart disease treatment devices market is expected to grow at a CAGR of 9.5% until 2022. This device allows for a quick and thorough understanding of spatial relationships and can be used to practice procedures, plan interventions, and improve outcomes. Physical models allow surgeons and interventional cardiologists to appreciate potential procedural difficulties, assess the likelihood of success or failure, and select appropriate equipment and devices for use. It can be used to rapidly design and develop truly customized implantable devices. Finally, by allowing information to be conveyed in both visual and tactile forms, rapid prototyping exhibits limitless promise on an educational level.

Additional Documents and Sources:

Kim MS, Hansgen AR, Wink O, Quaife RA, Carol JD. Rapid Prototyping: A New Tool in Understanding and Treating Structural Heart Disease. *Circulation*. 200;117(18):2389-2394.

About CU Innovations

CU Innovations is the technology transfer office for the University of Colorado Anschutz Medical Campus. CU Innovations seeks to bring together industry partners, entrepreneurs and investors to translate discovery into impact. <http://innovations.ucdenver.edu>