

4D Heart model visualization

Project Management and Software Development for Medical Applications

General Info



Virtonomy.io

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Project Abstract

With advance development in modern medical imaging technology, structural information of cardiac region can be exploited in various approach. Beyond that the physiological behavior and visualization is also an important aspect to understand the anatomy. The purpose of the current project is to develop a visualization tool that intuitively visualize a heart model including the dimension of time. The tool should allow user to understand the shape deformation in the cardiac cycle, and to enable device fitting test with a heart in motion. Successful outcome of the project will be deployed Virtonomy's SaaS web platform.

Background and Motivation

Virtonomy GmbH is developing the first web platform for conducting fully data driven clinical trials of medical devices with the use of virtual patients. Our system is based on clinical scans (CT, MRI), pathology data and data about the medical devices. The 3D anatomy model reconstruction from image data is one of the key parts of the entire processing pipeline. A robust visualization tool can give room to comprehensive experimentation on the performance of a given heart implant. With this, virtual testing is promoted making human and animal studies slowly less and less needed.

Student's Tasks Description

- Generate 4D mesh sequence files (gITF);
- Implement method to morph between surface mesh models of different phase in heart cycle;

- Integrate visualization of interpolated timeframe in web-based viewer;
- Evaluate and optimize the performance of the visualization tool;
- Export 4D animation of the heart for anatomical studies.

At the end of the project, the student shall have the following outcome: a 4D heart visualization interface and all the relevant source code in a GIT repo. The student will learn how to interpolate segmented cine-ct heart model and render the results on a web-tool. Virtonomy will provide supervision with medical industrial computer vision training and software development experience.

Technical Prerequisites

Python, JavaScript
Preferably: Three.js and/or A-Frame, React
Optional: Rust
Basic understanding of Git.

Why you should choose us

- Opportunity to work in an international start-up environment or remotely
- Participation in the exciting development and growth of a start-up
- Contributing to an exciting real-life medical data solution with impact

References

https://docs.blender.org/manual/en/latest/animation/shape_keys/index.html

<https://threejs.org/examples/?q=animation>

<https://github.com/elrnv/gltfgen>

<https://github.com/neverhood311/Stop-motion-OBJ/tree/shape-key-baking>

Please send the completed proposal to ardit.ramadani@tum.de, lennart.bastian@tum.de and tianyu.song@tum.de
Please note that this proposal will be evaluated by the BMC coordinators and will be assigned to a student only in case of acceptance.