Deep learning based cardiac anatomy polygon mesh generation

Project Management and Software Development
for Medical Applications

General Info

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Project Abstract

This project aims at developing a deep learning or another superior method to perform cardiac anatomy polygon mesh creation given segmentation map and original CT image stack. The more exciting challenge is to be able to generate quality meshes suitable for web virtual implantation while limiting model size. Successful outcome of the project will be used in Virtonomy's 3D model reconstruction process.

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.

Our existing 3D model reconstruction includes several manual steps and to automate further the process, a deep learning based approach is taken. One of the key steps in the process is to perform cardiac anatomy polygon mesh creation based on segmentation maps.

Student's Tasks Description

- Literature survey and method selection
- A cardiac anatomy polygon mesh creation code should be developed and working models should be produced and evaluated.

- A further model size constraint shall be imposed on the model creation processing.

At the end of the project, the student shall have the following outcome: A baseline cardiac anatomy polygon mesh generation tool with model size as input, and its statistical comparison to manual optimized model. The student will learn how to structure and take care of the complete cycle of a deep learning project. Virtonomy provides supervision with medical industrial deep learning and software development experience.

Technical Prerequisites

Computer vision and Deep Learning knowledge.

Experience with modern Deep Learning framework.

Python + Jupyter. Basic understanding of GIT.

Feel comfortable working in Linux or willing to learn quickly

Why you should choose us

- Opportunity to work in a vibrant environment with many other start-ups (Werk1) or from home
- Participation in the exciting development and growth of a start-up

References

Getting Topology and Point Cloud Generation to Mesh, Austin Dill, et al.

Virtonomy's references for 3D anatomical models:
https://virtonomy.io/services/references