

Validation Of The gVirtualXRay Library Using CT Reconstruction

gVirtualXRay

gVirtualXRay is a library that can simulate the attenuation of X-rays in real time with GPU acceleration. The library is capable of producing projections using a mesh that is loaded into the scene. This library has uses in the real world like in the classroom as a way to demonstrate to students various X-ray radiography procedures.

The need for validation

X-ray simulation attempts to approximate the behaviour of X-rays in the real world. With the benefits of these simulations, there is the issue of accuracy with respect to the imitated real-world system. The degree of accuracy that the simulation achieves will determine how much the results can be trusted and whether the simulations are trusted enough to be used for specific applications.

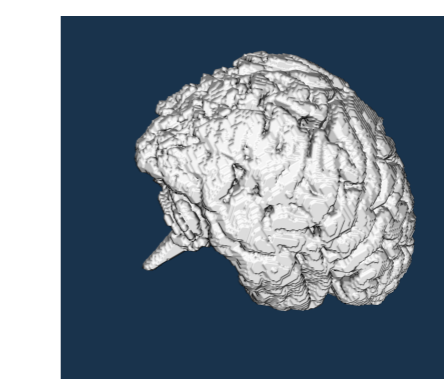
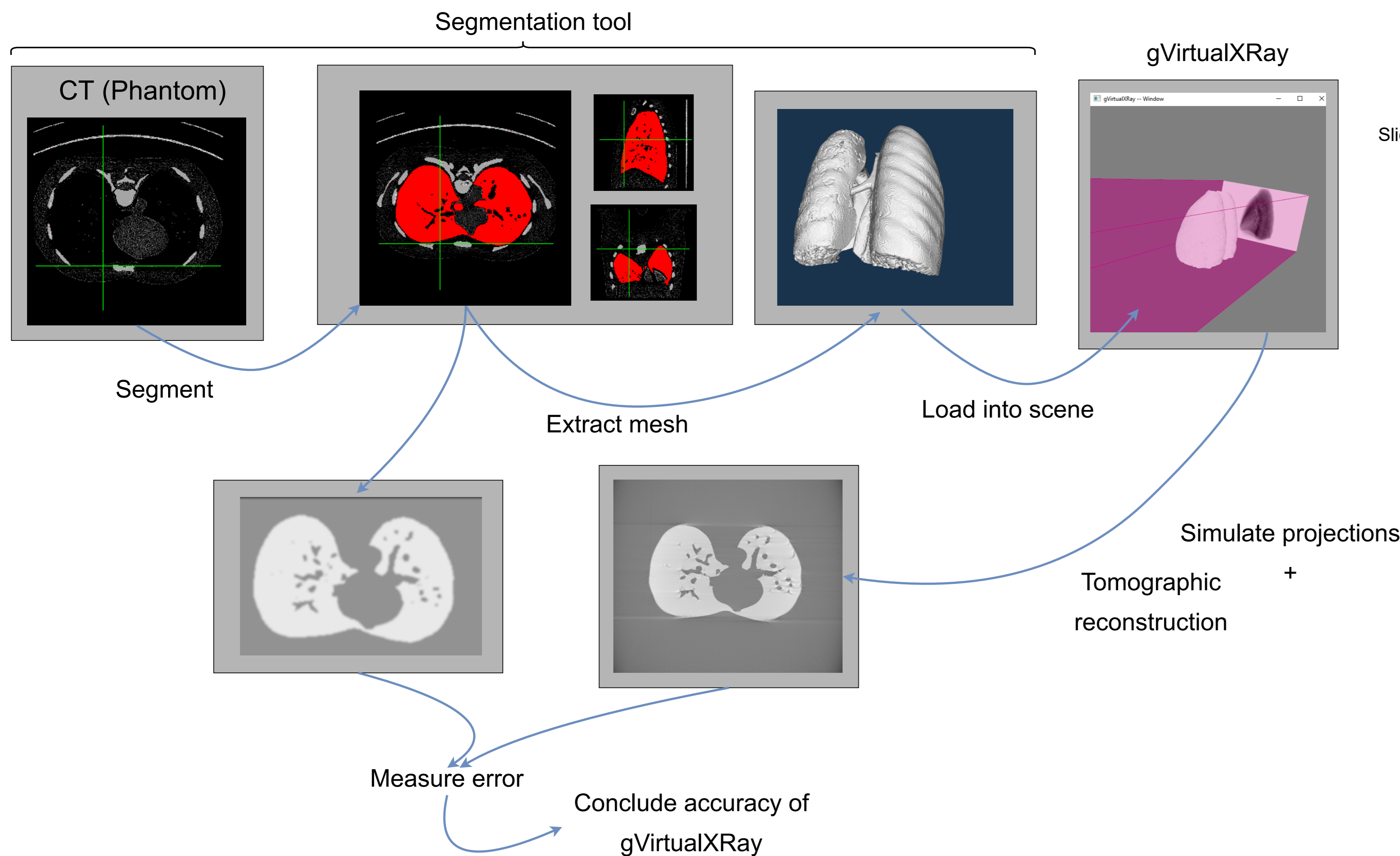
Aim

The purpose of this project is to assess the accuracy of gVirtualXRay simulations using reconstructed structures from CT volumes

Key algorithms used

- Fast marching
- Geodesic active contours
- Marching cubes
- Confidence region growing

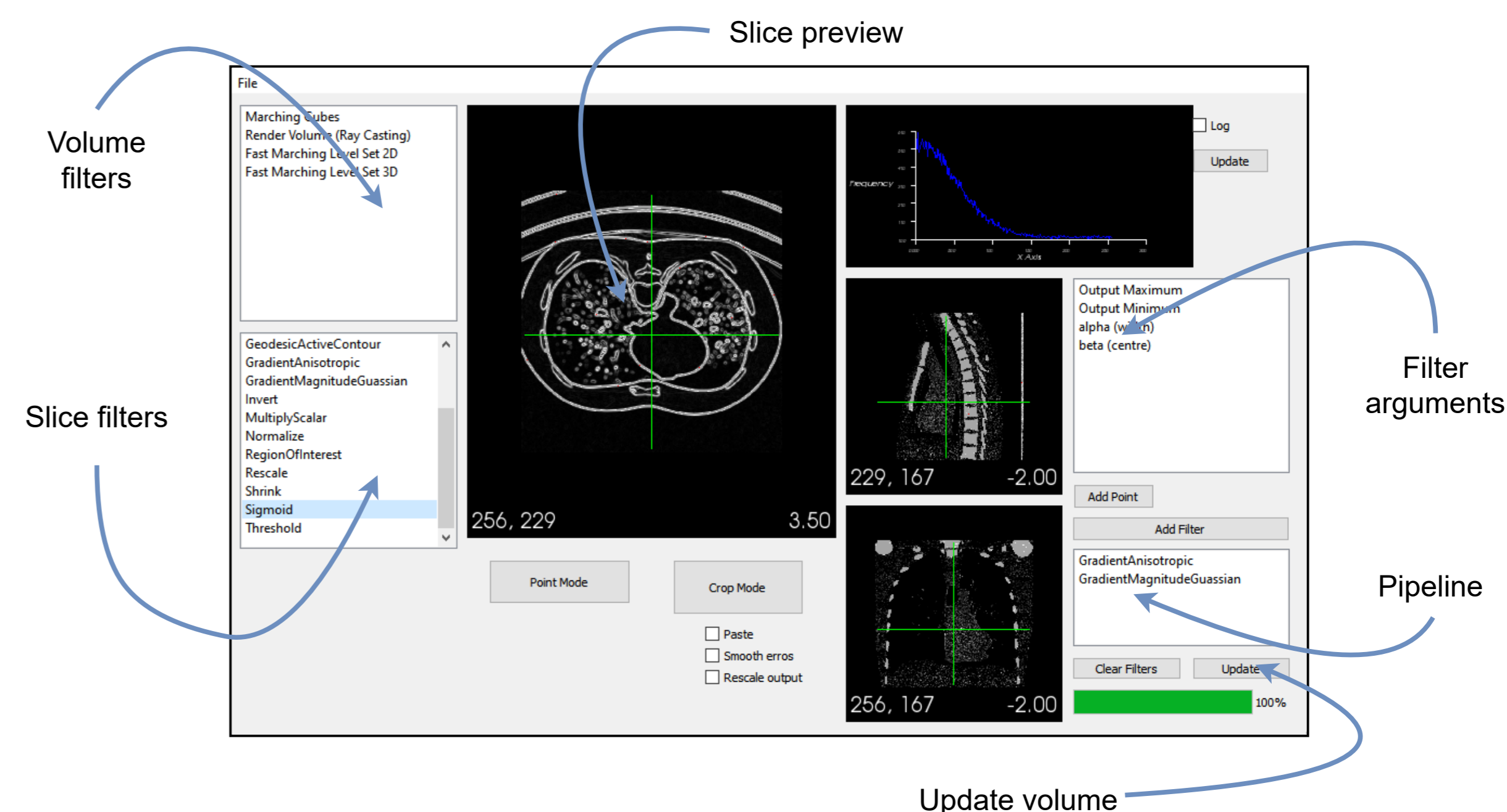
The process



Segmentation Tool

A large part of this project was developing a segmentation and surface extraction tool.

This tool is capable of constructing and managing a filter pipeline that is first previewed on a single slice before being applied to the volume. It allows for navigation of the volume using the mouse and pre-segmentation filtering to help provide better results for segmentation. Segmentation can be easily seeded at the cursor and surfaces extracted, each with a click of a button.



Technologies used

The development of the segmentation tool created as part of this project was assisted by the ITK, VTK and QT frameworks in C++.
ITK is a library that provides functionality for image analysis including segmentation.
VTK is a visualisation library that helps with 3D, and 2D, image processing and rendering problems.
QT packages include tools for developing applications with graphical interfaces.



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