Liver Detection and Reconstruction from CT Images

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Motivation

- Organ segmentation remains a challenge
  - Physiological differences between patients
- Automatic processes are adjunct methods
  - Hand-drawn segmentation too time-consuming
- Volume rendering a key component of many radiotherapy dosage planning

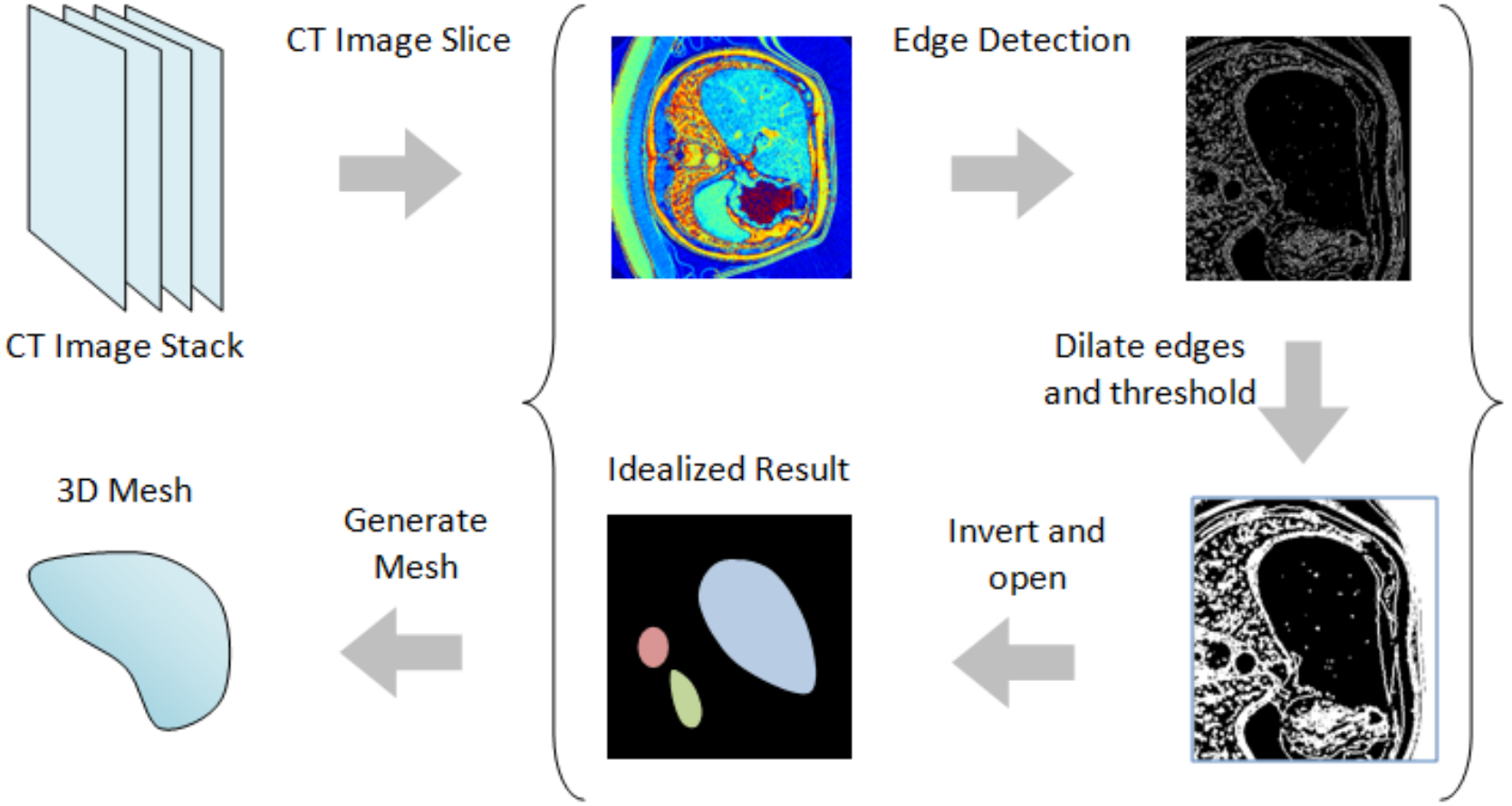
Background

- Computerized Tomography (CT) is a popular imaging modality and diagnostic tool
- A challenge presented by www.sliver.org to address organ segmentation
  - Provided 30 data sets (20 training, 10 test)
  - Both raw images and ground truth
  - User interaction a key component of all the top scoring algorithms

Methodology

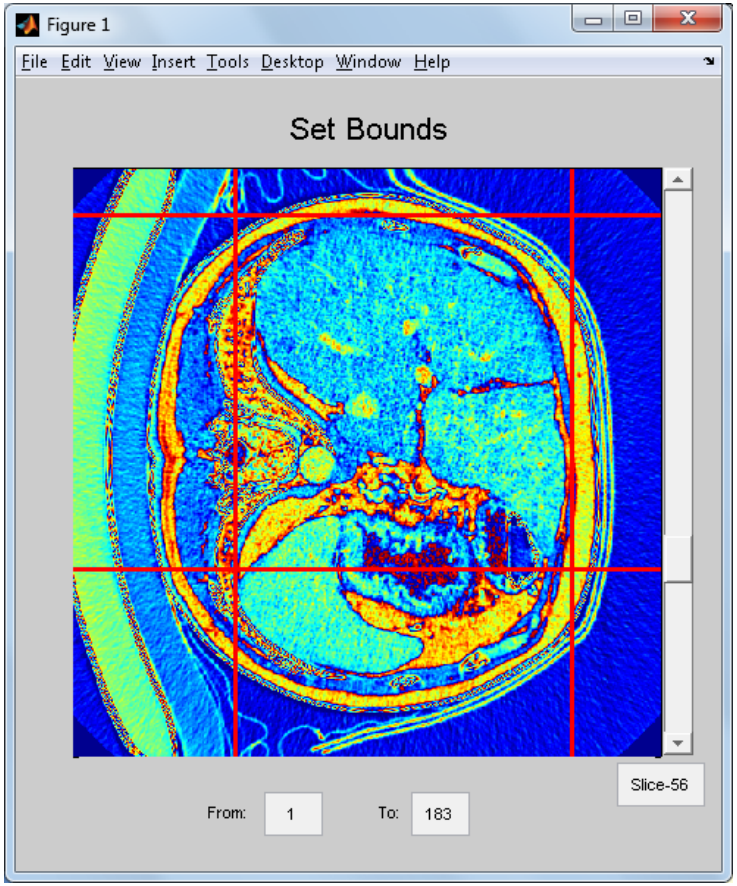
- Implement a MATLAB script for a semi-automatic segmentation of the liver organ
- Utilize edge-detection via a Sobel filter
- Assemble contours via connected components
- Generate a 3D reconstruction and save the mesh data using MATLAB’s isosurfaces

Edge Detection



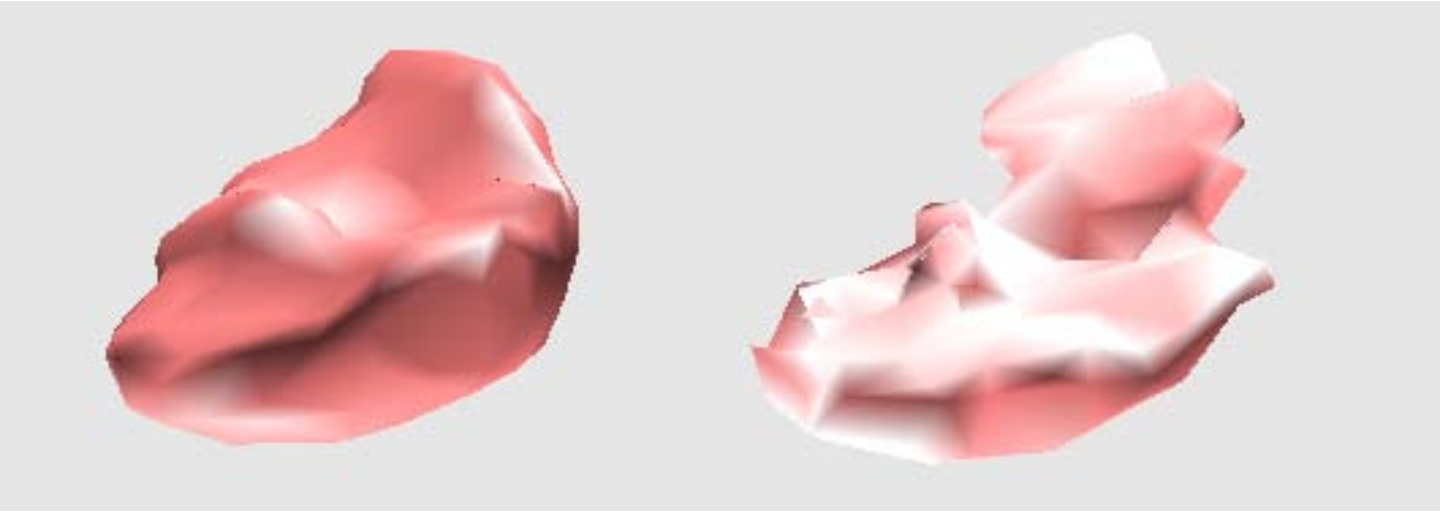
GUI User Interaction

- Allow the user to manually specify the target region
- Speeds up the segmentation process



Results

- Disappointing, with 2.3 voxel error ratio



Ground Truth Reconstruction

Conclusions

- Simple semi-automatic algorithm insufficient for liver segmentation
- User interaction, planning or knowledge a key component of successful algorithms
- MATLAB mesh rendering and isosurfaces not suited for large data sets at high resolution