

Intuitive Interactive Segmentation of 2-D Medical Images

Master's Thesis Introductory Talk

Negar Mirshahzadeh

02.05.2016

Supervisors: Peter Fischer, Tanja Kurzendorfer, Thomas Pohl, Alexander Brost, Stefan Steidl, Alexander Kölpin (LTE), Andreas Maier
Pattern Recognition Lab (CS 5)



FRIEDRICH-ALEXANDER
UNIVERSITÄT
ERLANGEN-NÜRNBERG

TECHNISCHE FAKULTÄT

Content

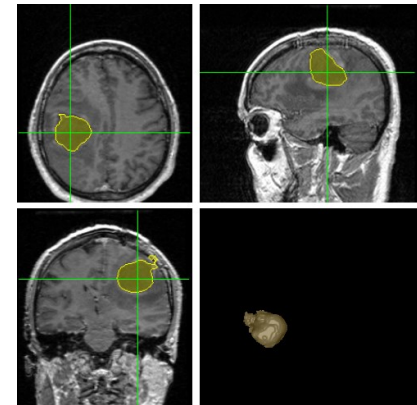
- Introduction
- Clinical Motivations
- Aim and Approaches
- Structure
- Implementation





Introduction

- Image segmentation
 - An essential step in many diagnostic medical imaging
 - General classification
 - Supervised
 - Unsupervised
- The spectrum of segmentation



**Manual
segmentations**

**Interactive
approaches**

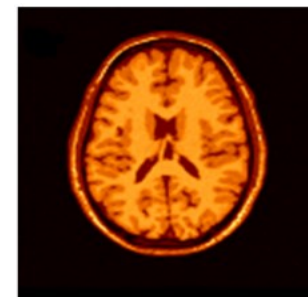
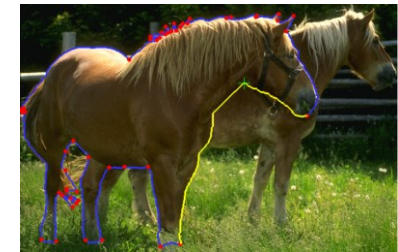
**Fully automatic
techniques**





Background in Interactive Segmentation

- Intelligent scissor
 - A graph searching problem
 - Finding the optimal path
- Graph cuts
 - Study of graphs as a set of objects
 - Finding the minimum-weight cut
- Random walker
 - Study of graph as a set of nodes
 - Finding which seeds, random walkers first arrive at





Clinical Motivations

- Problems
 - Manual segmentation
 - Time consuming
 - Fully automatic segmentation
 - Insufficient accuracy
 - Large number of training data
 - Fails in difficult cases
 - Semi-automatic segmentation
 - Ineffective interactions
 - Fails in images with low contrast and noisy boundary

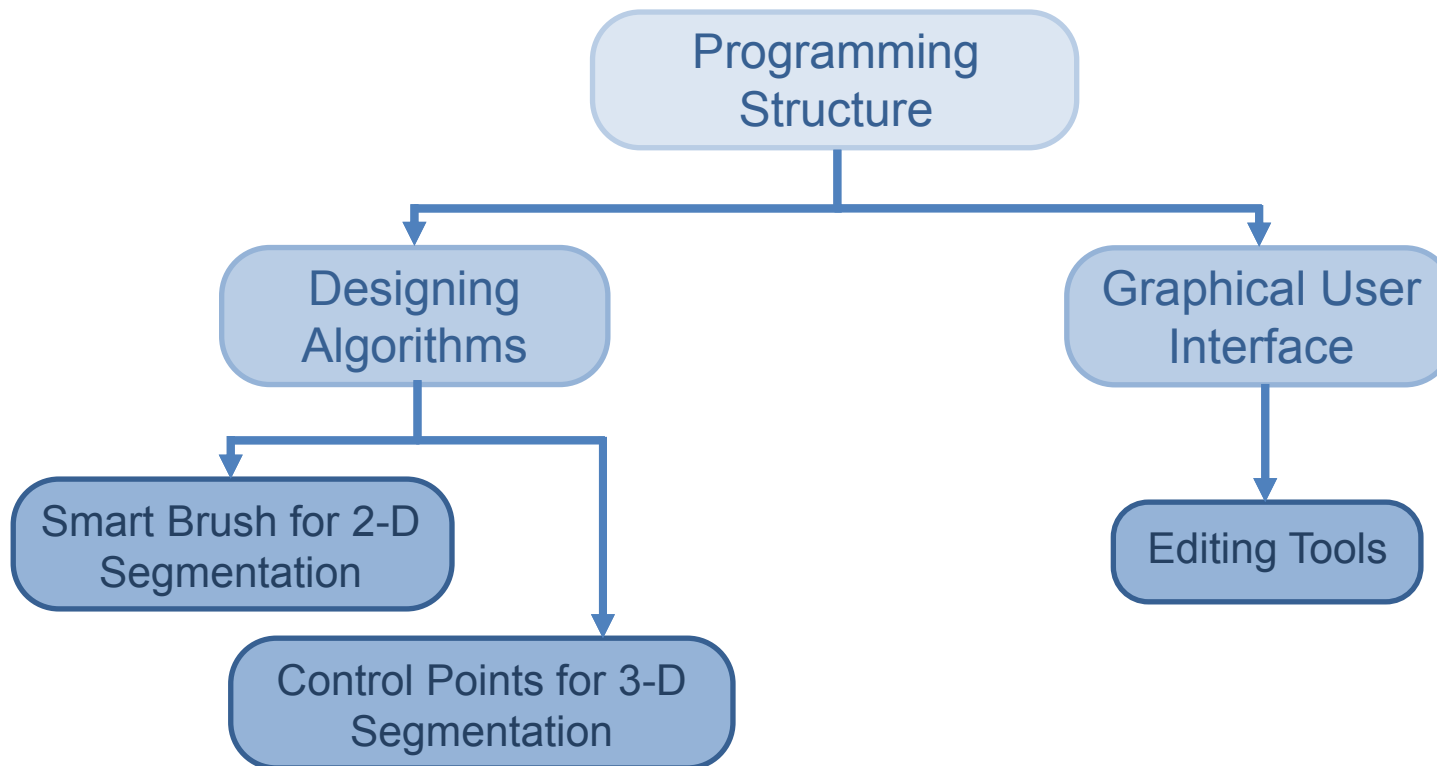


Aim and Approaches

- Fast computation in both 2-D and 3-D segmentation
- Fast editing
- An ability to produce an arbitrary segmentation with enough interaction
- Intuitive segmentations

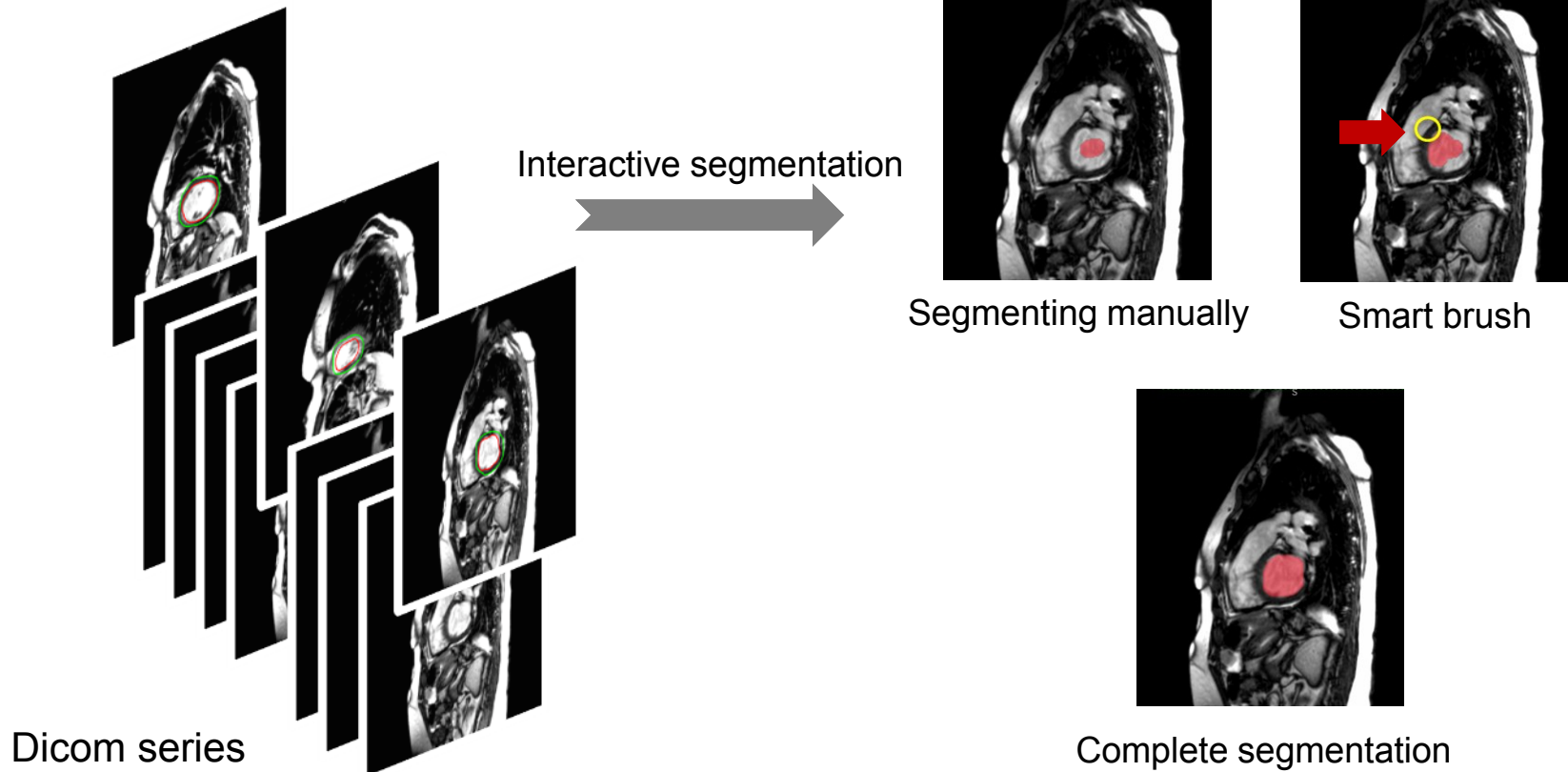


Structure



Implementation

- 2-D segmentation





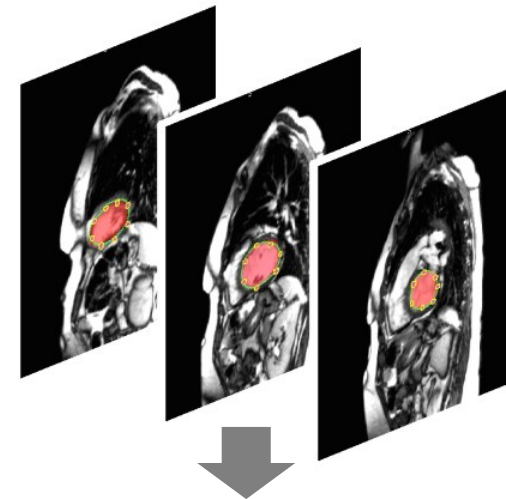
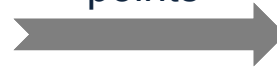
Implementation

- 3-D segmentation

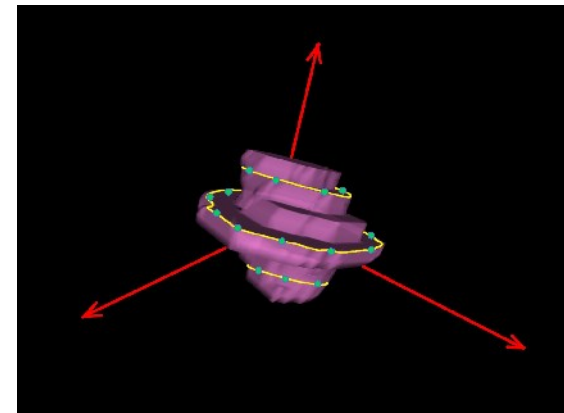


Dicom series

Compute the control points



3-D volume computation





Implementation

- Graphic user interface
 - Editing toolbox
 - Updating tools
 - Understandable visualization



To sum up

- Manual segmentation of few slides → High accuracy in 2-D
- Smart Brush functionality → Fast segmentation
- Control points → High accuracy in 3-D
- Graphical user interface → Effective interactions





Thank you for your attention!



**FRIEDRICH-ALEXANDER
UNIVERSITÄT
ERLANGEN-NÜRNBERG**

TECHNISCHE FAKULTÄT