ISMRM 2011 Sunrise Educational Course on Image Analysis
Image Segmentation: Practice
SYLLABUS

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Overview

In a multitude of image analysis applications, segmentation plays a crucial supporting role. It is a necessary first step for measuring the volume, thickness, and shape of anatomical structures. It is equally necessary for measuring physiological properties of tissues and organs. After decades of research, fully automatic segmentation remains elusive for many applications. Furthermore, some of the most effective automatic segmentation methods are highly application-specific, require extensive training data in the form of expert manual segmentations of example images, and thus very difficult for end-users to implement. Despite these challenges, more and more general-purpose software tools for image segmentation are becoming available, making accurate automatic segmentation more broadly available to imaging researchers. *In this course, we will discuss effective automatic, semi-automatic and manual segmentation approaches that can be practically implemented using freely available software.*

Objectives

The objective of the course is to introduce attendees to a range of highly effective yet practically accessible approaches to image segmentation. Upon completing the course, the attendees should be able (1) to choose the appropriate approach for a given segmentation problem; (2) to find a software implementation for their chosen approach; (3) to formulate a strategy for validating their segmentation protocol.

Topics

- A decision tree for segmentation approaches and software;
- Manual segmentation: tools, protocols, reliability analysis;
- Semi-automatic segmentation with active contours using ITK-SNAP;
- Atlas-based segmentation and multi-atlas label fusion using ANTS;
- Automatic brain segmentation using complex, multi-algorithmic packages FSL and FreeSurfer;
- Validation of automatic segmentation.

Format

The topics will be presented using a combination of Powerpoint slides, 3D visualization of imaging data and segmentation results obtained by different methods, and segmentation demos in ITK-SNAP.