Human-Computer Interaction Application to Aid with the Initialization for Active Shape Modeling

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Overview

- Motivation
- Intro Human-Computer Interaction
- Initialization Task / Active Shape Modeling (ASM)
- Application
- Results / Remaining Work
- Demo
Motivation

- Why initialization?
Motivation cont.

- Specific easy to use tool tailored for initialization process
- Better initial shape position could lead to improved ASM algorithm results
- Semi automate process of finding initialization for similar MRI image data
- Provide user with accurate and fast feedback
Human-Computer Interaction (HCI)

- Also called: man-machine interaction (MMI) or computer-human interaction (CHI)
- Interdisciplinary subject relating computer science and other fields of study
- Mostly about the user interface
- In general applied to software / hardware
- Lets user interferes with the process
HCI cont.

- Design methodology includes:
  - Usability / usefulness
  - Intuitive / natural

- Goals:
  - New interface / interaction techniques
  - Effective techniques for evaluating and comparing interfaces

- A product needs appropriate level of user interaction to bring out the full potential of human-computer interaction
In Medical Imaging:
- Image Segmentation
  - Complicated, tedious
  - Manual – difficult and time intensive

Current techniques
- Displaying final results - accept/reject
- Modify results – accept / correct
- Evaluate results – change parameter, rerun
- User-steered – continuous user interaction
HCI cont.

- How does this apply to this project:
  - Need something that user can use intuitively
  - Simple interface to reduce chances for error
  - Visual feedback for user to enhance understanding
  - Track previously adjusted parameters
Initialization Task / ASM

- How does it work...?
  - Point Distribution Model (PDM)
  - Transformation Matrix
  - MRI data

- Current Process
  - Matlab, PDM->Volume, InsightSnap
  - => repetitive steps
The initial placement greatly effects the performance and results of the ASM.

Identification of initial placement of same shapes should take minimal time while keeping accuracy.
Application

- Software libraries/packages used
  - ITK (Insight Segmentation & Registration Toolkit)
  - VTK (Visualization Toolkit)
  - FLTK (Fast Light Toolkit)
- Implemented in C++
- Platform independent
Application cont.

- Simple Steps:
  - Load MRI data
  - Load Point Distribution Model (PDM)
  - Adjust the model
  - Export the Transformation Data

- Visual Features
  - Three different views (axial, coronal, sagittal)
  - 3D view of MRI with Model
Application Screenshots
Application Development Status

- Load MRI
- Load PDM
- Display PDM together with MRI (broken)
- Move the model
Results / Remaining Work

- Features left to be implement:
  - Multiple MRI file processing
  - Keeping PDM transformations for subsequent initializations
  - Export of the Transformation Matrix
Demo
Questions...