Visualization of Medical Data 1

Visualisierung der medizinischen Daten 1

SS 2015
VU 186.105

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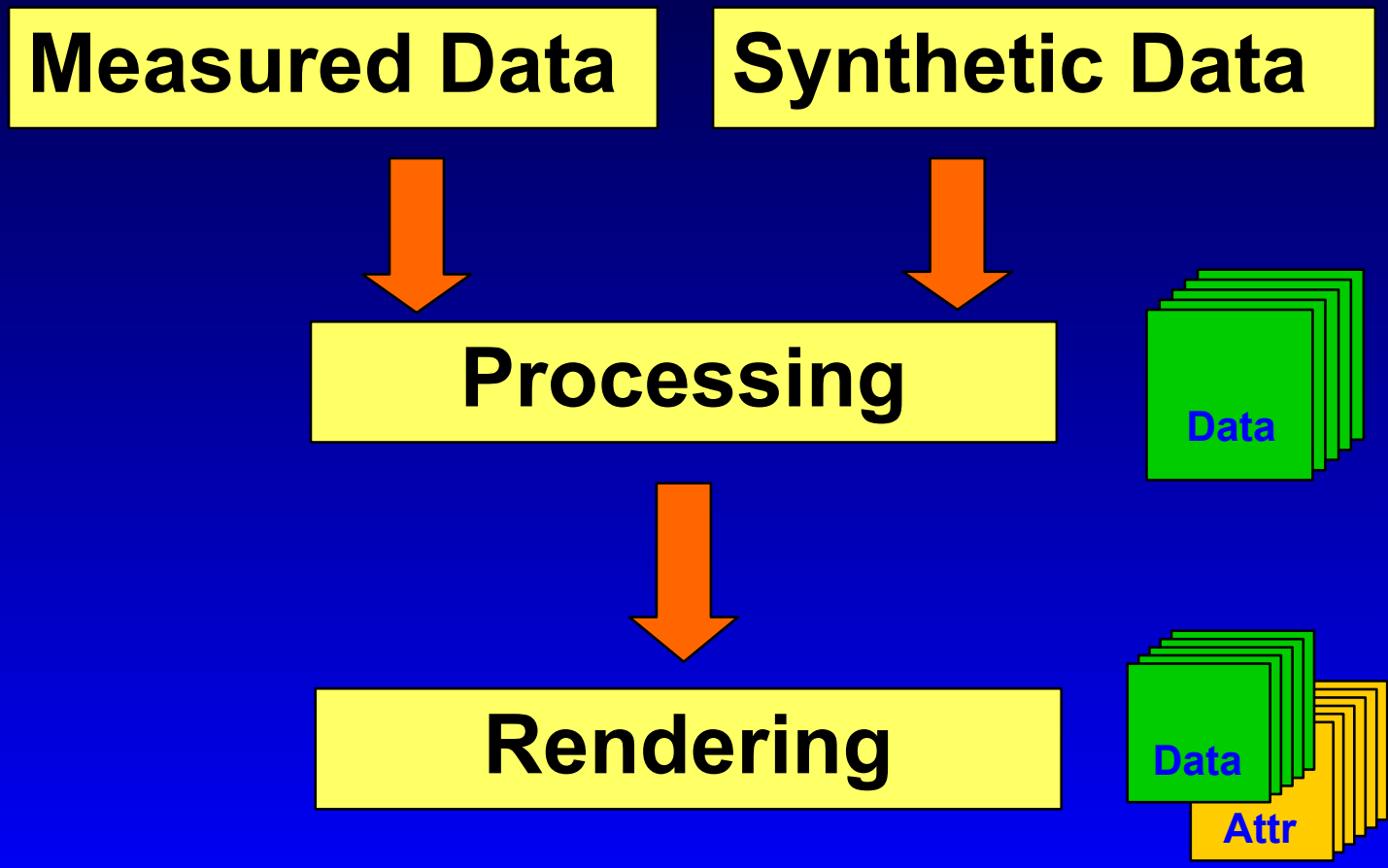
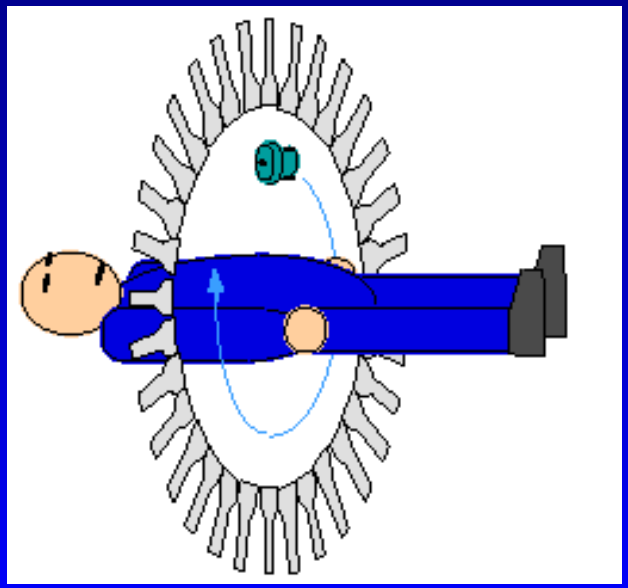
3D Data Acquisition, Processing and Rendering

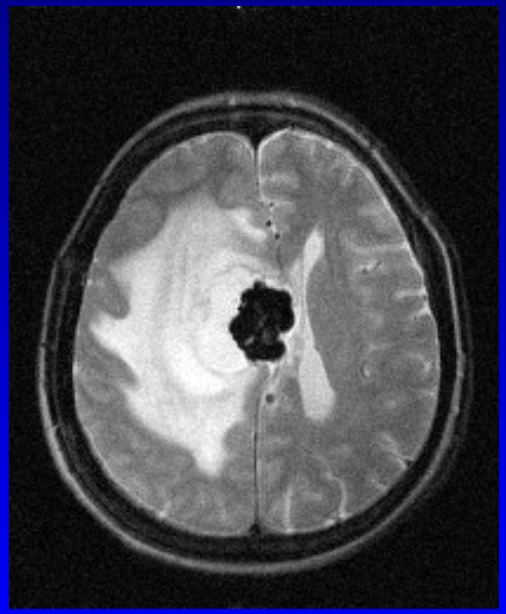
GENERAL



Data Acquisition

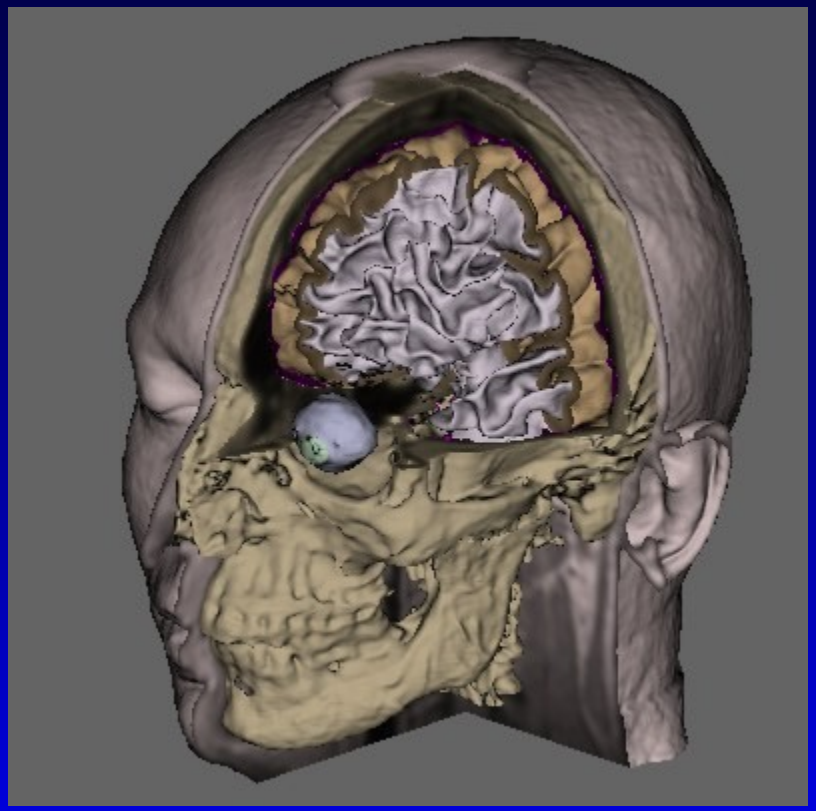
- CT, MRI, PET, SPECT, US
- Scanner physics
- Reconstruction from raw data
- Formats for data storage





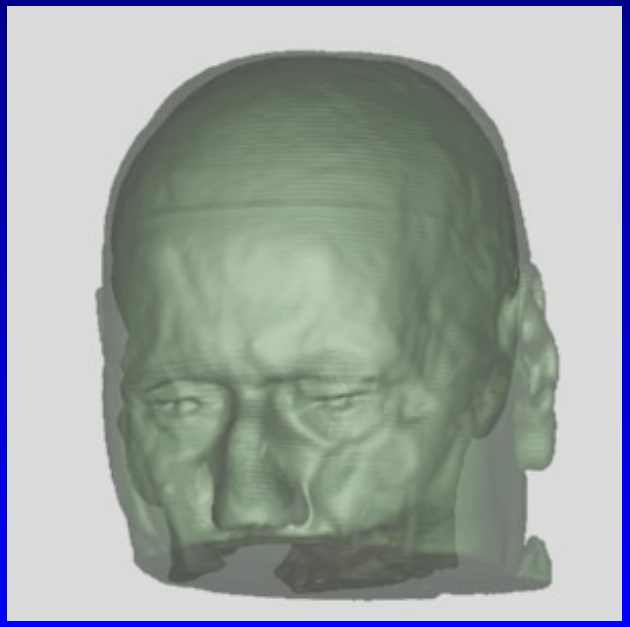
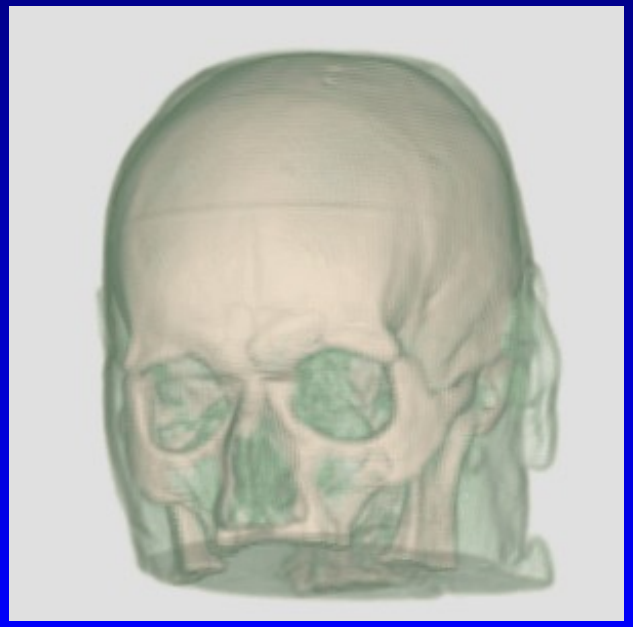
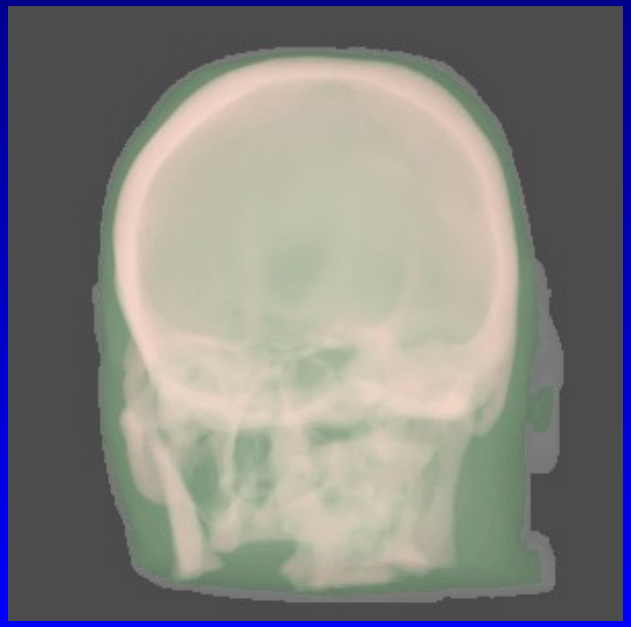
Processing

- Enhancement
- Registration
- Classification
  - Selection of transfer functions
- Segmentation
  - Interactive
  - automatic



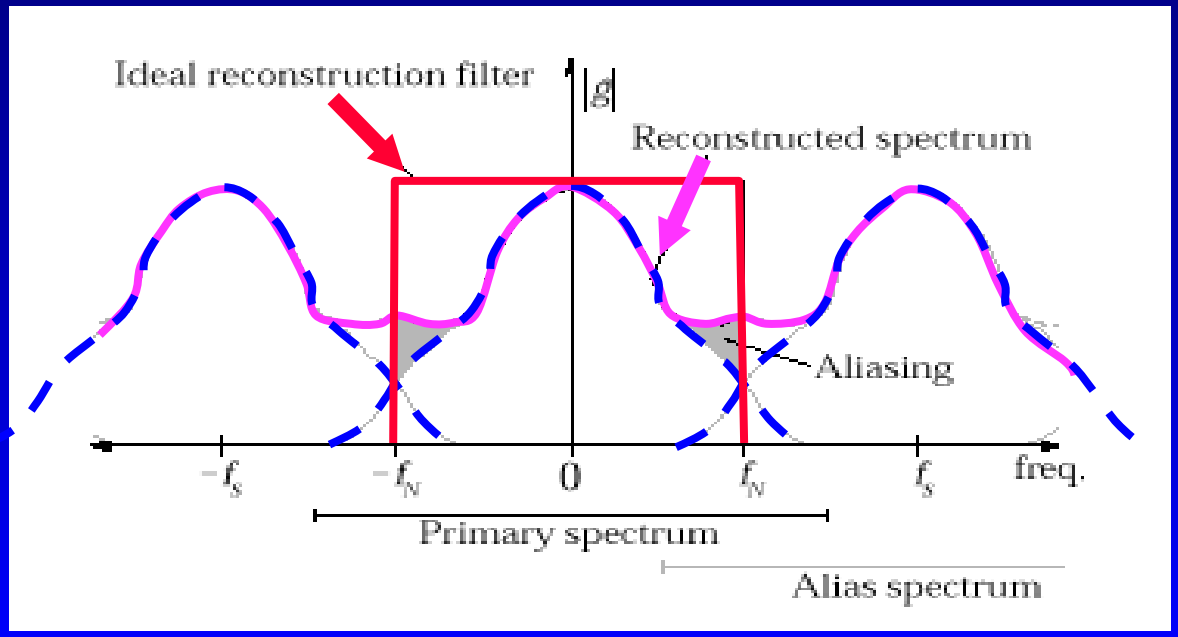
Rendering

- Different visualization techniques
- Surface & gradient estimation
- Perception enhancement
- Hardware acceleration

General Questions

- Sampling and (anti-)aliasing
- Reconstruction filters
- Data resampling and rendering



Thursdays,
1:30-5:00 pm
(March 12, April 9, April 30, May 21)

Seminarraum 186

Favoritenstraße 9, 5. Stock

http://www.cg.tuwien.ac.at/courses/MedVis/VU.html

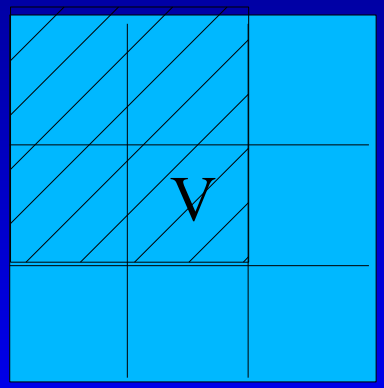
Grades

1. Project:
   - Simple programming, C++, or
   - Self-specified + presentation
2. Written exam

Grade = Project && Exam

Project 1

- Volume smoothing with oriented mask. The algorithm:
  1. For each voxel V
     1. Compute mean value and variance of 8 voxels (hatched) in 8 directions
     2. Store the mean value corresponding to the lowest variance
  2. Submission and exam:
     1. Submit source of the project with one of the processed volume as example
- Source: see the web page



Project 1 (cont)

- Environment:
  - Basic source code provided
- Requirements:
  - Basic knowledge of C and C++ programming
  - No GUI programming, just command line
  - GNU/Linux, Mac or some MS IDE.

Alternative Project

- Short presentation of your work in Volume processing and visualization
  - 10 minutes during the last lecture
  - To be announced in advance

Conditions

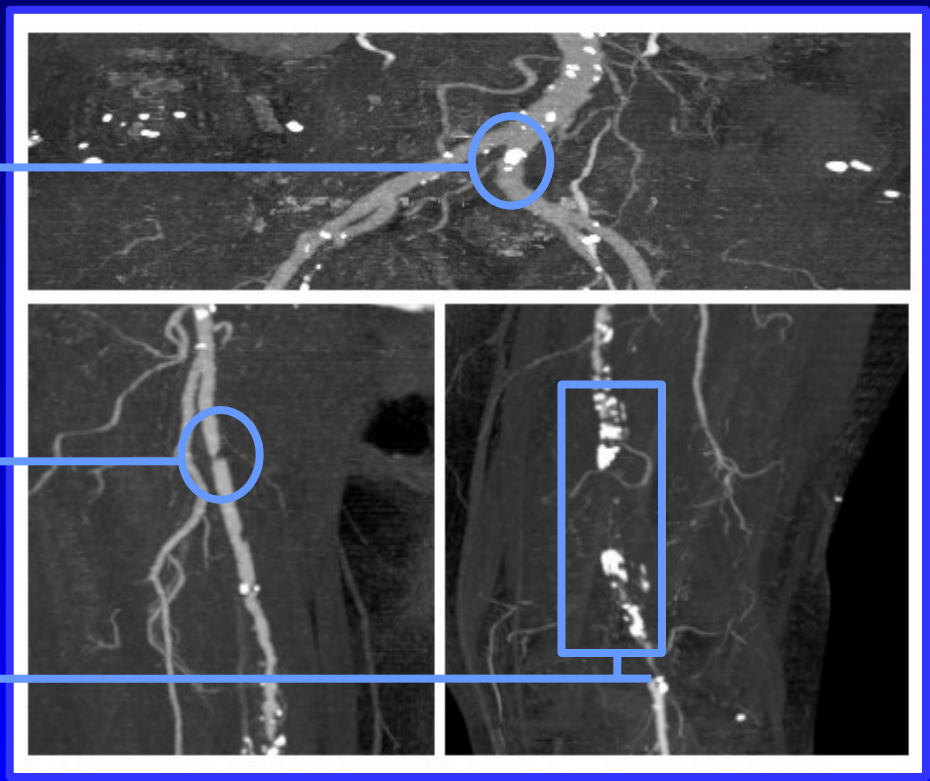
- **Ask questions** till the end of the semester
- Projects **must** be finished 2 days before the exam
  - Source to be send by e-mail
  - Exam during the last semester week + additional terms

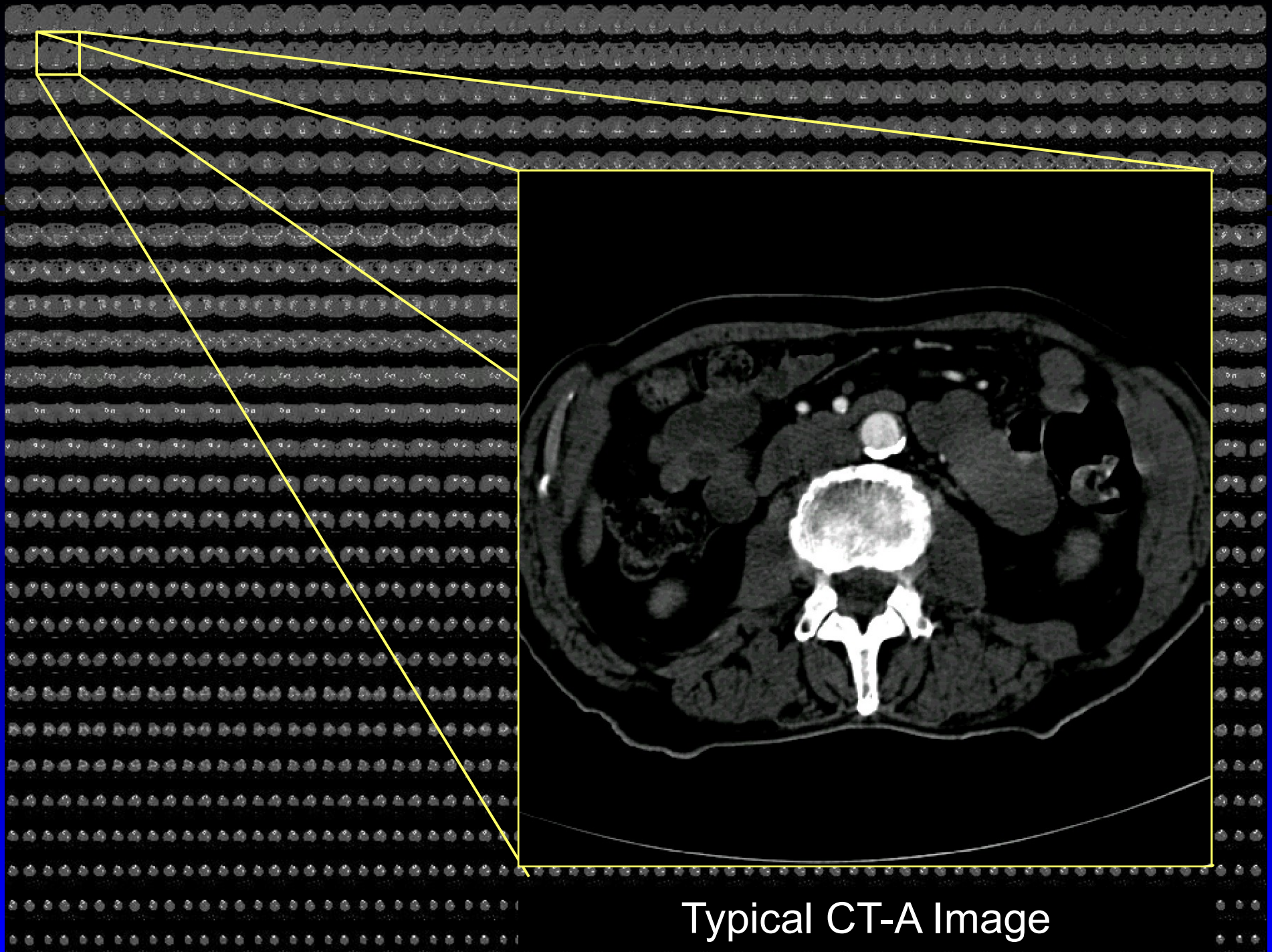
Praktikum

- 10 Semesterstunden
- A recommended preparation step for a master thesis
- Projects related to image processing, volume rendering and processing of volume data

The AngioVis Project

- Development of tools and algorithms for vessel visualization
- Collaboration with AKH and Stanford Medical Center

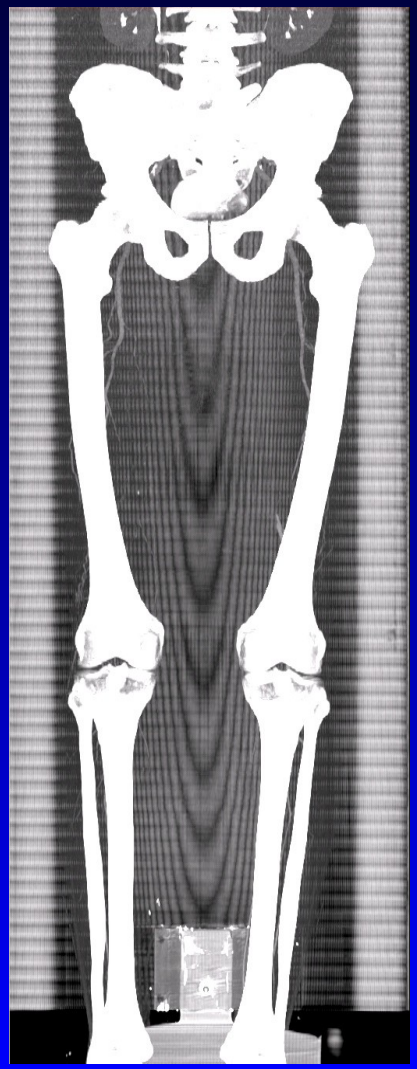




Typical CT-A Image

Main Topics

- Very large data sets
- Knowledge based segmentation techniques
- Specialized visualization tools
- Fast data manipulation
- Hardware supported visualization



Praktika and Master theses in the AngioVis/KASI Project

- AngioVis ToolBox (AVT) is a tool for processing 3D CT-A datasets
- Written in C++
- User interface based on Qt 4
- Graphics based on OpenGL
- All source code available (git)
- Consulting possible (G. Mistelbauer)

Praktika and Master Theses in Imaging and Analysis for Biology

- Projects related to plant biology
  - Shape descriptors, topology etc
- Python preferred