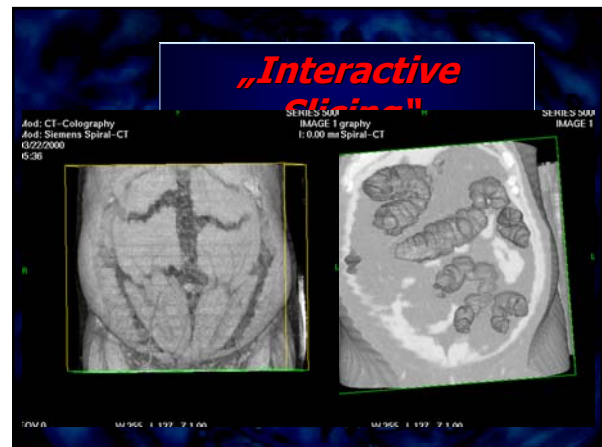
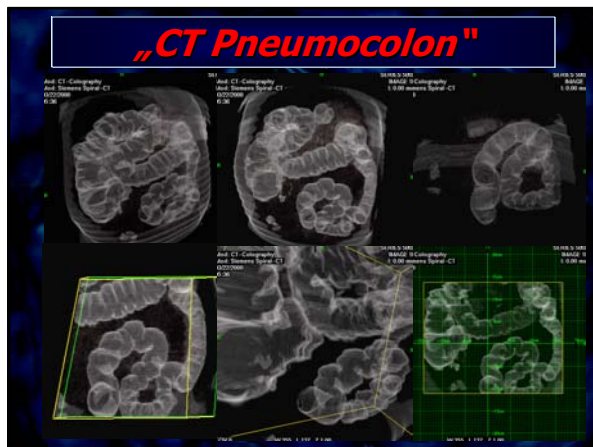


ColonCa – Medical Background

- ✓ 3. Most common Ca
- ✓ 2. Common Ca leading to death
- ✓ 11%
- ✓ Secondary Only complete in 85 – 90%
access Misses 10 – 20% of all Ca
- ✓ Col Perforation (1:1500)
Only part of the of the
colonic visualized

3D Visualization of the Colon:

- ✓ CT Pneumocolon
- ✓ „Interactive Slicing”
- ✓ „Fly through” (CT-colonoscopy)
- ✓ Virt. Dissection

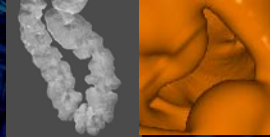


Problems - General:

- ✓ Post processing of cross sectional data:
 - time consuming
 - hardware intensive (expensive!)
 - specialized staff necessary

Problems - CT colonoscopy

- ☑ Path planning for automated „fly through” complicated and even operator dependent
- ☑ Endoscopic view display just a small proportion of the colonic surface -> Ante and - retrograde views necessary



What do you wanna have for CT - colonoscopy?

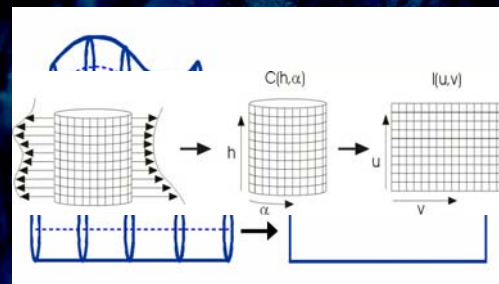
- ☑ Inspection of total colonic surface
- ☑ Fast tool
- ☑ Minimal interaction
- ☑ No operator influence
- ☑ Easy and quick to report
- ☑ (Hardware independent)

„Virtual dissection”

- ☑ Stretch the colon and cut it along it's longitudinal axis similar to the pathologist's table



„Virtual dissection”



„Virtual dissection” - How to do?

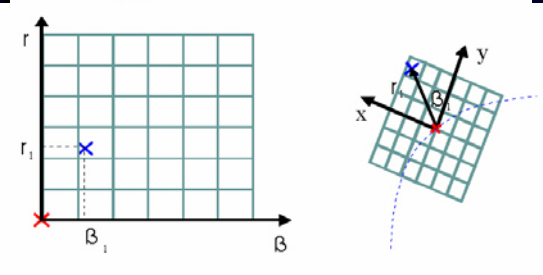
- ☑ Data aquisition
- ☑ Segmentation - Fuzzy connected
- ☑ Extraction of the centerline (Skeletonisation - Thining)
- ☑ Calculation of the cross sections
- ☑ „Remapping” to 2D

Virt.Diss. - Data Aquisition

- ☑ MRDCT
 - Slice thickness 2.5mm
 - Reconstruction: 1.25mm slice thickness, increment 0.5 - 1.0mm (~600-700 images)



Virt.Diss. - Cross sections



Virt.Diss. - Remapping

☑ Constant Angle Sampling

- No distortion in the y direction but adds area distortion.
- Can miss objects.
- No sense of "size".
- The surface is not sampled uniformly



Virt.Diss. - Remapping

☑ Perimeter Sampling

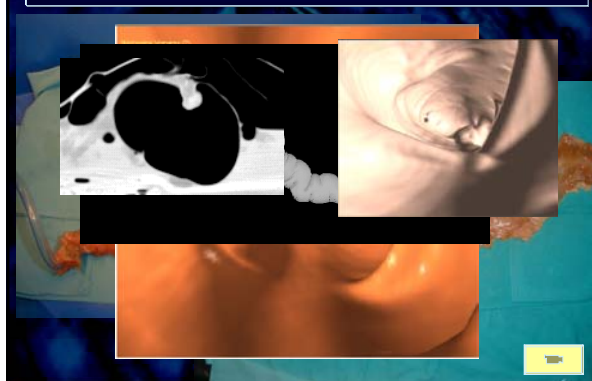
- Surface Sampled uniformly.
- No missing elements. If sample step small enough.
- Area Preservation.
- Deformation in the y direction- Shrinking
- Deformation increasing with distance to the vertical center line.



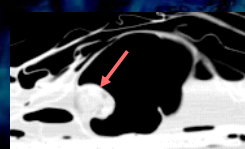
Phantoms - Technical



Phantoms - Cadaveric

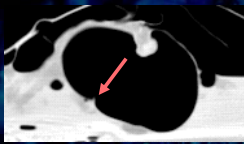


Phantoms - Cadaveric Artific. Polyps (n=13)



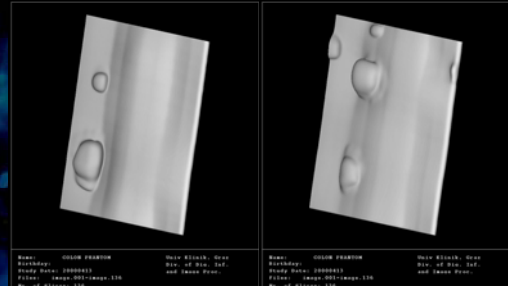
Filename:	image.691
Table Position:	-506.09
Size(Trans, Cor, Sag):	12.9 * 15 * 11.4
Protrusion(Trans, Sag, Cor):	13.8 * 13.8 * 11.2

Phantoms - Cadaveric Artific. Polyps (n=13)



Filename: image.580
 Table Position: -450.09
 Size(Trans, Cor, Sag): 6.8 * 4.8 * 3.6
 Protrusion(Trans, Sag, Cor): 2.6 * 1.6 * 0

Results - Techn. Phantom

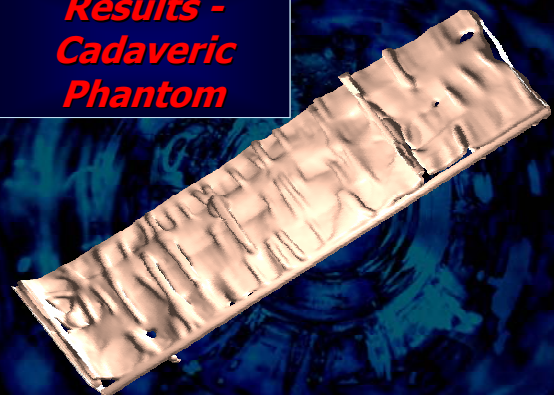


Results - Cadaveric Phantom

Name: COLON VIRTUELL
 Birthday: 20000406
 Study Date: 20000406
 Files: image.002-image.740
 Nr. of Slices: 370



Results - Cadaveric Phantom



Results - Cadaveric Phantom

Constant Angle Sampling

Perimeter Sampling



Results - Cadaveric Phantom



- ☑ **Polyps appear**
 - as bumps
 - as asymmetric broadening of folds
- ☑ **Time:**
 - Operator 10min
 - Total time: 2h

Results - Diverticulitis



Results - Medical Evaluation

☑ 2 Observer, 13 Polyps:

- Sensitivity: 12/13 = 92.3%
- Interob. Agreement: 11/13 = 84.6%
- Pos.pred.Value: 75-80%

☑ Each Observer overlooked 1 Polyp:

- 3.9 * 5.0mm
- 3.5 * 2.5mm

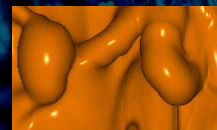
Conclusion VirtDiss

- ☑ Virt. Dissection of the Colon seems to be possible within a reasonable timeframe
- ☑ Operator interaction minimal (<10min), total time about 2h
- ☑ Graz environment platform independent
- ☑ Easy to report, performance excellent
- ☑ Clinical experience until now limited

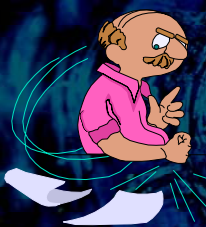
Outlook

Using the depth map enhance the image using image processing.

- Contour detection.
- Curvature detection.



Outlook



- ☑ „Troubelshhooting Tool“
- ☑ „Fecal Tagging“ – for easier patient preparation

