



Biomed. Imaging
& 3D Visualization

Sorantin

Introduction

Basic Facts

Enhancement

CAD – Breast
Cancer

Virtual Reality

End...

Biomed. Imaging - 2D/3D/4D & More Selected Applications

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Department of Radiology, Med. University Graz

July 4, 2012



Person

Wanted: Erich Sorantin

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- **Children:** 55a, 3 sons 23.5,25,27a
- **Education:** Certified Pediatrician and Radiologist, Univ.-Prof. of Radiology
- **Postion:** Interim.Head Div. Pediatric Radiology, Head RU Digital Information & Image Processing
- **Hobbies:** Rockmusic - guitar, keyboards
- **Military:** Chief Lieutenant, Commander of "Mobile Army Hospital Graz"
- **Scientific Interests:** Ped.Radiology, Radiation Protection, Image Processing, Machine Vision, 3D, Multimedia, Biosimulation
- **IT:** OS:MsDos – Win7,Linux/Unix, VMS
Programming: Basic, Modula2, C/C++, Perl, PHP, SQL, IDL, SAS, R.....

Text: \LaTeX (<http://www.dante.de>)



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....CEEPUS....

What is CEEPUS?

- **Central European Exchange Programm for University Studies**

30 academic institutions (25 medical, 5 engineering)

- **CEEPUS Supports with grants:**

- Students/Residents/Teacher Exchange
- Summer / Winter Schools
- Excursions

More Information:

<http://www.ceepus.info>

<mailto:erich.sorantin@medunigraz.at>



....CEEPUS....

Who is CEEPUS?

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Quo Vadis ...

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Basic Facts

Amount of Data

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- **Cross sectional imaging modalities like Spiral – CT & MRI**

- Geometrical & temporal resolution (4D) ➔
- Up to 2000 images / examination ➔
- Datasize \approx human genom ➔

➔ **Traditional reporting techniques "out of service"**



Solution: Biomedical Imaging & Visualization

Examples

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3D Display:

- "Multiplanar Rekonstruction (MPR)"
- "Maximum / Minimum Intensity Projektion" → MIP, MinIP
- "Shaded Surface Rendering (SSD)", "Volume Rendering (VRT)"

Type of Projection?

- from outside → Parallelprojection
- from inside → perspective Projection →

Virtual Endoscopy (VE)



Solution: Biomedical Imaging & Visualization

Examples

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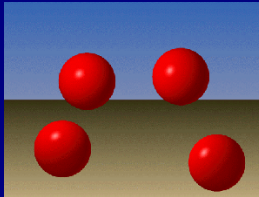
Enhancement

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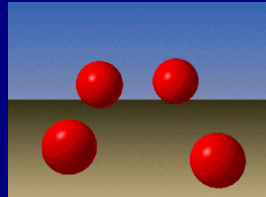
Virtual Reality

End...

- **Perspective:** near objects \gg more close ones
- **Perspective:** distant point infinite
- **Human Vision** \Rightarrow perspective



Parallelprojection



Perspective Projection



Solution: Biomedical Imaging & Visualization

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Quantification:(Airway Stenosis, Tumor Volumes)

Patient name: N N

Birth date: YYYYMMDD

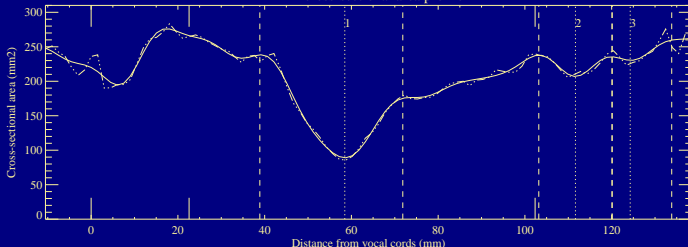
Study date: YYYYMMDD

Landmark0: 0.00mm (10.54mm)

Landmark1: 22.58mm (33.11mm)

Landmark2: 102.35mm (112.88mm)

LTT cross-sectional area profile



A=84 mm²
d=10.38 mm

A=150 mm²
d=13.86 mm

A=217 mm²
d=16.63 mm

A=283 mm²
d=19.00 mm

sten#	degree (%)	Bdegree (%)	Edegree (%)	length (mm)	min pos	min cross	begin pos	end pos
1	56.79	62.52	49.00	52.96	58.47	89.25	38.88	71.85
2	12.27	12.68	11.87	16.90	111.65	207.31	103.20	120.10
3	6.78	1.94	11.17	13.75	124.28	230.67	120.10	133.84



Solution: Biomedical Imaging & Visualization

Examples

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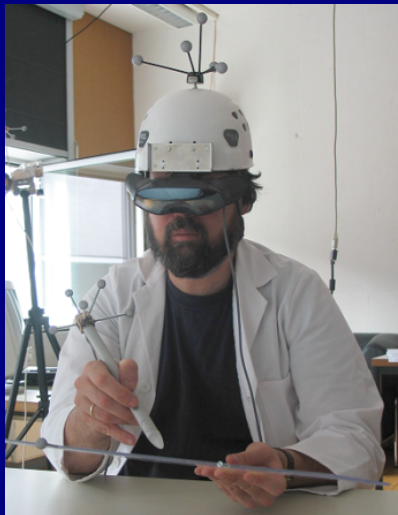
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Navigation & CAS (Computer Aided Surgery)





Solution: Biomedical Imaging & Visualization

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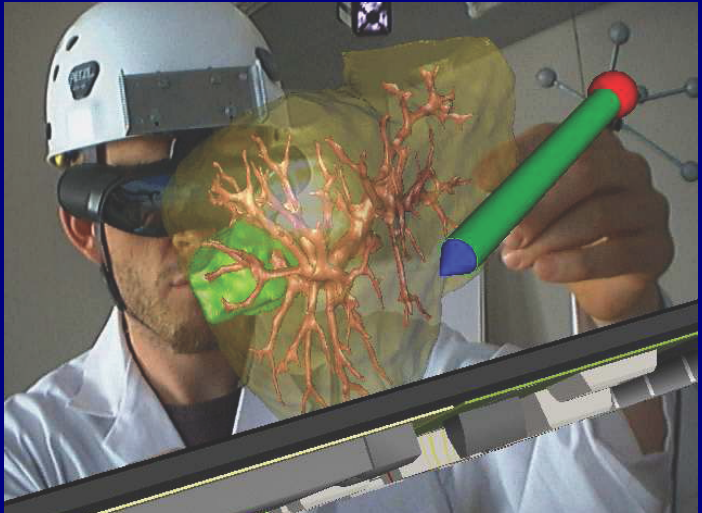
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Solution: Biomedical Imaging & Visualization

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Functional Imaging

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Solution: Biomedical Imaging & Visualization

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CAD – Computer Aided Diagnosis

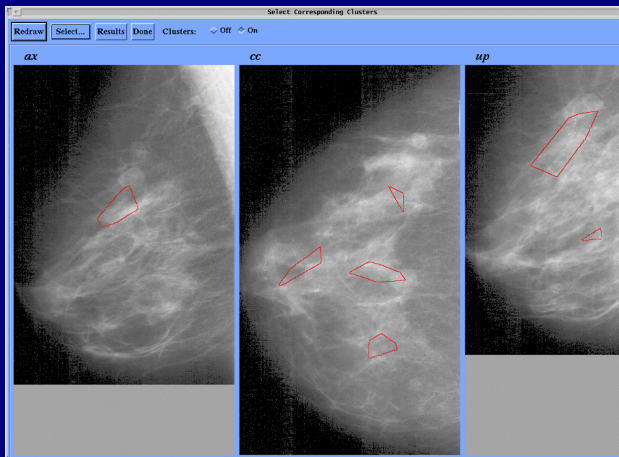




Image Processing Enhancement

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- **Image Processing for LTS**
- **Virtual Dissection of the Colon**



Computer Aided Diagnosis (CAD)

Breast Cancer

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- **Computer Aided Diagnosis - Breast Cancer**



3D – Display Virtual Reality

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Virtual Liver Surgery Planning System



End Everything is virtual....

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