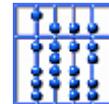


User Interface for Medical Augmented Reality



Diploma thesis
Introductory Talk



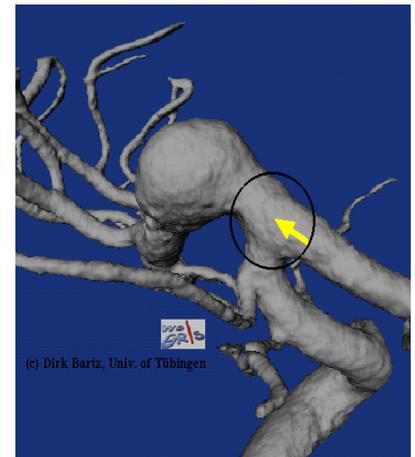
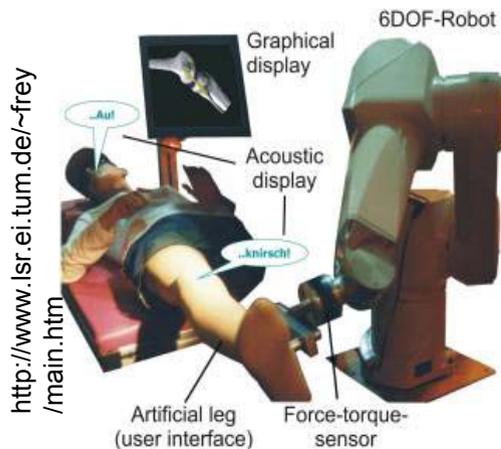
Student: Marion Gantner

Supervision: Prof. Nassir Navab, Tobias Sielhorst

Chair for Computer Aided Medical Procedures

AR and VR in medicine

- Augmented and Virtual Realities provide possibilities in different medical domains
 - Surgical education
 - Training simulator (The Munich Knee Joint Simulator)
 - Computer aided diagnosis
 - Virtual endoscopy (Virtual Angioscopy)

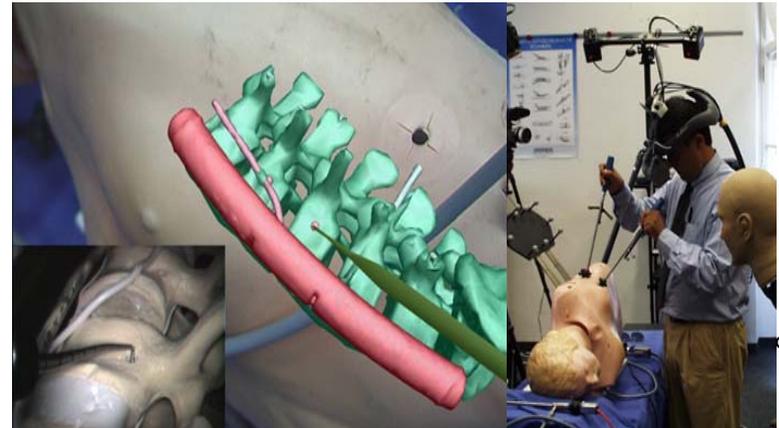


(C) 1998-2002, Dirk Bartz, WSI/GRIS, University of Tübingen

AR and VR in medicine

- Augmented and Virtual Realities provide possibilities in different medical domains
 - Operation planning
 - Robot assisted surgery (keyhole heart surgery)
 - Intra-operative surgery assistance
 - Enhanced surgical view, navigational support

<http://www.clevelandclinic.org/heartcenter/pub/history/future/robotics.asp>



Courtesy of Ali Khamene, Frank Sauer & Sebastian Vogt

User Interfaces

- For every system a User Interface is needed
 - to allow the user to interact with the system
- Traditional HCI tools like keyboard and mouse are not suitable for surgical environments
 - Are not appropriate for 3D interaction
 - Cannot be placed in reach
 - Obstructive for the physician
 - Cannot be sterilised



Courtesy of Klinikum Nürnberg

User Interfaces

- Especially for intra-operative surgery assistance some characteristics must be considered
 - Sterile operation room, environment and equipment
 - No discharged air of computers or projectors
 - Possible electromagnetic interference
 - tracking systems vs. examination equipment (CT/MRT)
 - As few cables as possible and handy equipment in order not to constrain the physician



User Interfaces

- Possible interaction modes
 - Voice Entry
 - Gesture Entry
 - Optical Entry
 - Tangible Entry
 - Tracked device (pen, surgical device)
 - Tracked display
 - Data glove
 - Index finger ring
 - Cubic Mouse, 3D Space Mouse, Flystick
- For best efforts a combination of several possibilities will be used



Courtesy of Oliver Schönbrunner, TU Wien



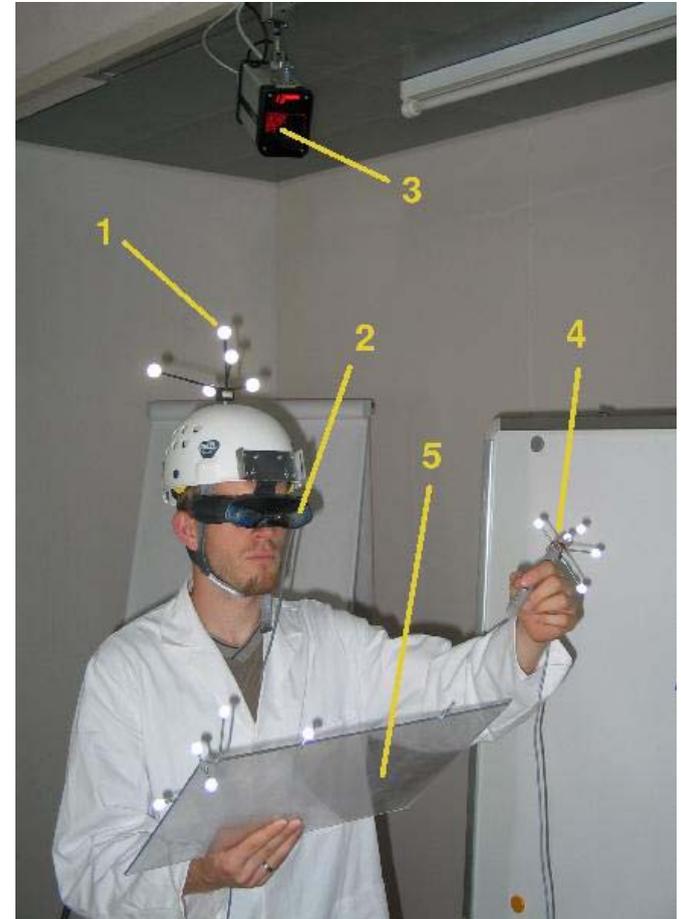
Courtesy of Ali Khamene, Frank Sauer & Sebastian Vogt



Courtesy of Mark Billingham, University of Washington

Developments for AR in medicine

- Liver surgery planning system (TU Graz)
 - See-through HMD
 - tracked PEN and
 - tracked Personal Interaction Panel (transparent plexiglass)



<http://liverplanner.icg.tu-graz.ac.at>

Developments for AR in medicine

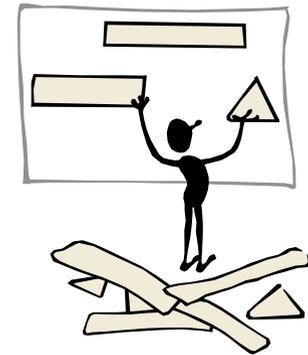
- **MedARPa** (Zentrum für graphische Datenverarbeitung e.V. Darmstadt, consortium leader)
 - Freely moveable AR display
 - Multimodal interaction technologies
 - Foot switch
 - visual and audio feedback



<http://www.medarpa.de>

Workflow and Timetable

- **September: *orientation***
 - Analysis of published work on Augmented Reality and Virtual Reality User Interfaces
 - Collecting advantages and disadvantages
- **October/November: *experience***
 - To become acquainted with the functionality of RAMP
 - Figuring out what can be realised



Workflow and Timetable

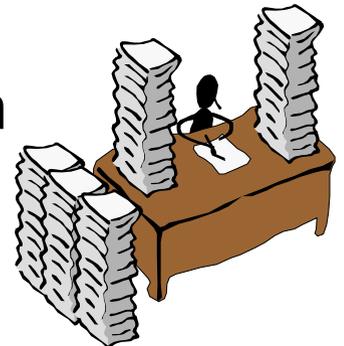
- **November/December:** *concentration*

- Reflecting in relation to a specific medical attendance in cooperation with the respective physicians
 - To find a realisable and satisfying solution



- **January/February:**

- Implementation of the discovered solution
- Writing the thesis





Finished

- *Thanks for your attention*
 - *Questions*
 - *Discussion*