

Medical Augmented Reality and User Interfaces

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Language

- We will do everything in English
- You can do your presentation and report in German
- One supervisor is English speaking

Two fundamental problems in the OR

- Images of the patient are shown on the monitor
- Hands have to be sterile and are used to operate



Medical Augmented Reality

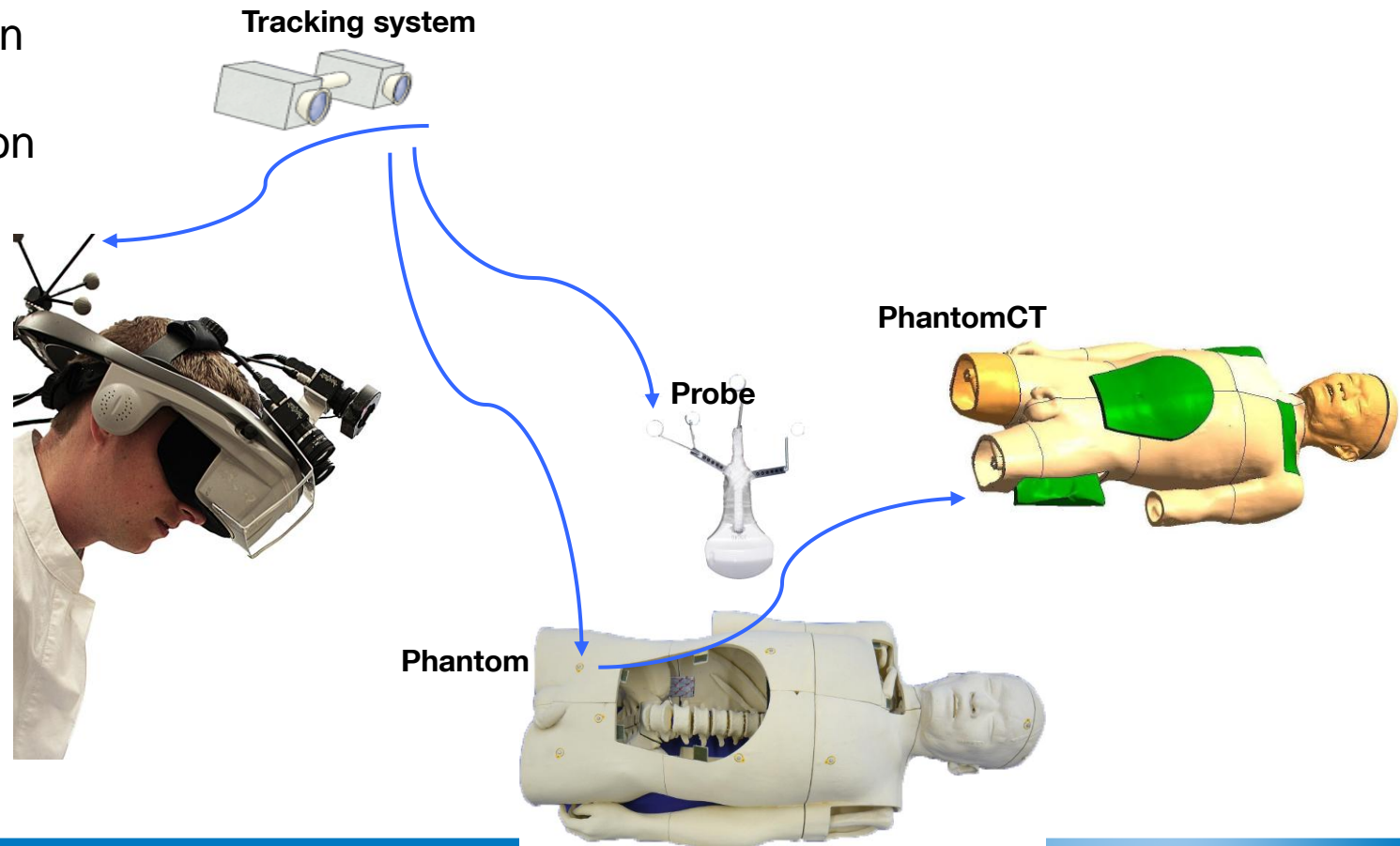
- Definition of AR by Azuma [Azuma1997]
 - Combination of real and virtual
 - Interactive in real-time
 - Registered in 3D
- In Medicine
 - Pre- or intra-operative images and video images
 - Usually the medical images are not updated in real-time
 - Registration is very important



[Azuma1997] Azuma, A survey of augmented reality, Presence

Important aspects of Medical AR

- Tracking
- Registration
- Calibration
- Visualization
- Display



Medical User Interfaces

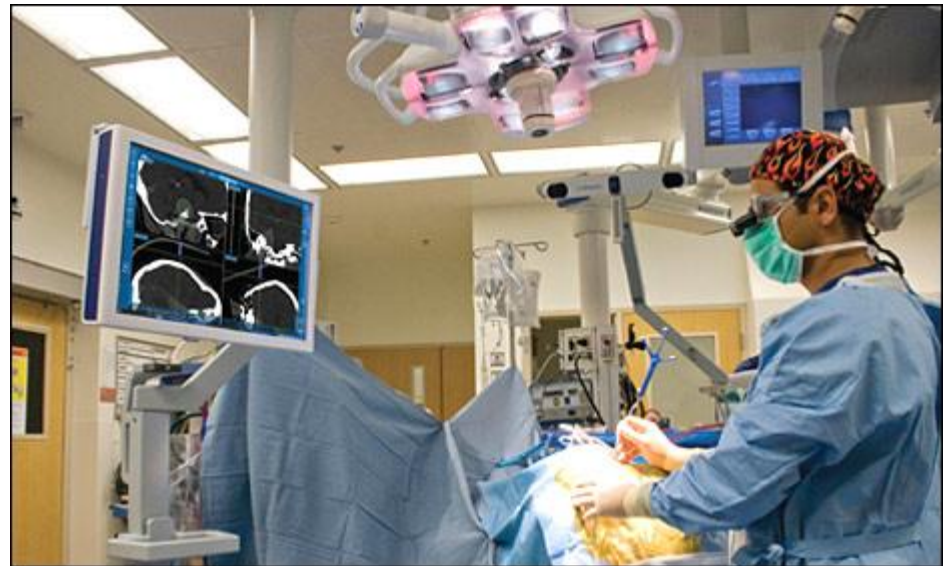
- Today
 - Indirect interaction (tell the nurse what to do)
 - Foot pedal
 - Speech recognition has not been that successful
 - First solutions for touch



BrainLab Digital Lightbox

Medical User Interfaces

- Increasing need for user interfaces due to computer assisted surgery
- Tomorrow?
 - Touch
 - Gestures
 - Eyegaze



Medtronic

Goals of the Seminar

Learn how to

- read up on a topic and how to read scientific papers,
- write a scientific paper,
- and present it

Scientific writing

- **Seminar:** Systematically investigate existing scientific literature regarding one specific topic. Summarize and present the most important findings.
- **During your studies (MA/DA):** Understand and discuss existing literature that are related to your own thesis.
- **Scientific publications (Conference / Journals / Workshops):** Present your own research and contribution to other researchers

Papers

- **Your reports will be based on scientific papers**
- **So what are scientific papers?**

- **Scientific papers are presented at conferences or in journals**

Conferences and journals

- Hundreds of conferences and journals on different topics
- Exchange of knowledge, make contacts, make yourself a name, quality control
- MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention
- ISMAR: International Symposium on Mixed and Augmented Reality
- MMVR, SPIE, ISBI, MIAR, IUI, 3DUI

How conferences work

Call for papers

Abstract submission

Submission

Reviews

Rebuttal

Decision / Notification

Final submission

Presentation

Time

- Dates, topics
- Short summary of submission
- Submit your work
- Reviewers from the same field rate your paper according to novelty, writing, soundness, importance
- You can respond to the reviews
- Which papers are accepted
- You can change your paper once more
- Poster or presentation

Good and bad conferences / journals

- Signs for bad conferences (not everything published here is of low quality)
 - International Multiconference on Computers, Engineering and Math (which is held on Hawaii every year)
 - German Conference on Something
 - Abstract only submission
- Signs for good conferences
 - IEEE or ACM conference
 - Impact factor
 - Low acceptance rate

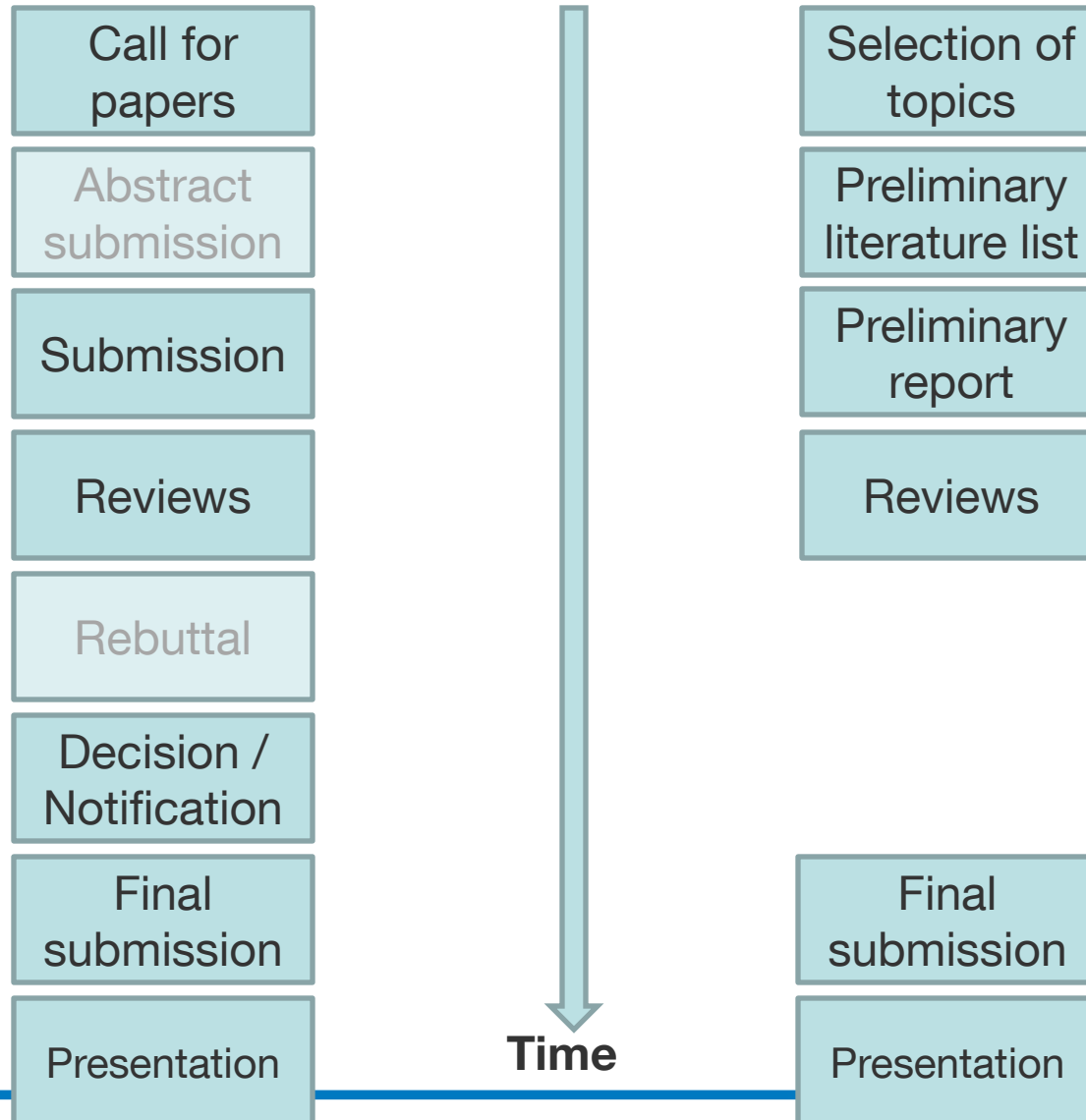
Structure of a scientific publication

- **Abstract:** This is the part that will be read most often. Has to arouse interest in the reader. Usually the abstract is freely available.
- **Introduction:** Motivation and related work.
- **Materials and Methods:** Exact presentation of the material (Data, soft- and hardware, survey) and of the methods.
- **Results:** Usually quantitative values.
- **Discussion:** Conclusions, problems, future work and a summary.
- **Reference:** Related work and literature that is important to understand the paper. Everything that has been used to obtain the own results.

Your presentation in the seminar

- Does not have to follow the typical structure of a scientific paper exactly
- Present one area using scientific papers from other authors
- Do not copy and paste
- Reference all sources
- Use references in your slides

How conferences work / How this seminar works



Access to scientific publications

- Access to the most publications is not free
- Many publications can be access for free using the TUM-proxy
- Some places to look for publications:
 - Google Scholar <http://scholar.google.de>
 - Citeseer <http://citeseer.ist.psu.edu/>
 - Elektronische Zeitschriftenbibliothek
<http://rzblx1.uni-regensburg.de/ezeit/>
 - **Our library!**
Books and electronic media...
Link to instructions how to access/download electronic media:
<http://www.biblio.tu-muenchen.de/medien/emedien.html>
Link to access/download media outside of the campus:
<http://www.lrz-muenchen.de/services/netzdienste/proxy/documentweb/>

Grades

- Submit your literature list (April 30th, 23:59 PST, 2 point)
- Submit your preliminary report (May 14th, 23:59 PST, 2 point)
- Submit your reviews (May 21th, 23:59 PST, 2 point)
- Report (10 points)
- Presentation (10 points)

L^AT_EX

- Typesetting system
- Widely used in academia
- Editors like TeXnicCenter
- Bibtex

Topics

- AR
 - History of medical AR
 - AR Display devices
 - AR for training and education in medicine
 - Perception in medical AR
 - Computer Graphics for Medical AR
 - Tracking technologies
 - Treatment of phobias using AR/VR
 - Usability Evaluations for Augmented Reality Applications.
- User Interfaces
 - Gesture based interaction
 - Gesture-based interaction using Kinect
 - Gesture-based interaction using Inertial Sensors
 - Gesture-based interaction using Gloves
 - Human Skeleton Tracking for User Interfaces
 - User interfaces for 3D interaction
 - Stereo displays
 - Speech recognition in the OR
 - Software Architectures and Frameworks for Multi-modal User Interaction.
 - Interactive 3D Graphics using Multitouch Screens.
 - Interactions with Large Displays.
 - Lay outing items in video walls and large displays.