Anwendungsbeispiele für AR

Vorlesung „Augmented Reality”
Prof. Dr. Andreas Butz, Martin Wagner
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Anwendungen der AR

- Industrie
  - Konstruktion, Reparatur
- Medizin
  - Diagnose, Operationsunterstützung
- Transport
  - KFZ, Flugzeuge
- Unterhaltung, Bildung
  - Museen
  - Fernsehen
Medizin: UNC Chapel Hill, 1992

- Ultraschall-scan vom Bauch einer Schwangeren
- 3D-Rekonstruktion
- Überlagerung des Bildes mittels HMD
- → 3D-Stethoskop

KARMA: Columbia University, 1993

- Use AR for technical maintenance
- Have a 3D model of a laser printer
- Instruct via HMD:
  - How to open it
  - What part to change
  - How to remove it
- Ultrasonic tracking
- Reflection Technologies „P4 Private Eye“ HMD
  - Monochrome LED
  - One eye only
Windows on the World: Columbia 1993

- Use HMD as an extension of regular screens
- Drag windows off the screen
- Arrange windows in the world
- Make display screen substantially bigger

Construction: Boeing, 1994

- Assembly of wire harness for airplanes
- Assembled on a large board
- Traditionally tedious task
- Equip board with markers
- Show in HMD where to mount next wire
Architectural Anatomy: Columbia, 1994

- Reveal hidden structures in a building
- Get information about these structures

AR for Construction, Columbia, 1996

- Assembly of a „Space-Frame“ construction from single parts
- Given sequence of steps
- Use a barcode scanner to identify mounted parts
- Check if correct part has been mounted
- AR system shows the next part’s position
AR for Construction, Columbia, 1996

EMMIE: Columbia, 1998

- Support a meeting
  - Several participants
  - Shared 3D world
  - With or w/o HMD
- 3D icons representing units of data
- 1:1 translation of desktop metaphor
- „Environment manager“ in analogy to window manager
Mobile AR Systems: Columbia, 1997-now

- Augmented Reality system in a backpack
- Tracking by DGPS (centimeter level)
- Interaction via handheld devices
- Various applications
MARS: Situated documentaries, 1999

- Content produced in cooperation with journalists
- Stories „located“ on university campus
- Visible only through AR: flags
- Content playback in HMD
- Content playback on handheld
- Interaction in HMD and on Handheld
MARS: Authoring Environment, 2003

- Authoring for situated documentaries
- Composition of clips from media snippets
- Assignment of clip positions on a 3D map
- Preview of clip playback
- Links between clips
  - Can be followed forward and backward
  - Turn campus into physical hypertext

Archeology Visualization, Columbia 2003

- Record dig site surroundings as QTVR panorama
- Record detailed 3D model of
  - The actual dig site
  - The objects found
- Later: review what was found where
- Virtual visit of the dig site possible
PingPongPlus
(Ishii et al. SIGGRAPH 98)

- Physical PingPong
- Virtually augmented
- Additional game functionality

PingPongPlus variations
SHEEP: TUM AR Group, 2002

- Pointless shepherding game
- Demonstrates possibilities of highly distributed AR applications:
  - Multimodal input
  - Multiuser interaction
  - Multiple output devices
    - Projection table
    - See-through laptop
    - HMD
  - Interaction with PDA devices

Invisible Train: Schmalstieg, 2004

- 2 players with handhelds with cameras
- Empty wooden toy train tracks with markers
- Trains only visible on the handheld
- Players can set the shunting switches
- Goal: avoid collisions as long as possible
AR-Soccer, Uni Paderborn, 2004

AR in Museums: Oliver Bimber, 2003-now

- Augmenting physical exhibits by
  - Additional information
  - 3D animation
- Camera-based tracking with markers
- Video-see-through
  - Laptops
  - Mobile phones
NightVison, Daimler-Chrysler 2000

• Uses infrared laser light and infrared cameras
  – Invisible to others
  – Narrow spectrum, can be filtered
• Doesn’t blind other cars

AR in car navigation, Siemens VDO 2004
AR in car navigation, Siemens VDO 2004

position, orientation and route

virtual 3D model

Smart Road View

topography

camera live stream

AR in car navigation, Siemens VDO 2004
Head-up display in airplanes

- Manufactured by Thales Aviation
  - AMLCD (Active Matrix Liquid Crystal Display) glass
  - Can host innovative visualizations, such as
    - EVS (Enhanced Vision System)
    - SVS (Synthetic Vision System)
    - SGS (Surface Guidance System)
- Starting Dec. 2004, built into Airbus A318-380
- Not much technical info available yet…

Virtual Studios for TV production

- Track the [camera](#)
- Use a blue box to film live [actor/reporter](#)
- Create an animated [3D environment](#)
- Mix the two in real time
- [Interact](#) with virtual objects
Links to original projects

- [http://www.uni-weimar.de/~bimber/](http://www.uni-weimar.de/~bimber/)