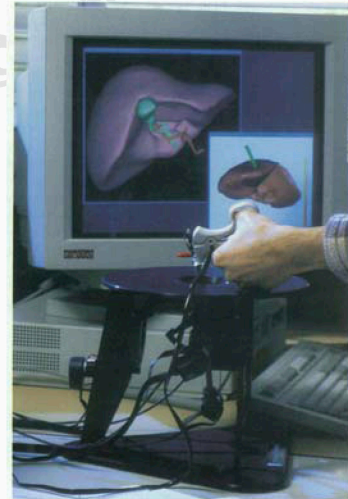


VI. VR APPLICATIONS

1. Health Sciences

- Virtual Surgery
 - Neurosurgery simulator
 - foreground
 - A user moves the handle of the Laparoscopic Impulse Engine.
 - background
 - The computed image shows the consequent deformation on the liver model.

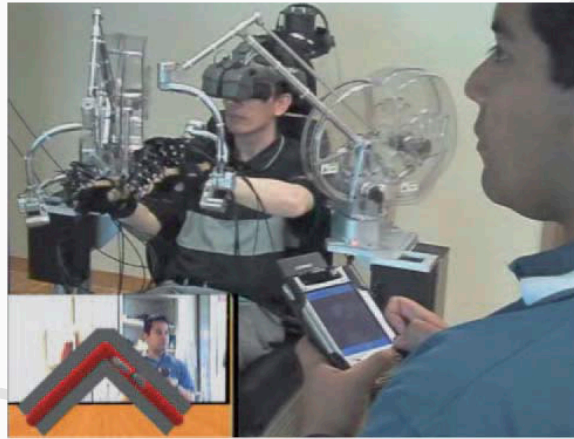


- Training in intraocular surgery



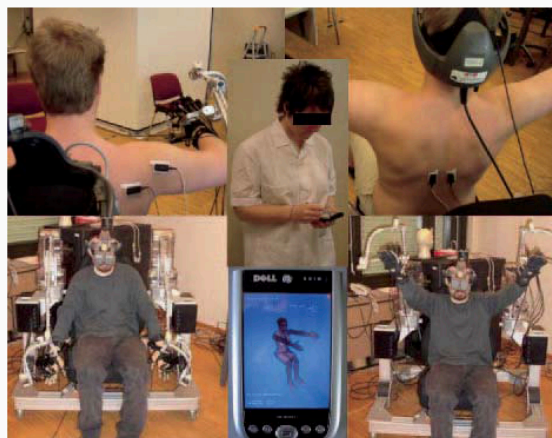
- left: surgical procedure performed under a stereo microscope.
- right: virtual simulation provides the sensory cues that eye surgeons are used to.

- Virtual Rehabilitation and Therapy
 - Physiotherapy
 - Post-stroke therapy



- Haptic interfaces provide resistive forces according to Virtual Reality-based exercises.

- Shoulder and elbow therapy



- 3D character shows the position in real time on a PDA.
- Therapy evaluation purposes and progress monitoring with data transmission.

- Psychological Therapy
 - Exposure-based therapy



- Anxiety-provoking stimuli are presented in a gradual order, attenuating patients' anxiety in a progressive way.

- Eye-tracking in exposure-based therapy



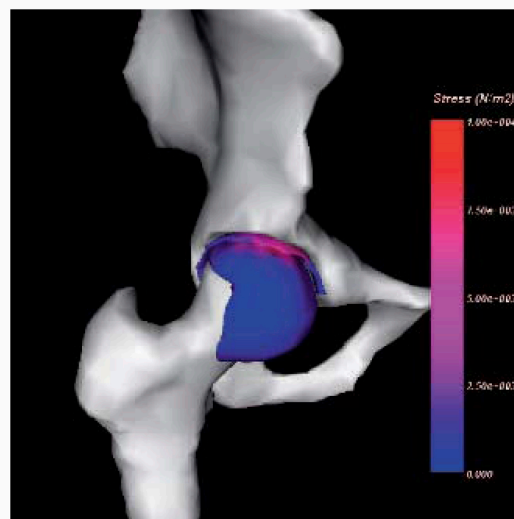
- The virtual audience was rendered in a more realistic way, using animated virtual characters and photo-realistic scenarios.
- Feedback gives estimation about patients progress.

- Virtual Anatomy
 - The visible human project (VHP)
 - Interactive 3D model



- Visually realistic results can be obtained at interactive frame rates with a three-layer model.

- Analysis of stress on the hip joint



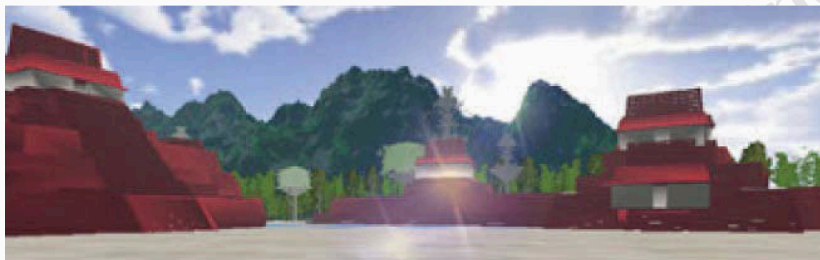
- The virtual model makes possible for the analysis of stress distribution on the heap joint in pre- and post-operative conditions.

- VHP collects data from human subjects to serve as a guidebook and baseline dataset in modern anatomy research and education.
- The virtual physiological human (VPH)
 - The VPH is a European initiative based on the international Physiome Project.
 - It is a methodological and technological framework that will enable investigation of the human body as a single complex system.

2. Culture Heritage

- In cultural heritage applications, Virtual Reality techniques are used to visually re-create historical elements that have today disappeared in archaeological sites.

- Virtual tours of buildings:
 - Virtual Campeche and Calakmul



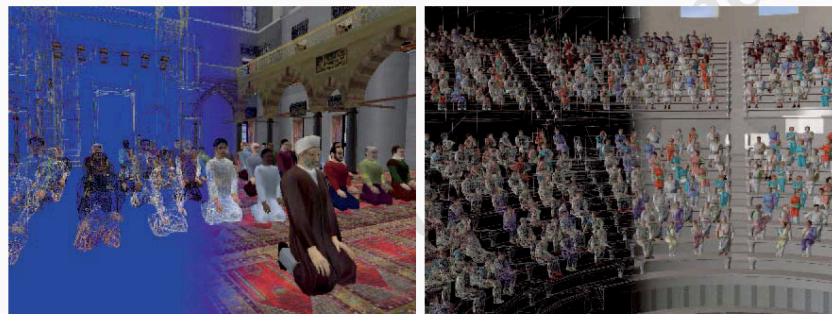
- Tourist in digital reproduction of Maya.

– Virtual Dunhuang



- The use of a CAVE system produces good immersion in a Dunhuang grotto.
- fully immersive virtual tour: “flashlight interaction paradigm”

- Meeting virtual inhabitants
 - CAHRISMA and ERATO



- A unification of graphic and sound models is used for interactive simulation to obtain authentic and realistic virtual environments.
- The realism of the experience is enhanced by their inhabitants (virtual crowds).

– ArcheoGuide



- Visitors not only see ruined monuments, but also admire and visit the temples in their former glory.
- Audio and visual information are presented to guide visitors.

– EU-IST LifePlus



- A tracking system determines visitors' location within the site, and audio-visual information is presented to them in context with their exploration, superimposed on their current view of the site.
- It renders lively, real-time animations and simulations of ancient virtual life.

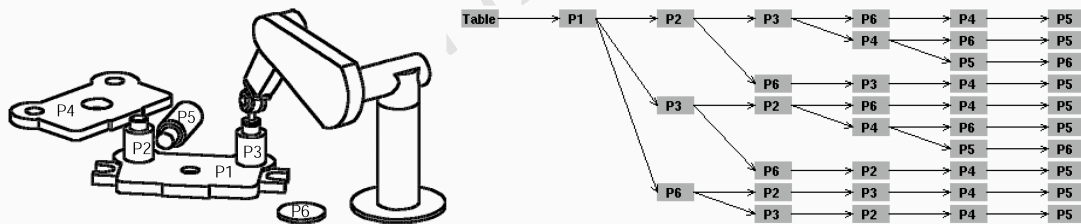
3. Other Applications

- Vehicle Simulators
 - Primary applications
 - driver training



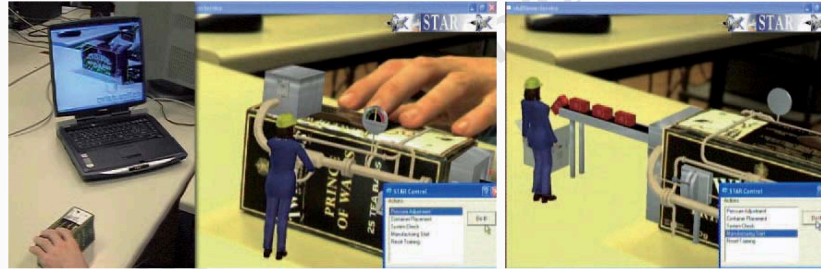
- A physical mockup has force-feedback.
- A fully virtual control metaphor allows interaction through motion trackers and data gloves.

- Manufacturing
 - Planning in manufacturing
 - The basic principles of virtual planning are the structural and geometric construction of the product and all restrictions that arise from the limited assembly space and the restricted accessibility.
 - Virtual robot programming and assembly planning



- robot programming with data gloves
- automatic generation of assembly sequences

- Augmented reality for operator training
 - Augmented reality and multimodal interfaces can be used for assisting human operators during assembly tasks.



- A Webcam is used to acquire the images of the user's hands and pieces of the 3D puzzle.
- The application visualizes the part that belongs to that work phase and shows the required action

- Entertainment
 - Game industry
 - Simulator or advanced video game



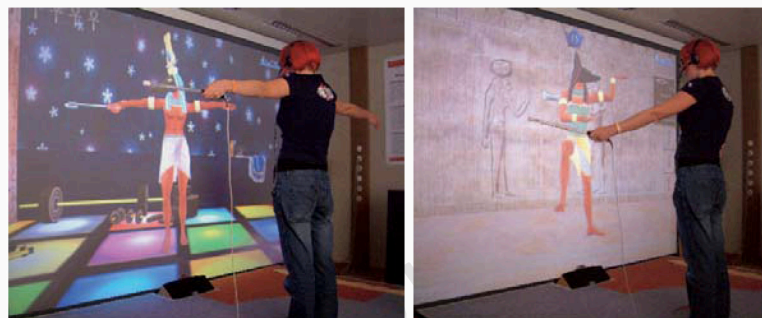
- Advanced computer graphics are complemented with highly realistic interfaces to produce a compelling experience.

– Nintendo Wii



- The Wii remote game controller, equipped devices such as accelerometers and an infrared sensor, makes possible the creation of appealing games.
 - Movie industry

– VR Studio by Walt Disney



- Immersive multiuser (CAVE-like) displays are very effective not only as game interfaces but also as design tools.
- The use of physical interfaces helps to immerse users in a VR experience.