446.326A CAD/CAM

Virtual Reality/Augmented Reality

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Outline

Introduction to VR/AR

Interface of VR/AR

Applications

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What is VR/AR

- Virtual Reality (VR)
  - "The user becomes fully **immersed** into an **artificial**, **three dimensional environment** that is completely generated by a **computer graphics**."
  - **Immersive** virtual reality

(a) 3D driving simulation   **(b) Hardware: HMD & Data glove**
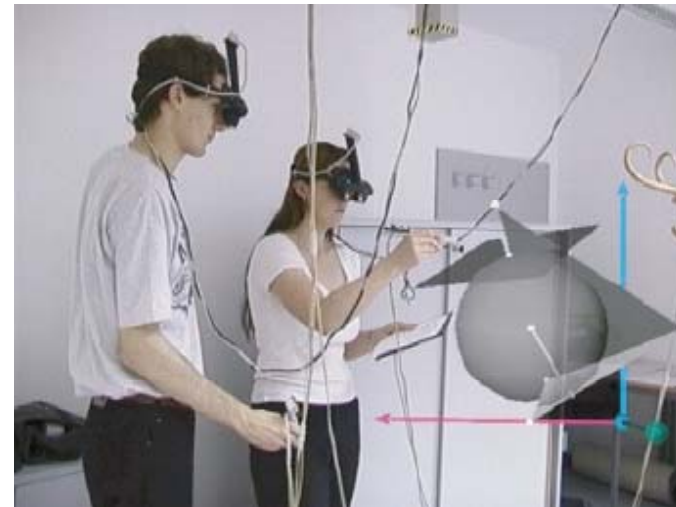
< Example of virtual reality >

What is VR/AR (cont.)

- Augmented Reality (AR)
  - The **virtual objects** display information that the user cannot directly with his own senses.
  - The information conveyed by the virtual objects helps a user perform **real-world task**.

< Example of augmented reality >

What is VR/AR (cont.)

- Range of VR/AR technologies

Mixed Reality (MR)

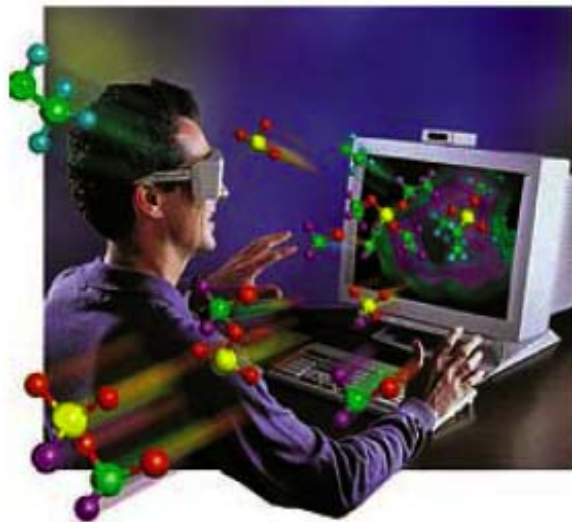| Physical Reality	Augmented Reality (AR)	Augmented Virtuality (AV)	Virtual Reality

< Diagram from reality to virtuality >

Interface of VR/AR

- Head Mounted Display (HMD)
  - Viewing tool for 3D virtual models
  - First wearable device
  - Often uncomfortable intrusiveness
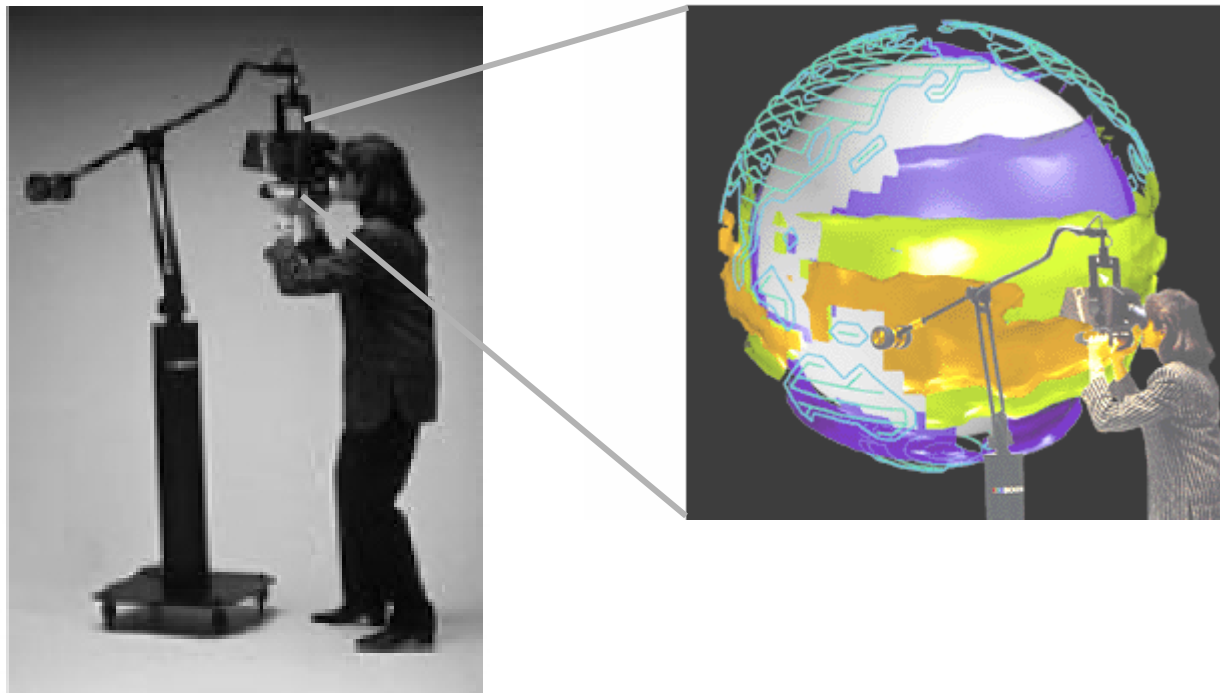

(a) Glasses type

(b) Goggle type

(c) Helmet type

< Various type of HMD >

Interface of VR/AR (cont.)

- Binocular Omni-Orientation Monitor (BOOM)
    - Head-coupled stereoscopic display device
    - Display device attached on multi-link system for tracking a head movement.
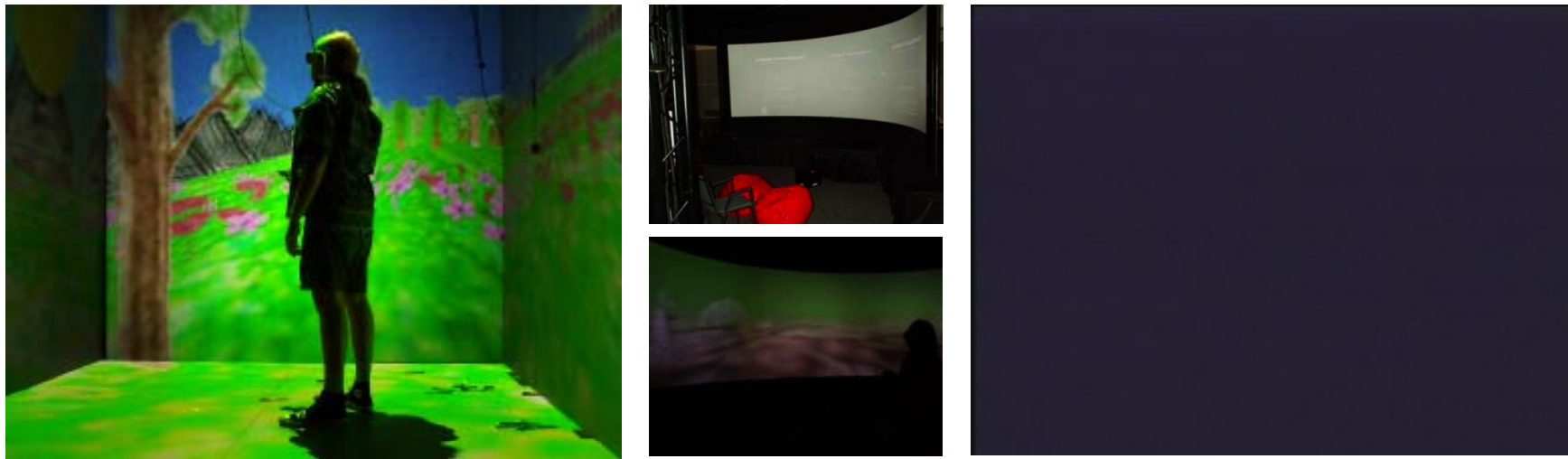

< Example of BOOM>

Interface of VR/AR (cont.)

- Cave Automatic Virtual Environment (CAVE)
  - Provides the illusion of immersion by projecting stereo images on the walls and floor of a room-sized cube
  - Several persons wearing lightweight stereo glasses can enter and walk freely inside the CAVE

< Example of CAVE >

Input device of VR/AR (cont.)

- Input devices
  - Allow interact with a virtual world

(a) Data glove

(b) Glasses type

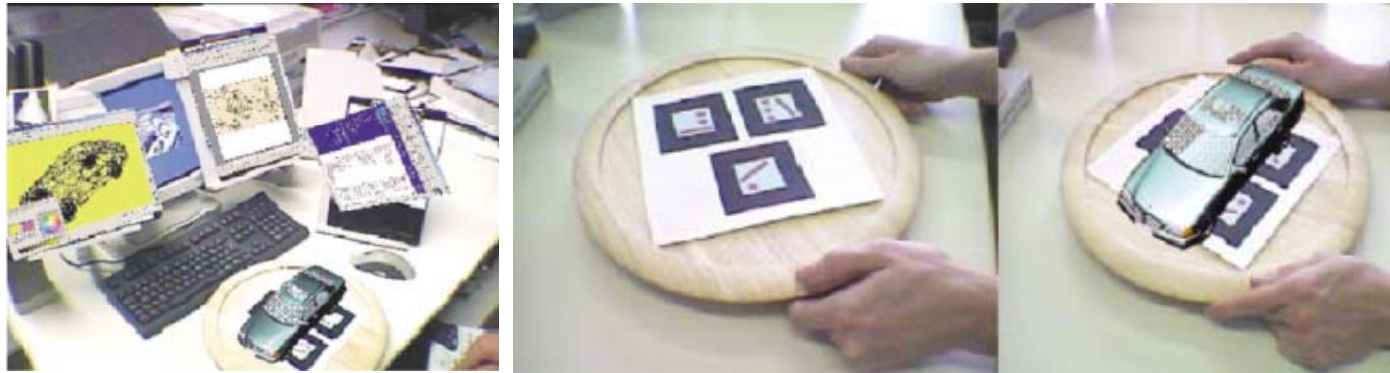**(c) Projection Desk**

(d) Controller

(e) Space mouse

Application

- AR Desktop Environment

(a) AR desktop environment

(b) Remote AR Conferencing

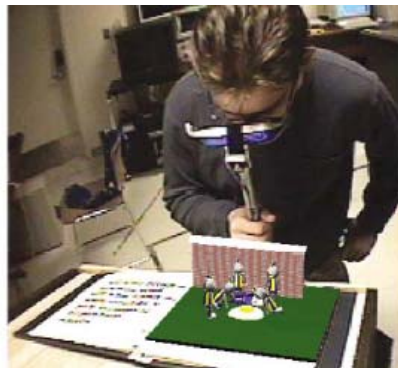**(c) Augmented Surfaces system**

Application (cont.)

- Education

(a) Geometry education

(b) AR museum

(c) Magic book (real, augmented & virtual reality)

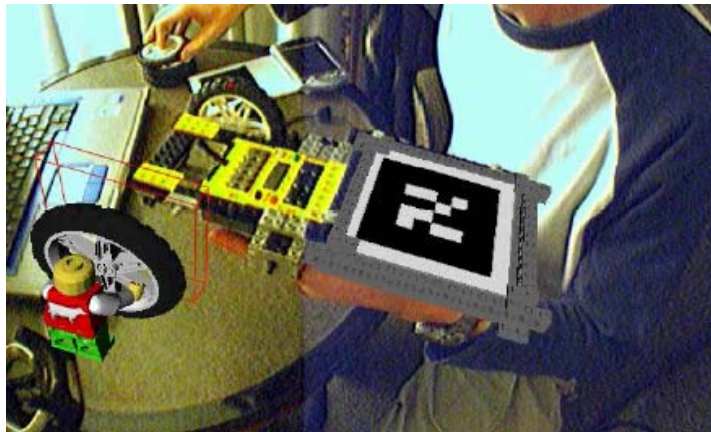(d) Military Training Simulation

Application (cont.)

- Entertainment

(a) ARQuake

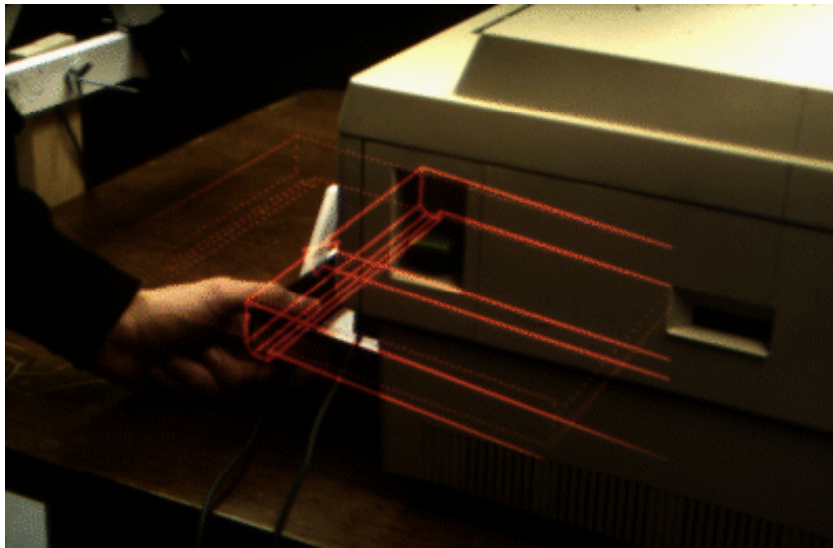(b) RV-Border Guards game,

(c) AR Lego

(d) Human Pacman

Application (cont.)

- Other fields

(a) Printer maintenance

(a) Surgery

Application (cont.)

You know the feeling. You try on a shirt at the store and think you look pretty fly, but you need a second opinion. With Social Retailing, developed by IconNicholson and shown at Bloomingdale's in March, you can send a video to your friends' cell phones and instantly get their vote. You can also try on outfits virtually using a mirror that shows how fab they might look - or not.
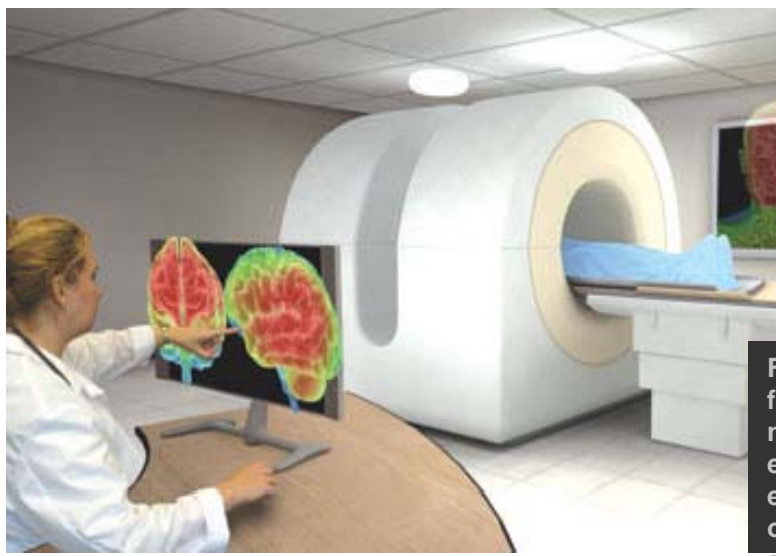Available 2008
iconnicholson.com

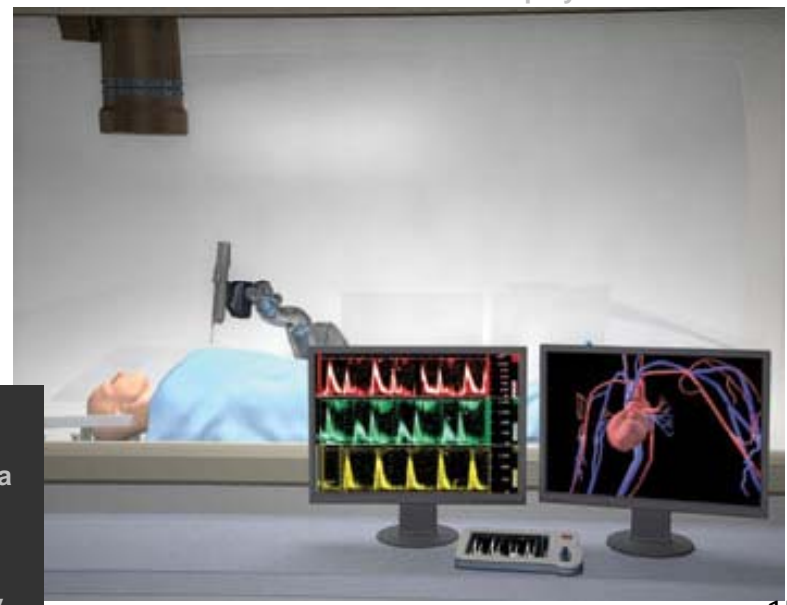http://www.time.com/time/specials/2007/article/0,28804,1677329_1678102_1678096,00.html

Application (cont.)

Future healthcare facility concept with nuclear imaging equipment (positron emission tomography, or PET) and advanced displays.

Future concept of a robotic-assisted, minimally invasive surgical facility consisting of a physician workstation (a portable console), and a bedside unit (based on the CorPath system developed by Corindus, Inc.).

Application (cont.)

Data acquisition techniques give researchers insights into fields outside the realm of machines.

Getting the moves down: Actor Andy Serkis (left) donned a motion capture suit to computerize his physical movements, which formed the basis of his character, Gollum (below), in the film The Lord of the Rings: The Two Towers. Pattern recognition research may simplify that process.
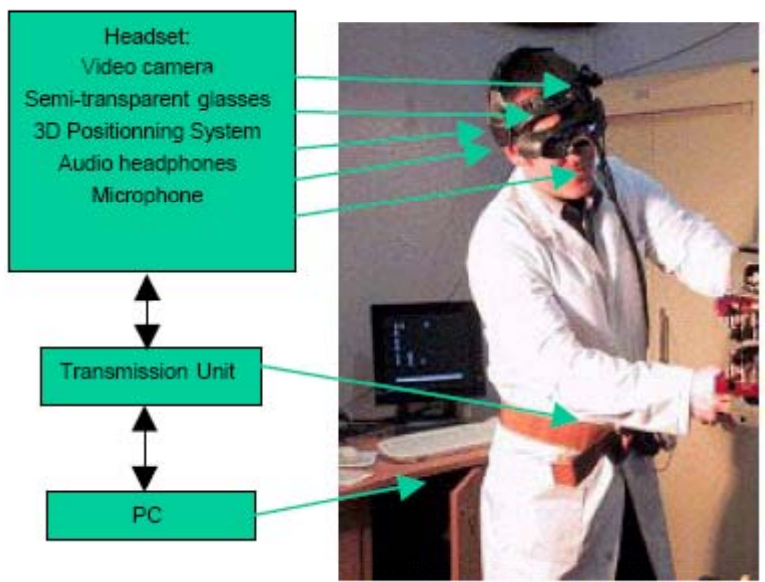
Application (cont.)

- AR for Training and Assistance to Maintenance in the Industries

< User equipment >

< 3D augmented workspace >

< View on tracked person and object from a normal camera and the infrared camera>
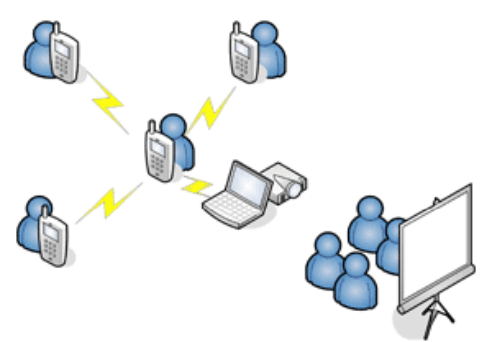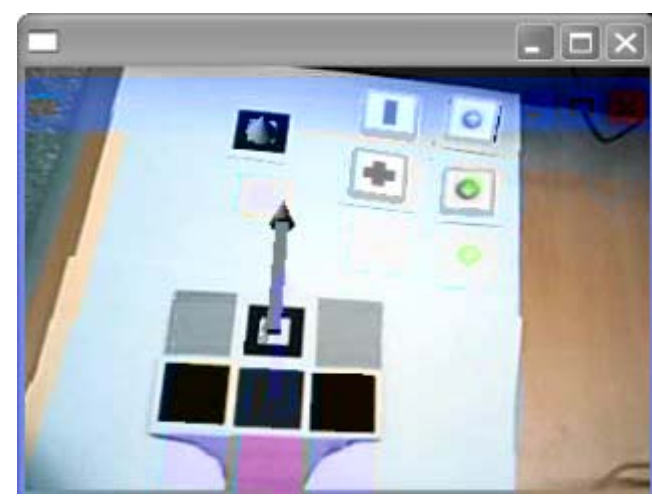
Application (cont.)

- AR using mobile phone

< Example of AR on mobile phone >

< network system >

< total view using mobile phone >
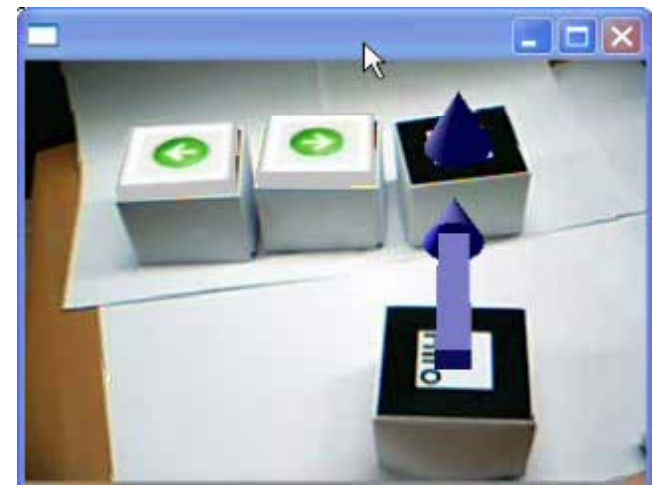
Application (cont.)

- AR Application (Demo)
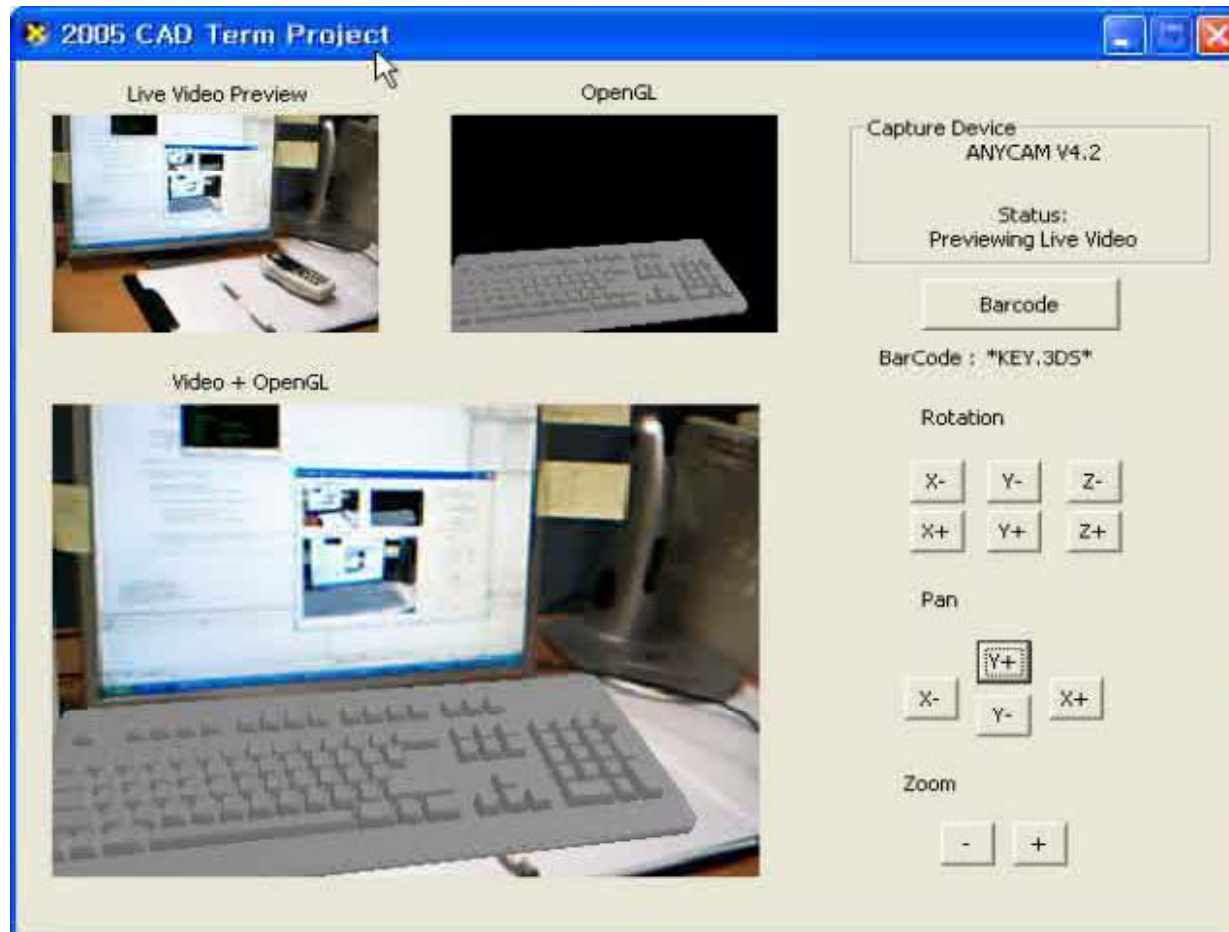

< Icons with different marks >

< Demo of sample icons >

Application (cont.)

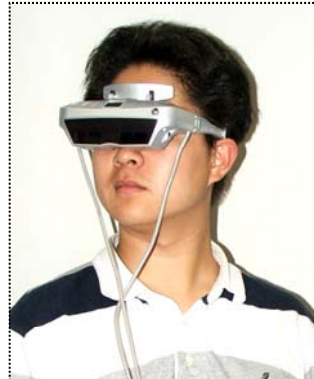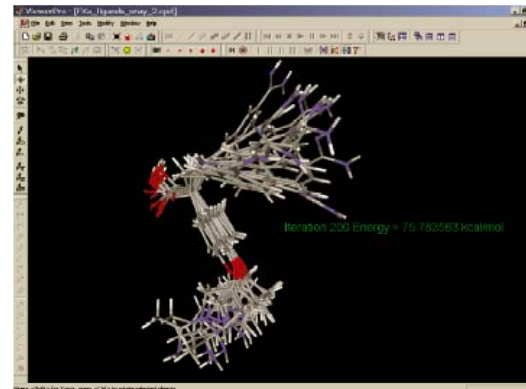- Product viewer in AR using Bar Code System based on PC Cam

Application

- Head-Mounted Display

< Hardware: HMD >

< Demo of sample image >

Application

- Wearable Gestural Interface

<M.I.T. Media Lab.>

Thank you for your attention !