CS591: HUMAN COMPUTER INTERACTION

LITERATURE SURVEY
VIRTUAL REALITY – A HUMAN COMPUTER INTERFACE

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VIRTUAL REALITY – WHAT IS VR?

PERCEPTION

TYPES OF VR

TECHNOLOGIES IN VR

ARCHITECTURE OF VR SYSTEMS

ONGOING TRENDS

FUTURE SCOPES

SUMMARY
VIRTUAL REALITY

"REALITY IS 80 MILLION POLYGONS PER SECOND" - COMPUTER PROGRAMMER, ALVY RAY SMITH
VIRTUAL REALITY

THE COMPUTER-GENERATED SIMULATION OF A THREE-DIMENSIONAL IMAGE OR ENVIRONMENT THAT CAN BE INTERACTED WITH IN A SEEMINGLY REAL OR PHYSICAL WAY BY A PERSON USING SPECIAL ELECTRONIC EQUIPMENT, SUCH AS A HELMET WITH A SCREEN INSIDE OR GLOVES FITTED WITH SENSORS
DO WE ACTUALLY SEE WHAT IS REAL?

PERCEPTION : THE ABILITY TO SEE, HEAR, OR BECOME AWARE OF SOMETHING THROUGH THE SENSES – “THE NORMAL LIMITS TO HUMAN PERCEPTION”

ACCORDING TO BRENDA LAUREL, "REALITY HAS ALWAYS BEEN TOO SMALL FOR THE HUMAN IMAGINATION. WE'RE ALWAYS TRYING TO TRANSCEND"

(QUOTED IN MCCARTHY, 1993)
TYPES OF VR SYSTEM

- **Windows on World (WoW)**
  - Also called Desktop VR.

- **Immersive VR**
  - The user has no visual contact with the physical world.
  - Often equipped with a Head Mounted Display (HMD).

- **Mixed Reality (Augmented Reality)**
  - The seamless merging of real space and virtual space.
  - Integrate the computer-generated virtual objects into the physical world which become in a sense an equal part of our natural environment.
**TYPES OF VR SYSTEM**

- **Tele-presence**
  - A variation of visualizing complete computer generated worlds.
  - Links remote sensors in the real world with the senses of a human operator. The remote sensors might be located on a robot. Useful for performing operations in dangerous environments.
TYPES OF VR SYSTEM

- Distributed VR
THE TECHNOLOGY OF VR

“If an interface is defined as where two different worlds meet, it would appear that the more dissimilar the two worlds the greater the need for a well-designed interface.”
TECHNOLOGIES OF VR

- Head-Mounted Display (HMD)
  - A Helmet or a face mask providing the visual and auditory displays.
  - Use LCD or CRT to display stereo images.
  - May include built-in head-tracker and stereo headphones
TECHNOLOGIES OF VR

- **Binocular Omni-Orientation Monitor (BOOM)**
  - Head-coupled stereoscopic display device.
  - Uses CRT to provide high-resolution display.
  - Convenient to use.
  - Fast and accurate built-in tracking.
**TECHNOLOGIES OF VR**

- **Cave Automatic Virtual Environment (CAVE)**
  - Provides the illusion of immersion by projecting stereo images on the walls and floor of a room-sized cube.
  - A head tracking system continuously adjust the stereo projection to the current position of the leading viewer.
TECHNOLOGIES OF VR

- **Data Glove**
  - Outfitted with sensors on the fingers as well as an overall position/orientation tracking equipment.
  - Enables natural interaction with virtual objects by hand gesture recognition.
TECHNOLOGIES OF VR

• Control Devices
  • Replication on mouse of 2D-VR
  • Control virtual objects in 3 dimensions.
ARCHITECTURE OF VR SYSTEM

- Input Processor,
- Simulation Processor,
- Rendering Processor and
- World Database.
ARCHITECTURE OF VR SYSTEM

▪ Input Processor
  • Control the devices used to input information to the computer. The object is to get the coordinate data to the rest of the system with minimal lag time.
  • Keyboard, mouse, 3D position trackers, a voice recognition system, etc.

▪ Simulation Processor
  • Core of a VR system.
  • Takes the user inputs along with any tasks programmed into the world and determine the actions that will take place in the virtual world.

▪ Rendering Processor
  • Create the sensations that are output to the user.
  • Separate rendering processes are used for visual, auditory, haptic and other sensory systems. Each renderer take a description of the world stat from the simulation process or derive it directly from the World Database for each time step.

▪ World Database (World Description Files)
  • Store the objects that inhabit the world, scripts that describe actions of those objects.
ONGOING TRENDS

MILITARY APPLICATIONS:
  FLIGHT TRAINING
  MISSILE LAUNCHES
  WAR SIMULATION

COMMERCIAL APPLICATIONS:
  ARCHITECTURE
  MEDICAL PURPOSES
  HEALTH CLUBS
  VIRTUAL SETS

SOCIAL USES
  TEXT BASED VIRTUAL REALITY
  EDUCATION
  VIRTUAL SEX
EXPOSURE THERAPY FOR ACROPHOBIA
FUTURE OF VR

• **Education**: Distributed VR.

• **Training**: In military training, parachuting, enemy combat, weapons training and hand-to-hand combat can be simulated through virtual training.

• **Sports**: Studies on athletes have shown that imagining moves on the field are 80-85% of actual physical training which indeed is a good sign when it comes in terms of virtual reality.

• **Inter-personal communication**: Experts have long said that 80 to 90-percent of all communication is non-verbal. Future virtual reality is expected help bridge this gap in that if we were to meet someone in a virtual space.
THE TEAM THINKS

Being in an academic institute and surrounded by the competitive world where students are struggling to get into companies, there is a great need to create a virtual environment where students can prepare for interviews by consulting experienced interviewers virtually. Such simulated environment not only prepares the students but also helps the company to conduct interviews and thereby prevent them from travelling to different colleges for campus recruitments. Overall, this is a good way of improving inter-personal communication and thereby reducing misunderstandings while communicating.
CURRENT PROBLEMS & FUTURE WORK

- Simulator sickness
- Low-fidelity
- Expensive
- Lack of integration between application packages

- High-fidelity system
- Cost-saving
- Collaborative
- High-level contact between participants in distributed VR
IMMERSIVE VIRTUAL REALITY TECHNOLOGY
SUMMARY

- Visualization of complicated, large data is helpful for understanding and analysis.

- VR offers us a new way to interact with computer.

- VR enables us to experience the virtual world that is impossible in real world.

- VR is changing our life, eventually VR will increasingly become a part of our life.