



A Next Generation Internet (NGI) Testbed

The ImmersaDesk:

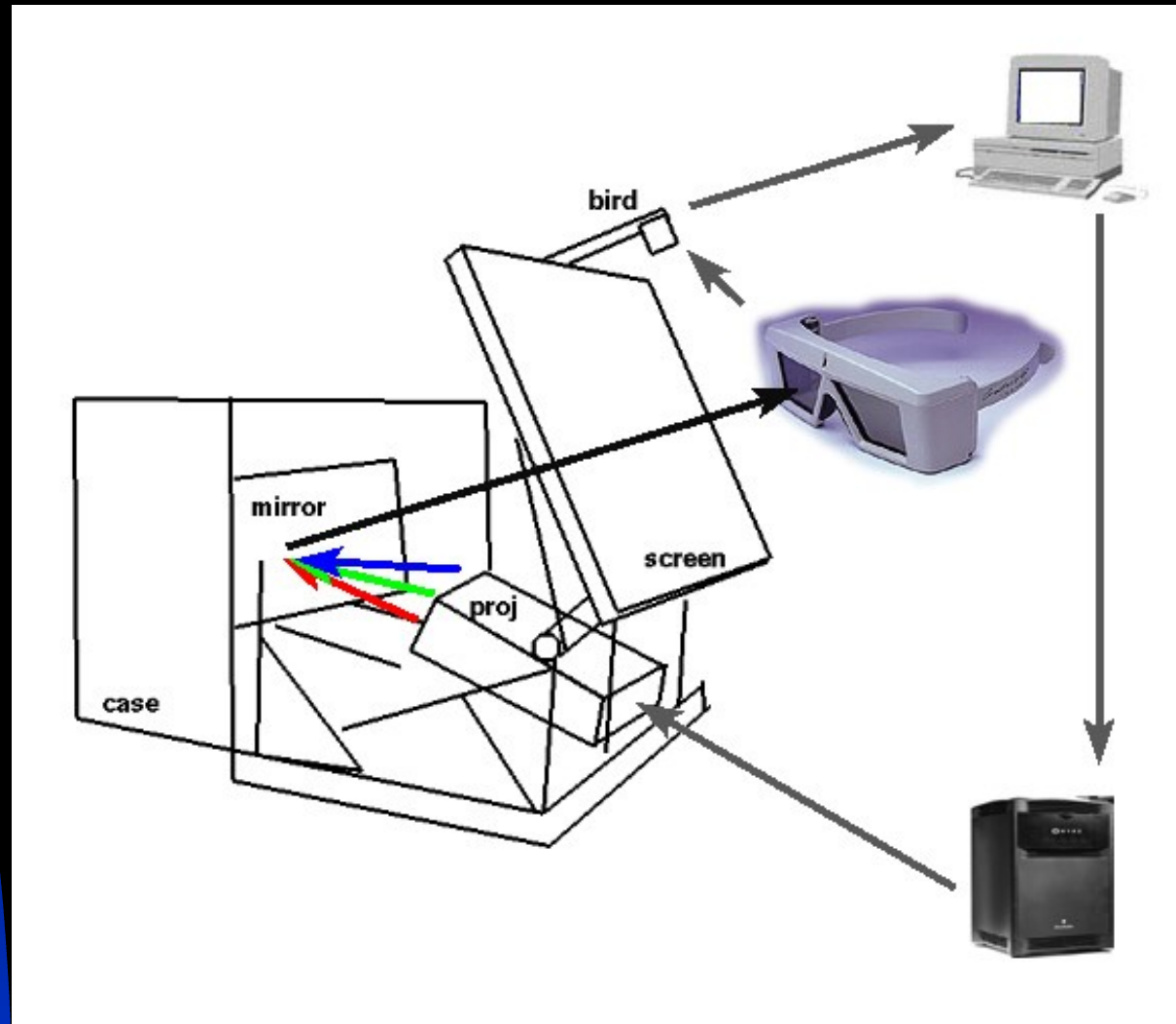
- 4' x 5' rear projecting screen
 - near immersive
- 1024 x 768 x 96 Hz
- driven by SGI Onyx2
 - Two R12000 Processors
 - 250 MHz
 - Infinite Reality Graphics



How does it work?



- PC-driven sensor gets position
- PC sends position to SGI (Silicon Graphics Incorporated high technology computer designed for.)
- SGI renders stereo image relative to position



CYBER TOUCH GLOVES



The Glove has six small vibro-tactile stimulators on the fingers and the palm.

Each stimulator can be individually programmed to vary the strength of touch sensation.

CYBERGRASP GLOVES

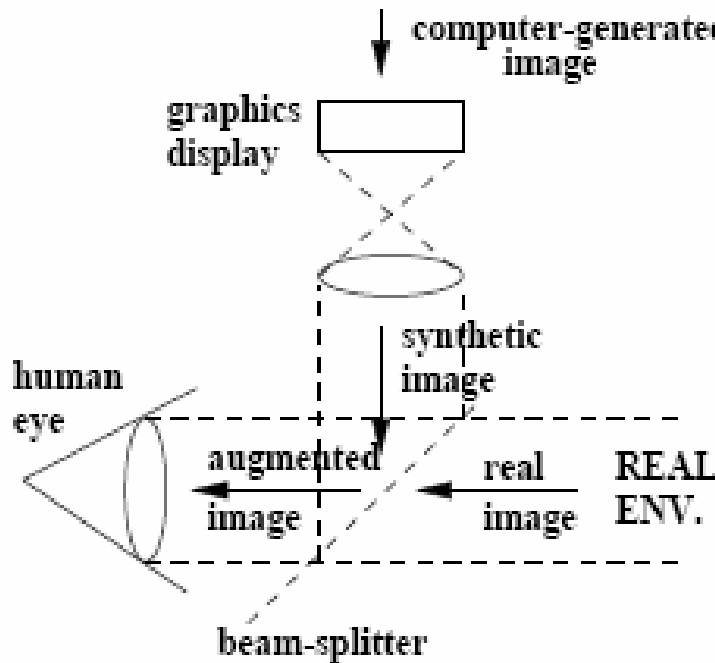


It has Haptic Feedback

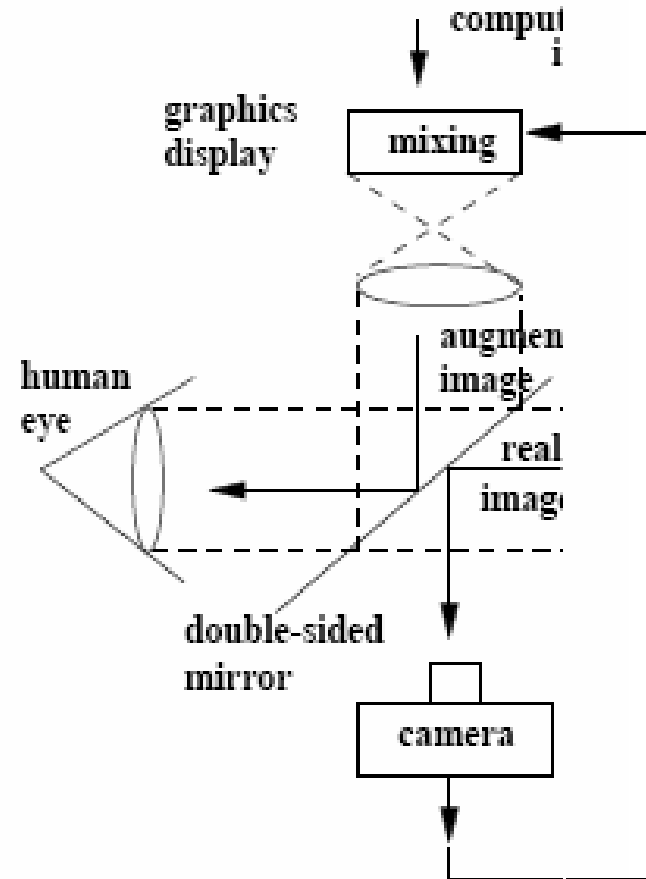


*CyberGrasp
"Hand-Referenced
Haptic Feedback"*

Two types of HMD for Augmented Reality:



SEE-THROUGH HMD



OPAGUE HMD



Architecture of VR

Technologies Enabling VR

- Virtual reality is a combination of several technologies that enable the realization of VR systems:
 - ◆ 1. advanced (fast) computers
 - ◆ 2. advance computer communication networks
 - ◆ 3. human-computer interfaces



Computers for VR

- the requirements of the computer :
 - ◆ **high processing power** for real-time rendering of virtual environments to generate visual stimulus
 - ◆ **powerful graphical subsystem** for real-time stereo display of rendered virtual environment
- Popular platforms include Silicon Graphics (SGI), SUN, ...

Distributed VR Systems



- Distributed VR system consists of **several networked computers and one virtual environment**
- **Each computer tracks actions of one user** and creates an illusion of user's presence in the shared virtual environment
- **All users are present in the same virtual world** although they may be physically at distant locations
- In this manner it is possible to perform multi-user simulations with interactions between users



- Modeling of material properties
- Human-machine interfaces
- Haptic interfaces
- Visualization techniques



Modeling of Material Properties

- Force propagation models
- Deformable models for tissue modeling
- Real-time deformations for simulations
- Volumetric elastic models



Human-Computer Interfaces

- Haptic interfaces are particularly difficult to realize
- Force feedback
- Tactile, smell, and taste sensors
- Physiological and psychological effects of simulators (cyberpathology)



Haptic Interfaces

- Haptic interfaces are devices that allow human-machine interaction through force and touch
- Areas of application include:
 - ◆ telemanipulation (for work in hazardous or challenging settings such as space and microsurgery)
 - ◆ virtual environments (for human operator training, design prototyping, and data visualization)