History

Ruth Aylett

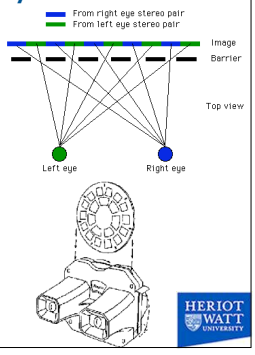
See http://accad.osu.edu/~waynec/history/lesson17.htm

The idea of the virtual

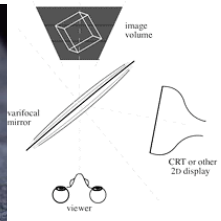
- Plato and the Parable of the Cave
- Creating the world in our head
  - It really happens in there not out here
- Dreams as virtual worlds
- Early literary example:
  - Telepresence in H.G.Wells *The remarkable case of Davidson's Eyes*

3D displays

- 1613 Francois d'Aguillion coins term stéréoscopique
- 1838 Wheatstone stereoscope
- 1849 Brewster stereoscope
  - Owned by > 1 million homes by mid 1850s
- 1903 Parallax barrier
- 1948 Holography



3D displays



Sensorama (1962)

- Morton Heilig - cinematographer
  - Projected film, audio, vibration, odours
- Pre-recorded
  - Motorcycle ride through New York, Bicycle ride, Dune Buggy, helicopter, belly dancer
- Also ideas for HMD and 'full-experience theatre'

Ivan Sutherland - 1965

- The Ultimate Display
  - "The Ultimate Display," Sutherland, I.E., Proceedings of IFIPS Congress 1965, New York, May 1965, Vol. 2, pp. 506-508.
- Data visualisation

  "A display connected to a digital computer…is a looking glass into a mathematical wonderland."
- Body tracking

  "The computer can easily sense the positions of almost any of our body muscles."

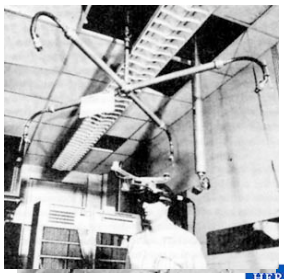
Ultimate display

- Virtual reality

  "The ultimate display would, of course, be a room within which the computer can control the existence of matter. A chair displayed in such a room would be good enough to sit in. Handcuffs displayed in such a room would be confining, and a bullet displayed in such room would be fatal. With appropriate programming such a display could literally be the Wonderland into which Alice walked"
- And beyond..
  - "There is no reason why the objects displayed by a computer have to follow ordinary rules of physical reality with which we are familiar."

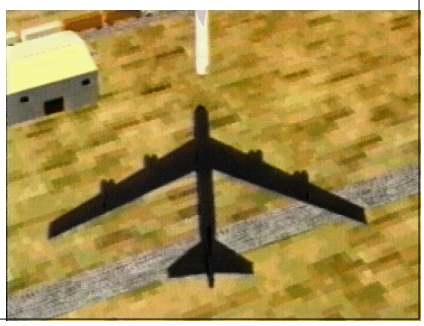
HMD-based VR

- Sutherland's HMD
  - Interested in medical visualisation of the heart



Evans and Sutherland - 1973

- Flight simulator at 20 frames/sec
- Work for US army
  - VR helmet - 70s/80s

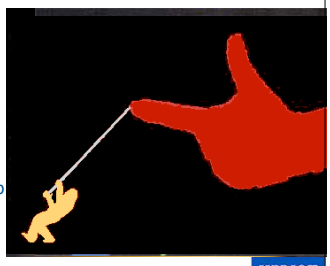


Nasa: VIVED - 1985

- Virtual Visual Environment Display
  - Polhemus tracker
  - LEEP-based HMD
  - 3D audio
  - Gesture recognition
    - w/VPL Data glove

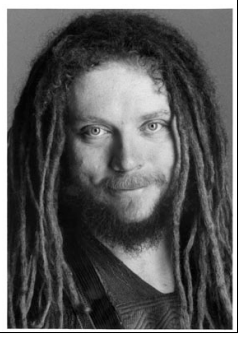
Kreuger's VideoPlace

- Art installation
  - User in front of backlit screen
  - Facing projection screen with camera on it
  - User's image digitised to produce silhouettes
  - Posture, rate of movement, relationship rt graphical objects analysed
  - Visual or auditory responses



VR takes off

- Term coined by Jaran Lanier
  - Set up Virtual Presence Ltd 1985 with Robert Zimmerman - 1st ever VR company
  - Created the DataGlove
- Sold to Thomson 1990



VR goes public

- 1987 article by Jim Foley that features the VPL Data Glove

USAF Supercockpit - 1986

- Research project
  - Wright Patterson Airforce Base
  - Visual, auditory, tactile
  - Head, eye, hand and speech input
  - Designed to deal with pilot information overload

British Aerospace

- Virtual Cockpit
- Virtual Environment Configurable Training Aids (VECTA)
  - Fully-immersive HMD
  - Inability to see hands disturbing!
- Real and Virtual Environment Configurable Training Aids (RAVECTA)
  - Video see-through HMD
  - Blue screening (chroma keying) of outdoor environment
  - See own hands!

First virtual sound 1988

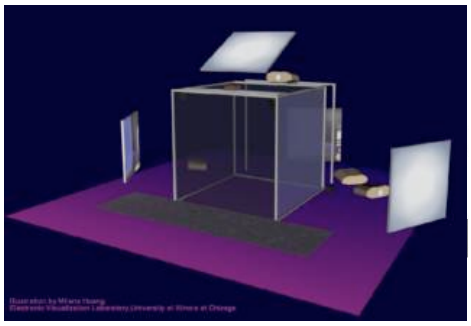
- Scott Fisher and E. Wenzel
- Created the first system capable of synthesizing four virtual 3-D sound sources
- The sound sources were localized even if the head moves

Fakespace Boom display - early 1990s

The CAVE system

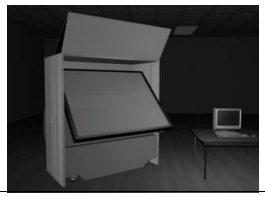
- Developed around 1992 at the University of Illinois' Electronic Visualization Laboratory (EVL) at Urbana Champaign, USA
  - First version based on a network of SGI Reality Engine machines to render images in real-time display
  - System composed of three projection walls and one floor
  - Uses two 3-D magnetic trackers, *Flock of Birds* by Ascension Technology, to locate head and hand

The CAVE



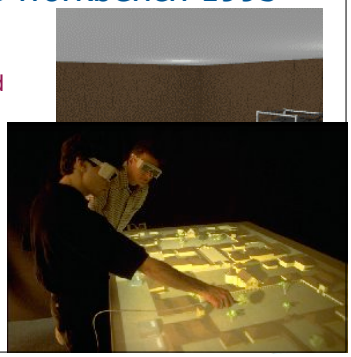
The ImmersaDesk

- Developed at EVL around 1995
  - Equivalent to a 3-D drafting table
  - Uses the same interface as the CAVE
    - Wand tracks the hand, plus a head tracker



Responsive workbench 1995

- Stereoscopic images projected onto a horizontal tabletop display surface
- Head tracking
- Data gloves
- Stylus/wand



Commercial VR systems

- Introduction of VRML 1.0 in 1996
- Introduction of Performer library by SGI around 1996
- Commercial version of the CAVE available in 1998 produced by Pyramid Systems
- Introduction of many high-speed graphic cards for PCs around 1998
- Introduction of VRML 2.0 in 1998
- Introduction of SGI Performer for PC Linux at the end of 1999.

Hype and fashion

- VR was hyped (as other technologies have been)
  - Media liked 'hippy' overtones
  - Alternative reality: trips-without-drugs
  - Popularised as indistinguisable from reality (aka The Matrix)
- This was never technically feasible
  - Not even visually
- Hence "virtual environments"

After the hype

- Less widely used for serious applications than hoped so far
  - Expensive (very!)
  - Depended on proprietary computers (SGI)
  - Required specialist tech support
  - HMDs were never accepted in industry
  - Many integration and reliability issues
  - Poorly supported by COTS (Commercial Off-The-Shelf technology)

3D on the web

- VRML had serious deficencies
  - Uncompressed text format
  - Complex browser plug-ins
- Ahead of user bandwidth
- Badly served by mainstream companies
  - Notably Microsoft
- Multiplicity of later proprietary formats

A second wave?

- 'Desk-top' VR
  - Using computer-games inspired technology
  - Cheap hardware
- Web-based multi-user 3D games and SecondLife
- PC cluster-based high-end displays
  - Use of games engines
    - Doom, Unreal Tournament. Half-Life etc
- Much cheaper
  - Still maturity issues