

Immersive Virtual Reality

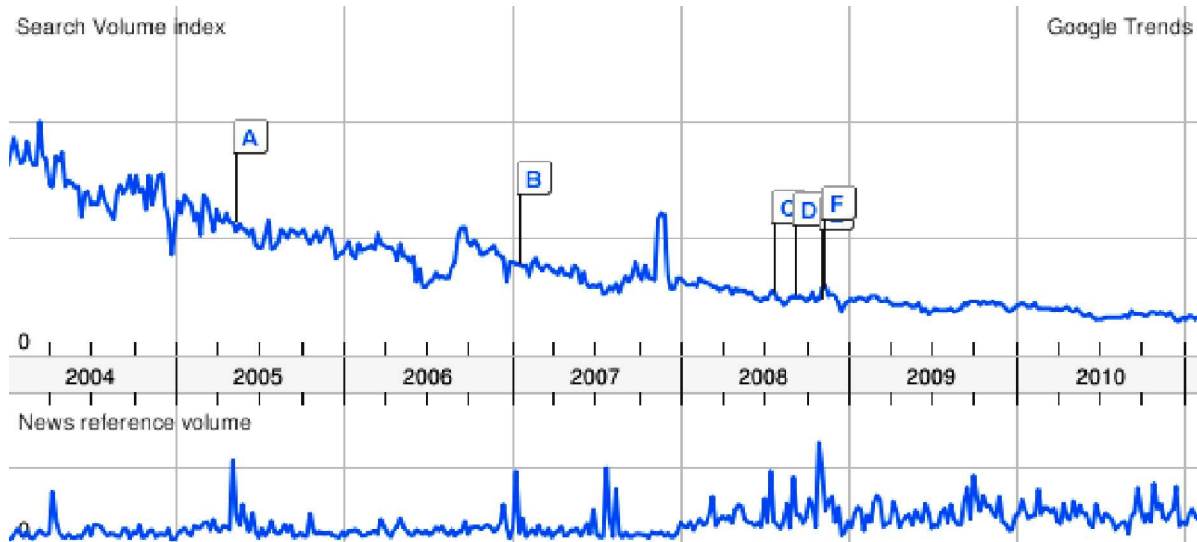
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Why me?

- I am currently the principal investigator for the augmented reality training system: an immersive VR close quarters battle training simulator.
- Approximately 18 years of experience in 3-D graphics and rendering, interactive VR and AR environments, computer vision, shared virtual experience, and tangible simulation.
- I look a lot better in virtual reality than I do here 😊

Frequency of terms search on Google for “virtual reality”



Scale is based on the average worldwide traffic of **virtual reality** in all years.

- A Study: Stroke survivors increase mobility with virtual reality games KASA - May 12 2005
- B Virtual Reality Embraced by Businesses Sydney Morning Herald - Jan 14 2007
- C Virtual reality: Unlimited wireless connectivity across city by next year Expressindia.com - Jul 25 2008
- D Virtual reality goes to war vs. stress disorder San Diego Union Tribune - Sep 9 2008
- E Researchers measuring just how real virtual reality is NetworkWorld.com - Nov 3 2008
- F Magellan Expands Knowledge on Virtual Reality Therapy for Treatment of Veterans with Posttraumatic Stress Disorder MarketWatch



What is immersive VR?

Immersive VR = iVR

- **iVR is the science and technology required for a user to feel present, via perceptive, cognitive and functional immersion and interaction, in a (computer) generated environment.**
- **Necessary components**
 - **Real-time rendering**
 - **Natural interaction**
 - **3-D tracking (depending on types of interaction)**



What is immersive VR?

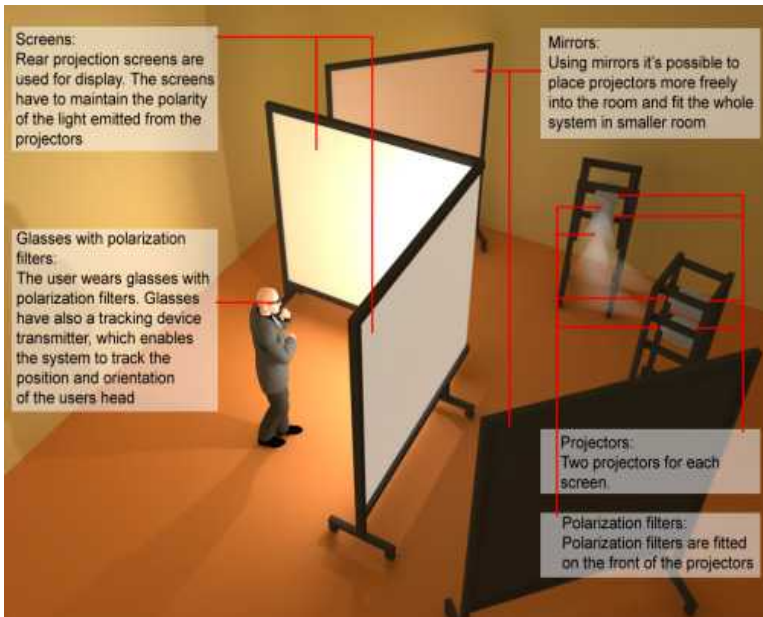
- Realtime 3D != VR
- Stereoscopy != VR
- 3D Tracking != VR
- Haptics != VR
- 3D Sound != VR
- 3D Interactions != VR

But everything combined is immersive VR

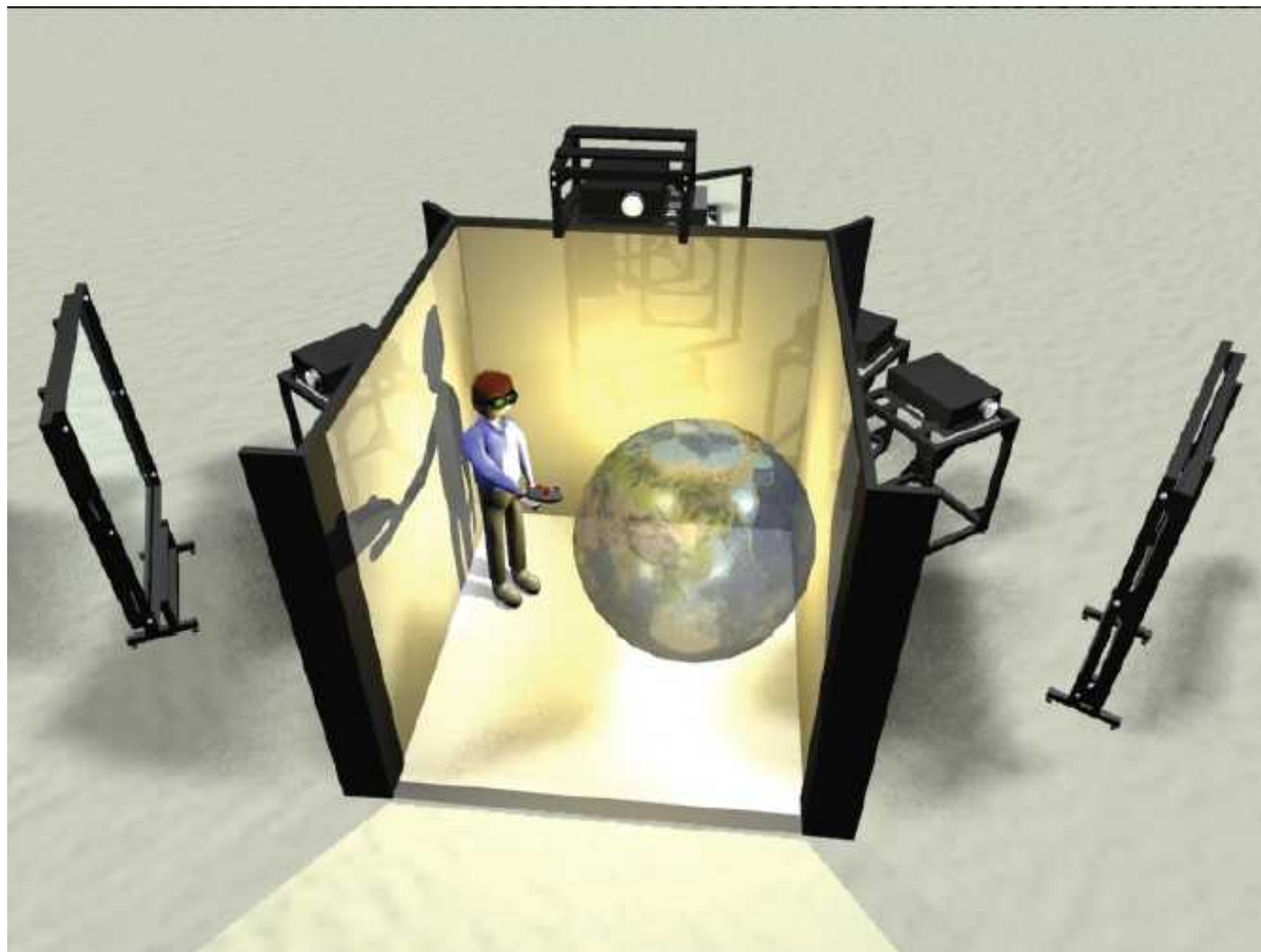
Virtual Reality Hardware



- Devices, incl.
 - Head Mounted Displays (HMD), data gloves, motion trackers, ...
- CAVE systems
 - VTT CAVE for 3D data visualisation
 - Utilises video projectors, networked PCs and low-cost VR technology
 - Provides stereoscopic walk-through functionality with gesture-based interaction



Immersive CAVE system



Augmented Reality

- **Augmented Reality (AR)**

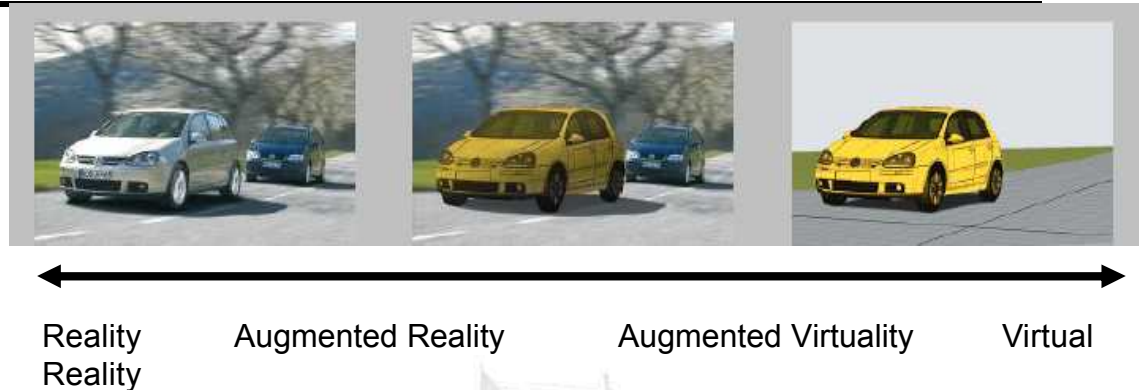
- Mixes virtual objects with user's view of real world
- Properties: real-time, interactive, 3D

- **Related technologies**

- Augmented Virtuality
- Mediated Reality
- Diminished Reality
- Mixed Reality

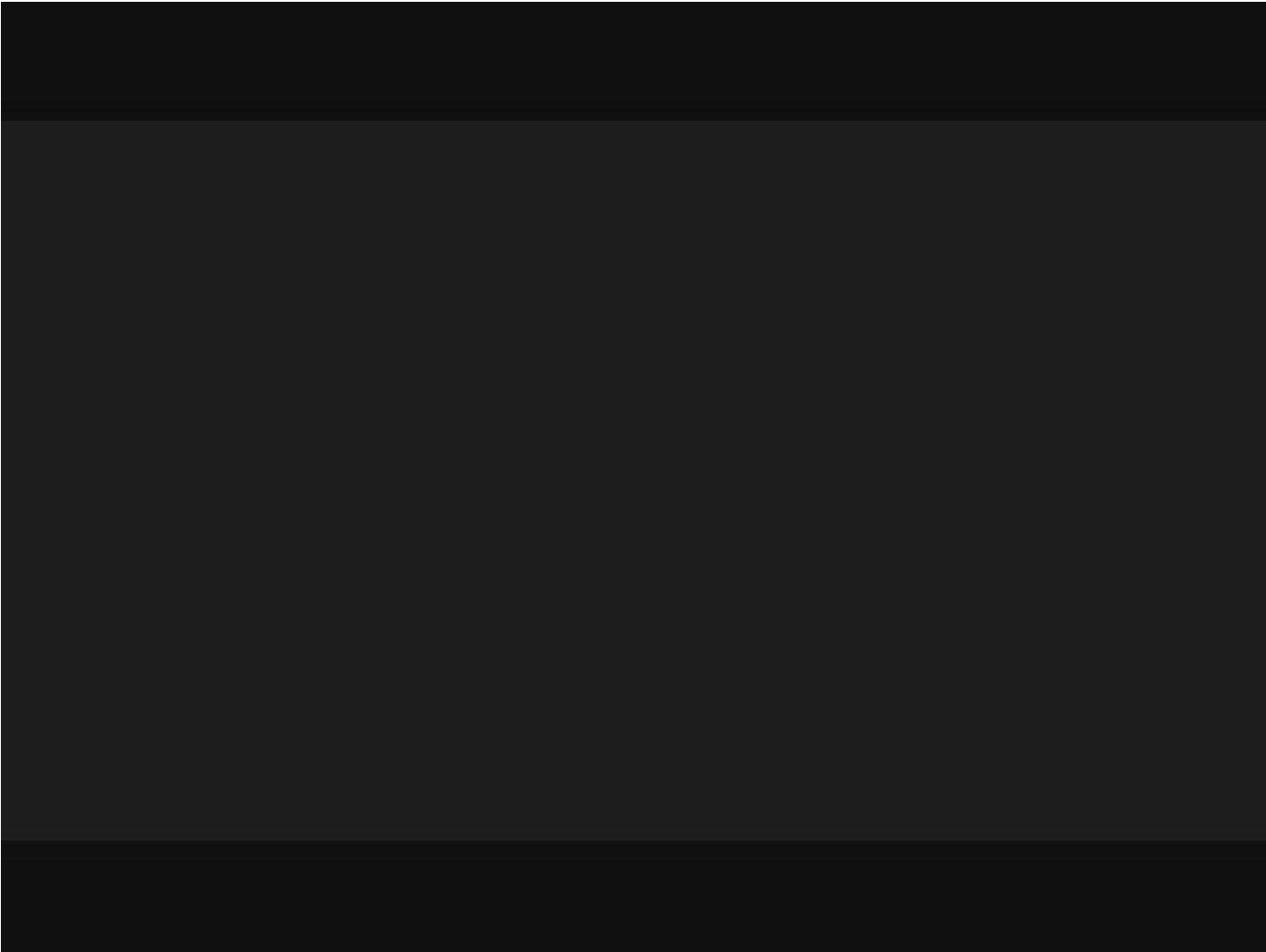
- **Display devices**

- PC screen + web camera ("Magic mirror")
- Data glasses (video or optical see through HMD)
- Hand held devices, camera phones ("Magic lense")





Sandia's AR-Training System Deployed to Large Scale System



Sandia's AR Training System

Level of Realism

Live Fire Shoot House

- Real Guns & Simunition
- Paper targets or real people using dye-marking cartridges
- Exercises shooting, tactical movement and decision making skills.



AR Training System

- 3D-Immersive Training
- 3D Avatar moving targets
- Exercises tactical movement and decision making skills



F.A.T.S. / PRISM

- 2D Projective Training Systems
 - 3D Avatar moving targets
- Exercises tactical movement and decision making skills





Videos

First Person View



Take Down



Other Large Scale Immersive Displays

VIEWS Corridor – the video

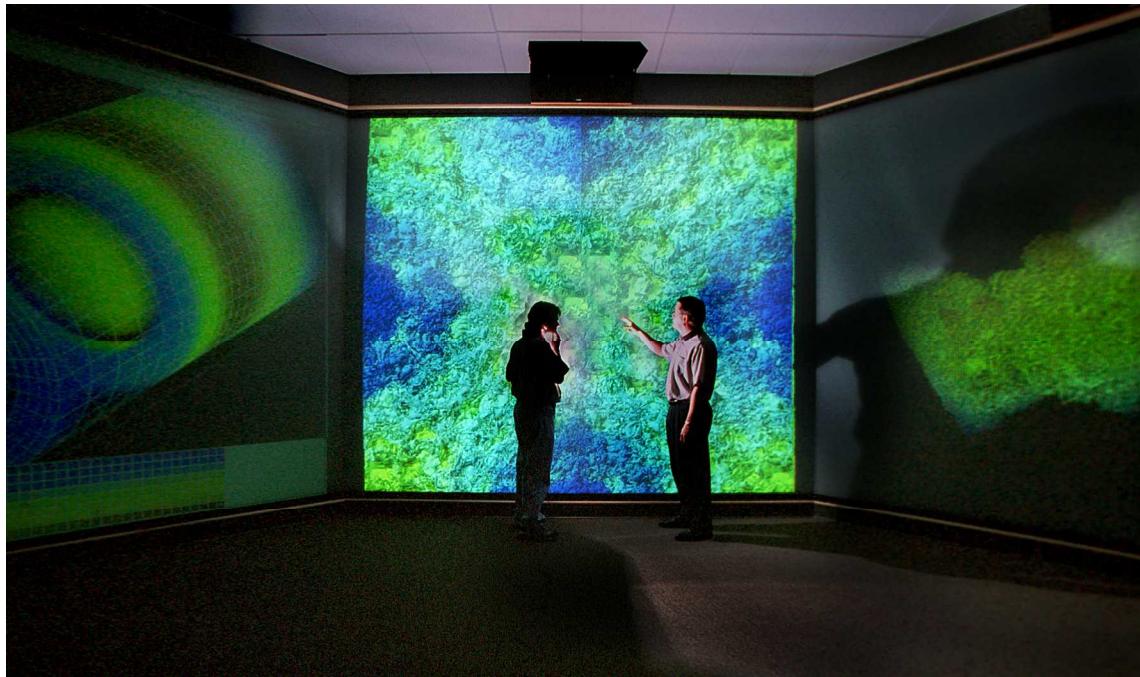


AR-Training System- Current Status

- **Deployed to 1 site**
 - **Used for about 3 years regularly when there was funding to support the extra training**
 - **Did not replace normal training**
- **Expensive**
- **VR/AR never as good as “the real thing”**
- **Probability of continued funding is minimal**

VIEWS Corridor – Current Status

- **Sandia VIEWS Corridor**
 - 48 HD Projectors
 - 60 MegaPixels
 - developed for data exploration by small groups of scientists
- **No longer in use**



Better uses of VR

Treatment of Post Traumatic Stress Disorder

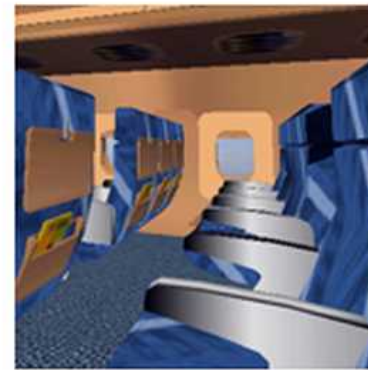
<http://www.virtuallybetter.com/>



Virtual Iraq is a set of virtual reality environments created to treat post-traumatic stress disorder (PTSD) in Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) combat service men and women as well as those who have served in Afghanistan. The development and clinical evaluation of Virtual Iraq was funded by the Office of Naval Research (ONR Award No: N000140510384), a project that lasted three years.

Better uses of VR

Treatment of Irrational Fear



VRE therapy for fear of flying

- decreased cost
- decreased travel time
- client is gradually exposed to a hierarchy of flying situations such as:
 - Sitting on an airplane with the engines off
 - Sitting on a plane with the engines on
 - Taxiing on the runway
 - Takeoff
 - Flying in good weather
 - Flying in bad weather • Landing



Stress Innoculation

- <http://www.pbs.org/wgbh/pages/frontline/digitalnation/waging-war/immersion-training/full-immersion.html?play>