The Evolution of Virtual Reality in the Department of Psychology at CUA

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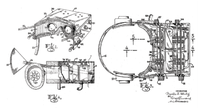
The History of Virtual Reality

1930's: The Link Trainer
A flight Simulator designed by Edwin Albert Link to aid in training for World War II pilots.

1940's: Sawyer's View-Master
A handheld device using two unique images, one for each eye to allow for stereoscopic, or 3D, vision.

1950's: The Sensorama
A sit-in immersive theater that utilized stereoscopic 3D vision, fans, aromas, and a shaking chair.



1960's: The Telesphere Mask
The first head-mounted VR setup. Allowed for 3D stereoscopic wide vision, but it did not allow for aspects of motion tracking.

1970's: The Super Cockpit
A project developed by a military engineer to be a training cockpit for military pilots. The project cost into the hundred millions and allowed for infrared and radar imagery and projections of generated 3D maps.

1980's: VPL Eyephone
First commercially marketed virtual reality set priced at $9,400. Ahead of its time system allowing for both head and hand tracking.

1990's: Nintendo Virtual Boy
Portable VR gaming device mass produced and reasonably priced at $179.99.

1990's: Virtuality Gaming Machines
Enclosed gaming station that include a headset and controllers priced at $78,000, with games ranging $5,000-$10,000. This system actually used a magnetic transmitter in the enclosure ring that interacts with receivers in the headset and gun to determine orientation within game.

Virtual Reality in CUA Psychology Department

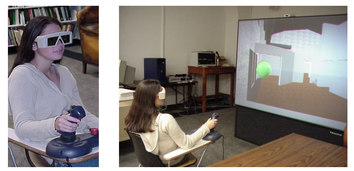
Cognition and Virtual Reality Lab
1990's-2000's

Transfer of Transparent VE Training

Intergraph TDZ 2000

- Dual 300 MHz Pentium III processor
- VX113 video card
- nVision HMD

VR and Transfer of Training Paradigms



Barco 1208s Rear-Projection System

- Draper Diamond screen, 5'8" x 4'10"
- 1280 x 1040 resolution
- FOV 58 degrees horizontal
- Crystal Eyes stereoscopic goggles
- Stereoscopic liquid crystal shutter display

Spatial Memory Models in VR Navigation

Cyberseat II

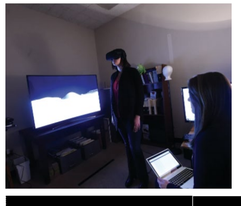
- Virtual Research V6 HMD
- Head-coupled rotation control
- 60 degrees, 640 x 480, 100% overlap
- Joystick-based translation

Effects of Auditory Stimuli on Visual Search

First HMD with Embedded Eye Tracker

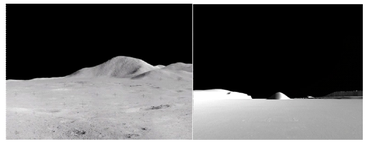
- Dichroic mirror inside reflects image of eye to camera
- Exhaust fan inside casing
- Eye-tracking camera

Lunar Psychophysics Virtual Reality Lab
2017-present



Models: Oculus Rift SDK2 and CV1

- Depth perception in immersive VR vs. non-immersive displays
- Impacts of vestibular stimulation and virtual motion on depth perception
- Rendering of planetary atmospheres in Unity 3D VR software



VR Demonstration

Model	Oculus Rift CV1	Oculus Go
Demo	"Touch Basics"	"Introduction to VR"
Utility	• Optimal for VR research and development • Avid gaming	• Optimal for casual VR games and apps • Video viewing • Oculus go app
Resolution	• 2,160 x 1,200 pixels • 90Hz refresh rate • Direct connection to computer using a split HDMI and USB 3.0 cable	• 2,560 X 1,440 pixels • 32 and 64 GB options • 60Hz or 72Hz refresh rate
Tracking Capability	• 6 degrees of freedom tracking • Minimum 3 external tracking sensors • Hand tracking via Oculus touch controllers	• Wireless: 3 degrees of freedom tracking • Stationary within the VR space (head rotation only) • Hand tracking (directional only) via Oculus Go controller
Minimum Specs/cost	• Recommended specs for graphics card NVIDIA GTX 1060 or greater • VR computer needed (min $700) • Device costs about $350 with controllers and sensors	• All-in-one: no computer needed • Device ranges $200-$250

The Future of VR

Virtual Reality

Oculus Quest
- Spring 2019
- All-in-one system with 2 controllers.
- First wireless VR system built for gaming

Oculus Rift S
- Upgrade from Oculus Rift
- Higher resolution display (2,560 X 1,440)
- Improved optics
- Passthrough+ feature: glimpse of the real world around you without ever taking off the headset

Mixed/Augmented Reality

Microsoft HoloLens 2
- All-in-one immersive mixed reality
- Allows for virtual interaction in the real world
- Professional work oriented with the ability to pull up schematics and diagrams
- Enables users to work and solve tasks quickly.
- Significant applications for doctors/surgeons, mechanics, business professionals, etc.