

# Theory and Applications of Virtual Reality and Immersive Computing

Bjoern Hartmann, Joe Menke, Allen Y. Yang

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# Instructors



Bjoern Hartmann  
Jacobs Institute

Email:  
bjoern@eecs.berkeley.edu



Allen Y. Yang  
FHL Vive Lab

Email:  
yang@eecs.berkeley.edu



Joe Menke  
Now at Apple Res.  
Email:  
joemenke@berkeley.edu

# Course Resources: Jacobs Institute

<http://jacobsinstitute.berkeley.edu/>

A HUB FOR ALL THINGS  
DESIGN



# Course Resources: FHL Vive Center

<https://vivecenter.berkeley.edu/>

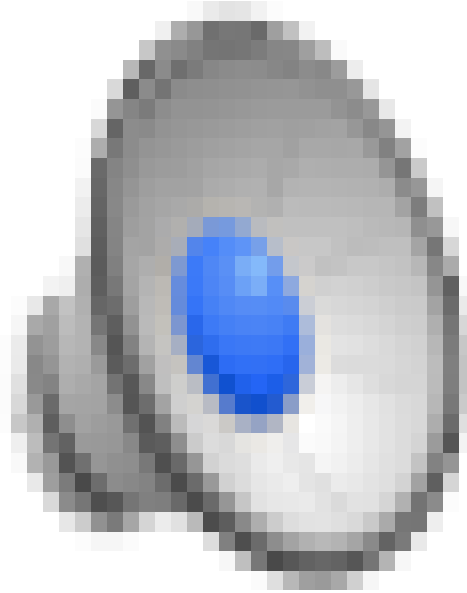




# Ready Player One: A Future in VR



# Leia's Hologram: Probably the first AR experience from Hollywood



# More in Hollywood Movies

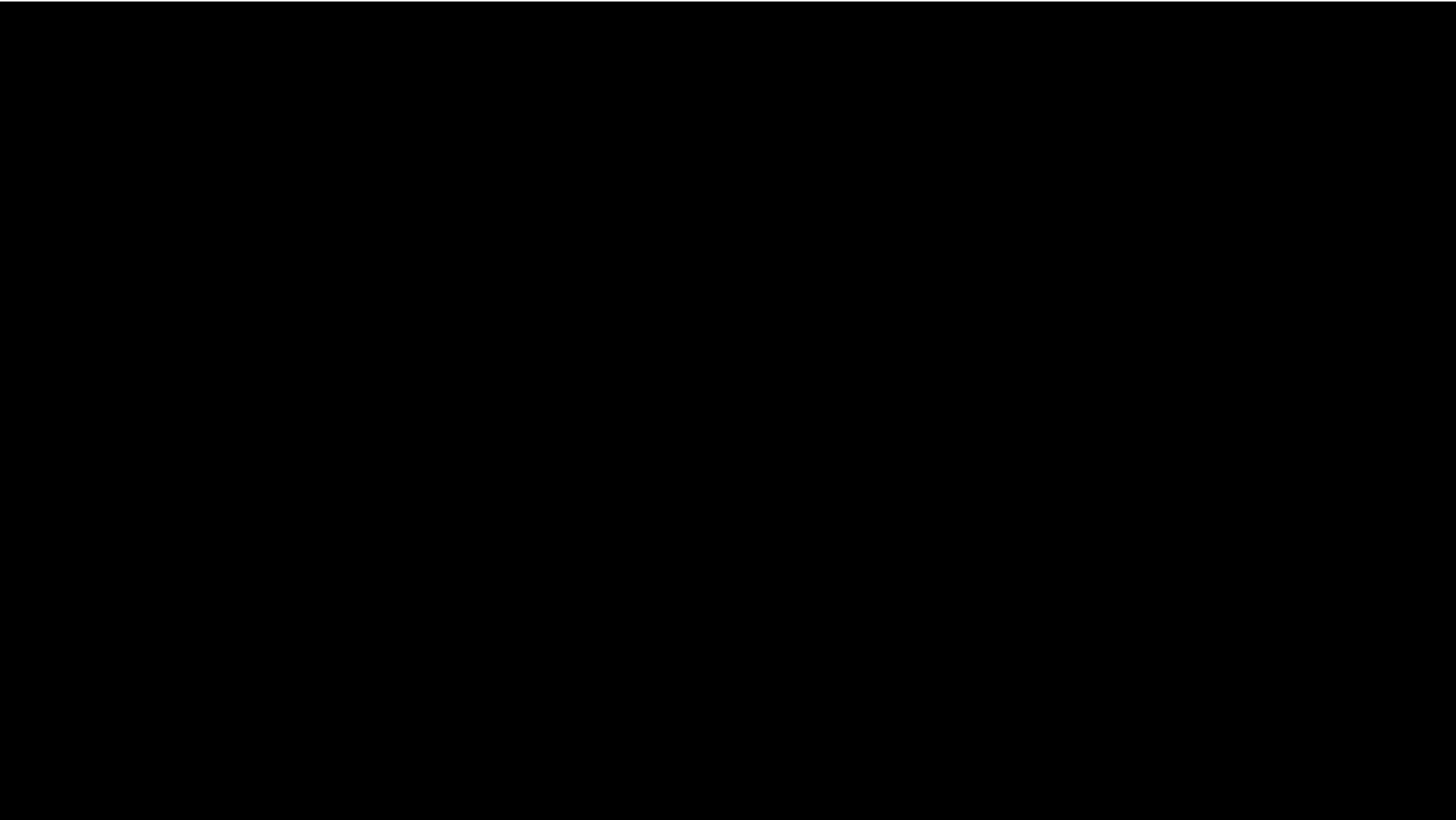


# A Real Market since 2016

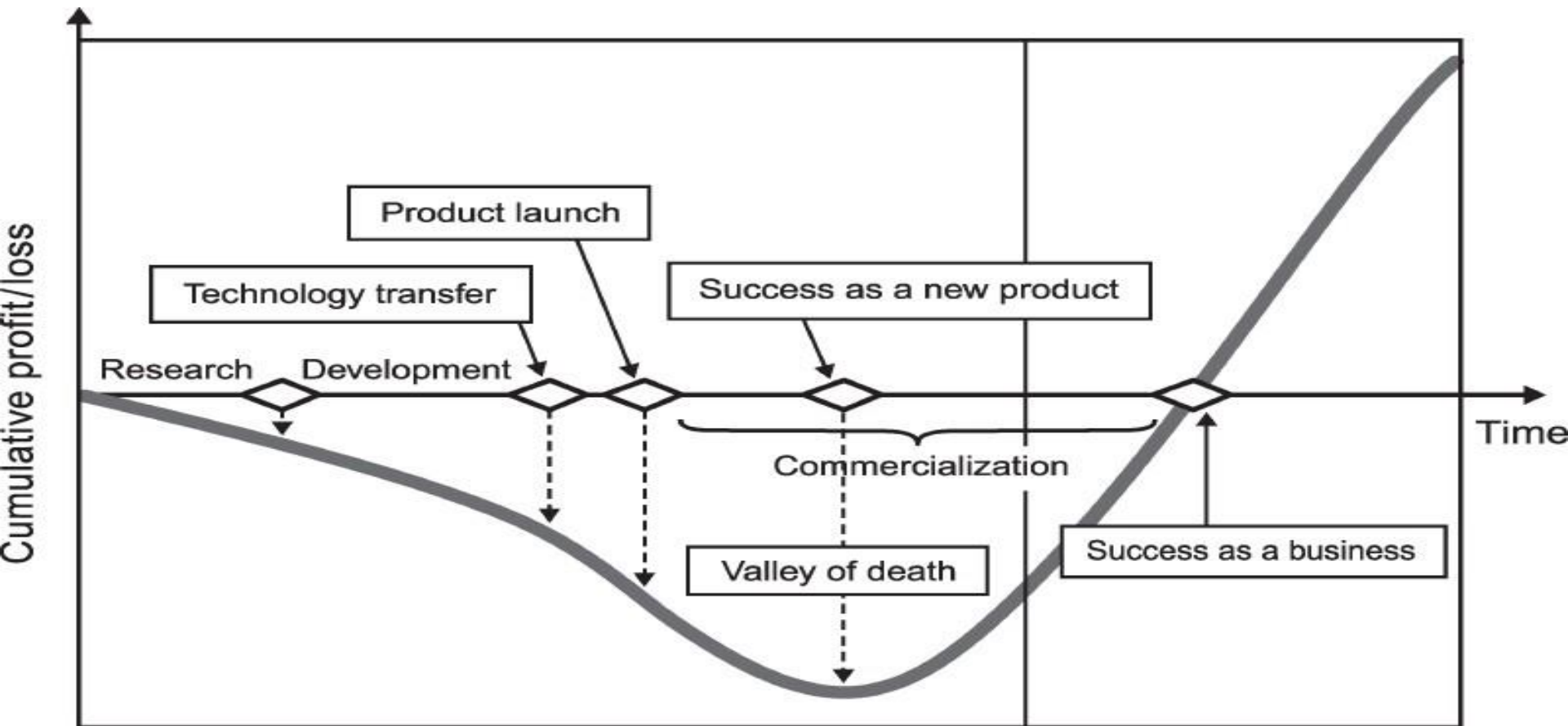




# CES 2017: Samsung 4D VR Experience



## What we have learned about the challenges and opportunities?



# Sensorama: The First VR Experience



Morton Heilig, 1958

# The First VR Head-Mounted Display

Oct. 4, 1960

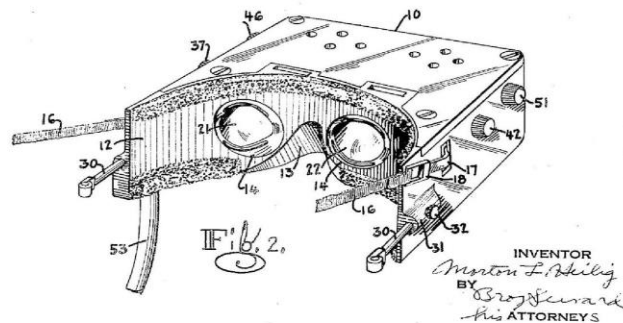
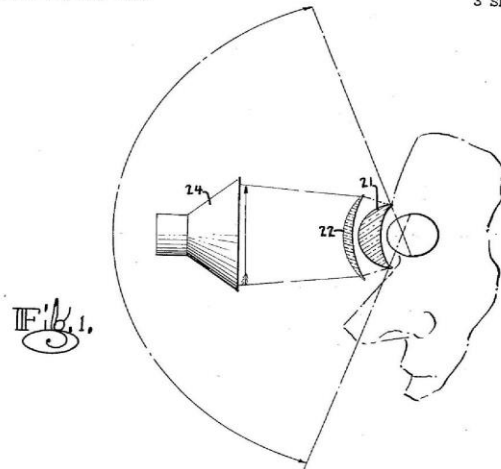
M. L. HEILIG

2,955,156

STEREOSCOPIC-TELEVISION APPARATUS FOR INDIVIDUAL USE

Filed May 24, 1957

3 Sheets-Sheet 1

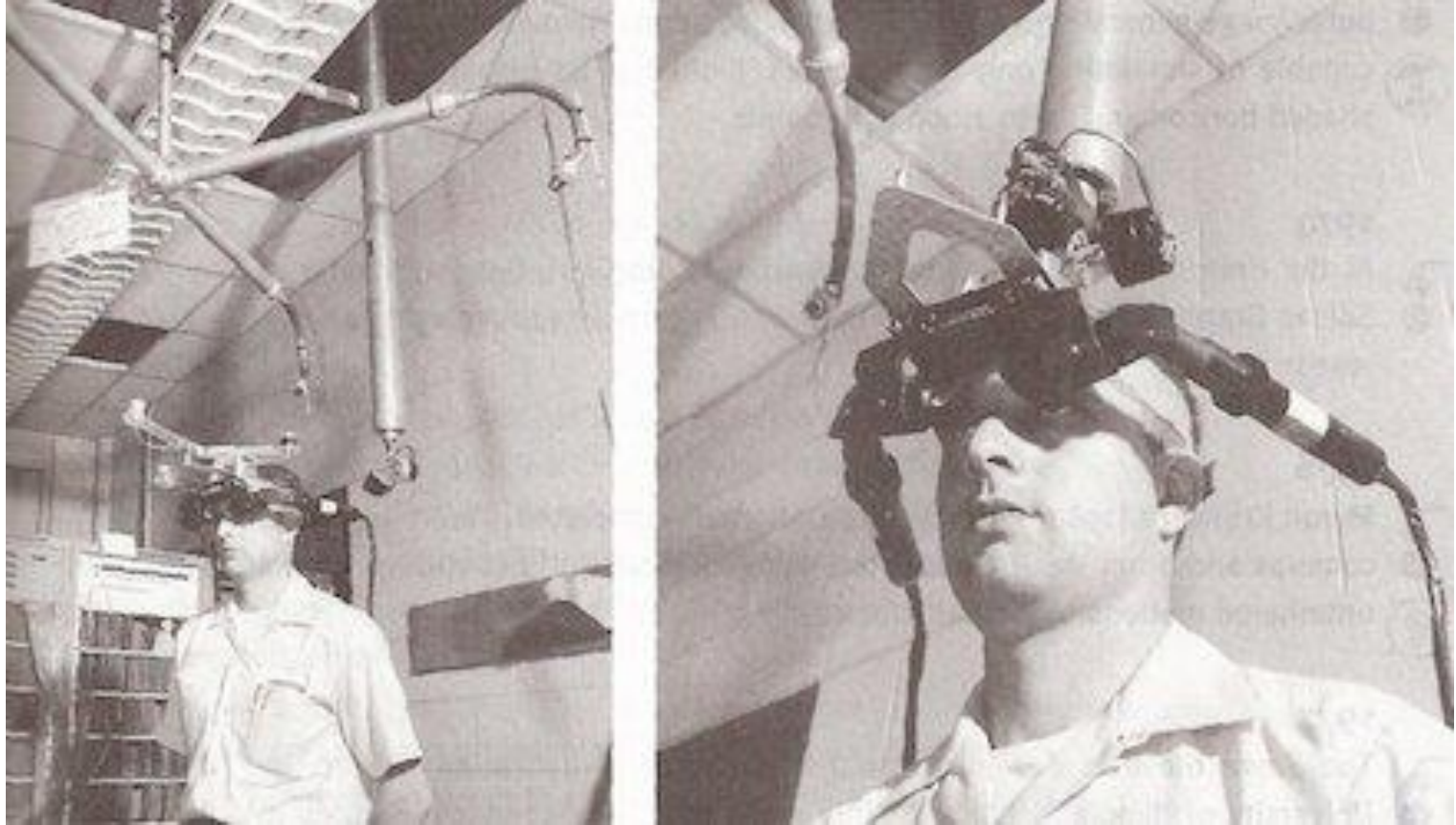


Telesphere Mask Patent

Morton Heilig, 1960



# The First AR Prototype



Ivan Sutherland, 1968

# The First AR Prototype



Ivan Sutherland, 1968

# First VR/AR Applications in 1980s



Military Training



NASA VR Lab

# First Consumer Products



Mattel's Power Glove as  
Nintendo controller



Virtuality



SEGA VR



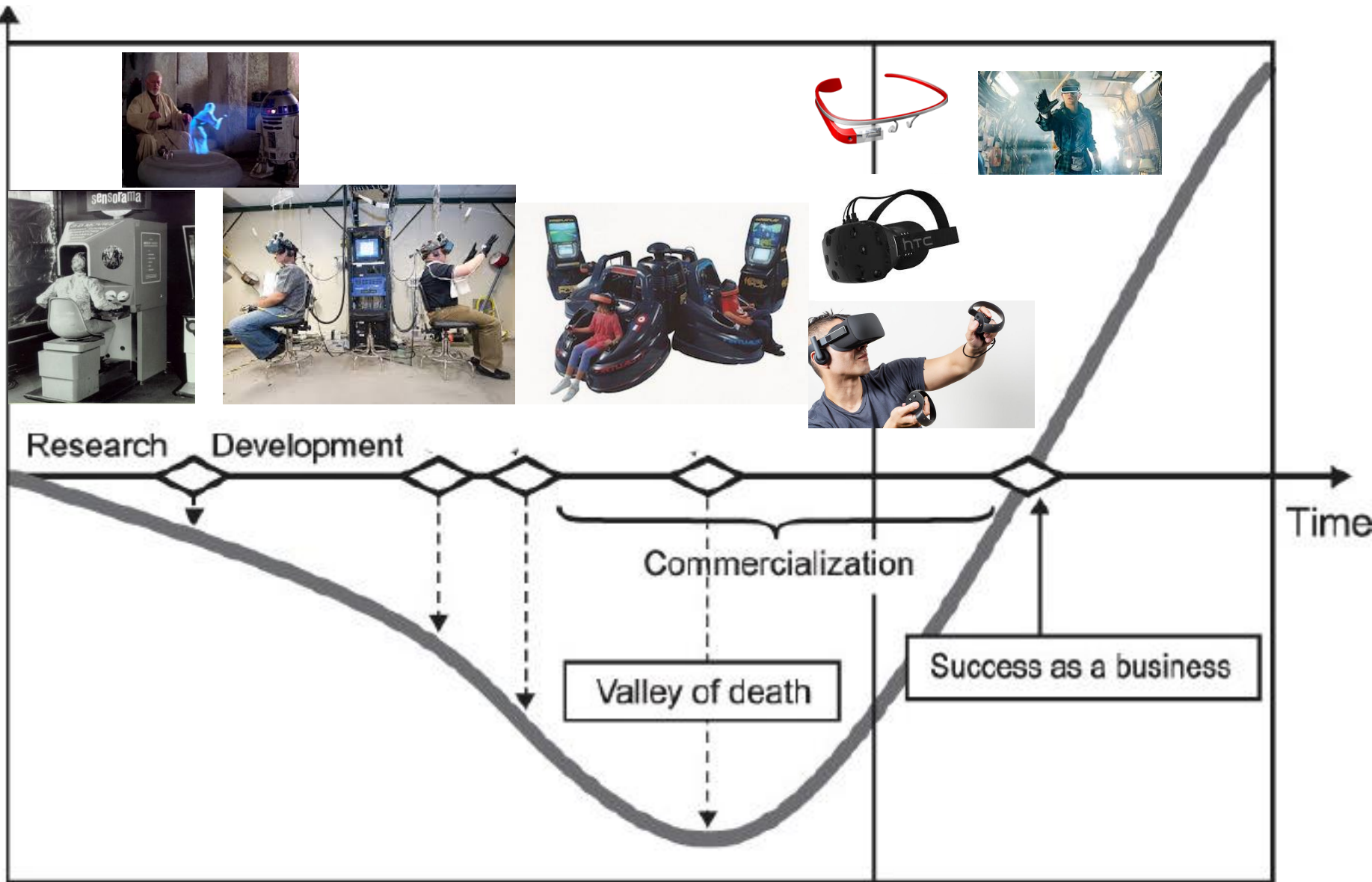
Nintendo Virtual Boy



Sony 3D Viewer



Cumulative profit/loss



1958

1977

1980s

1990s-2010s

2012

2018

# What is Reality?



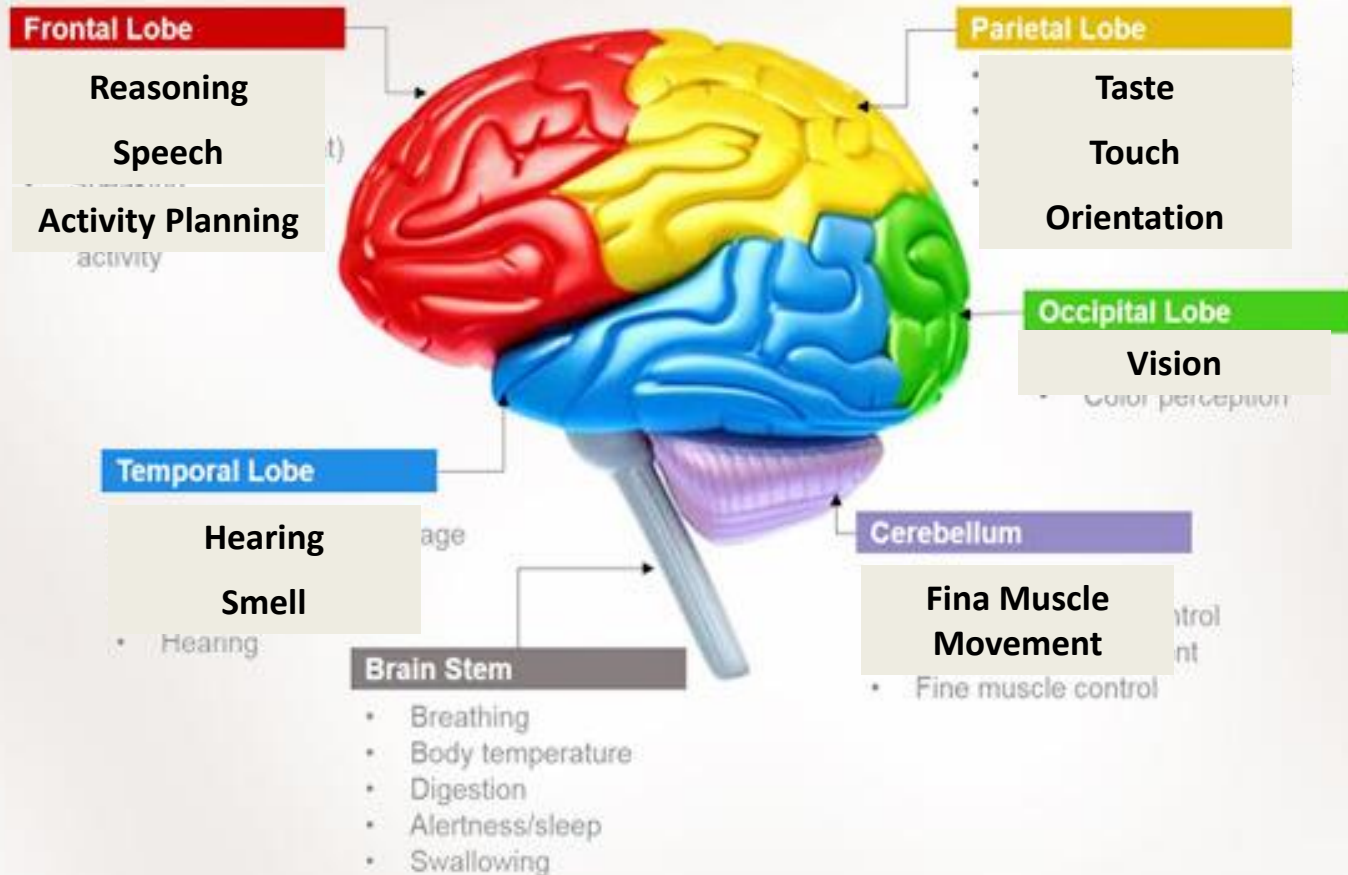
“What is **real**?”

“How do you define '**real**'?”

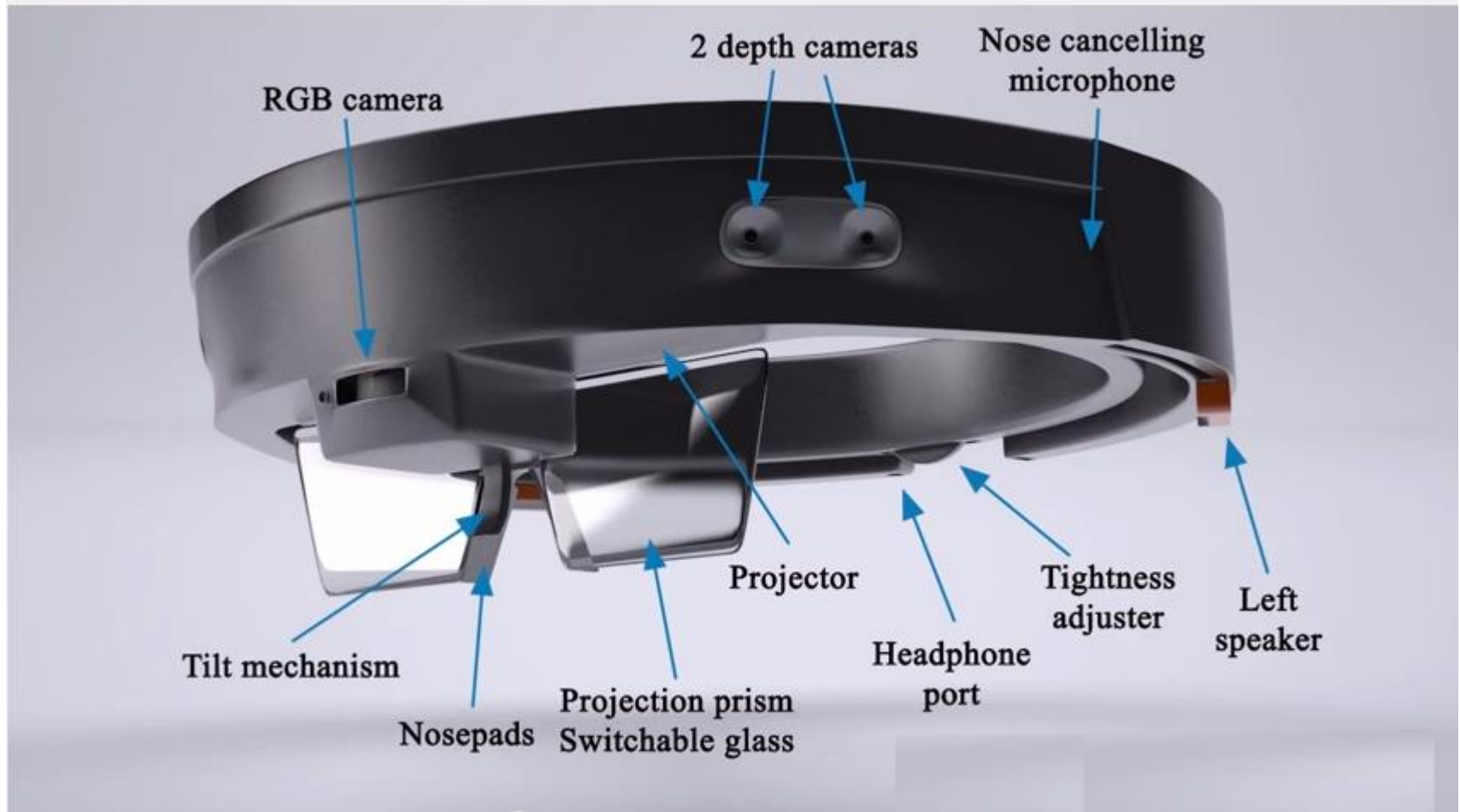
“If you're talking about what you can **feel**,  
what you can **smell**, what you can **taste** and  
**see**, then 'real' is simply **electrical signals**  
**interpreted by your brain.**”

*- Morpheus in Matrix (1999)*

# The Senses of Reality



# Anatomy of an AR Device: HoloLens





# Summary of Corresponding Techs



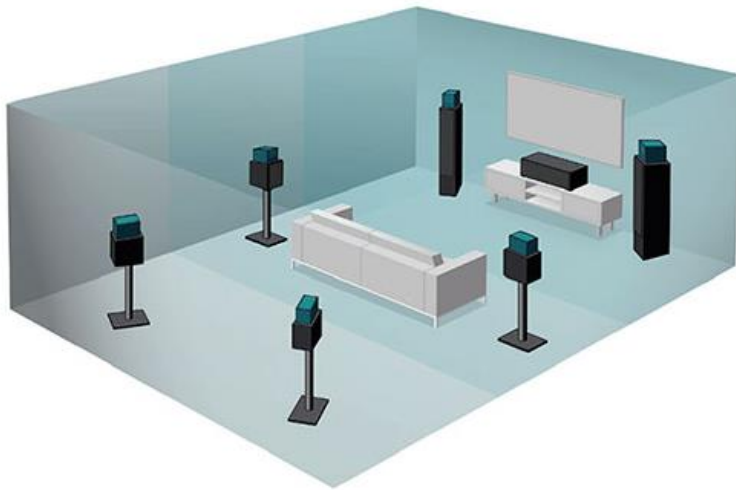
Graphics



Photography



Stereoscopy

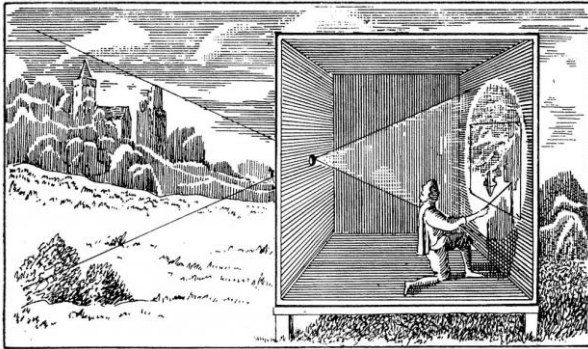


3D Audio



Interaction

# Early Forms of Photography



Camera Obscura, circa 400BC

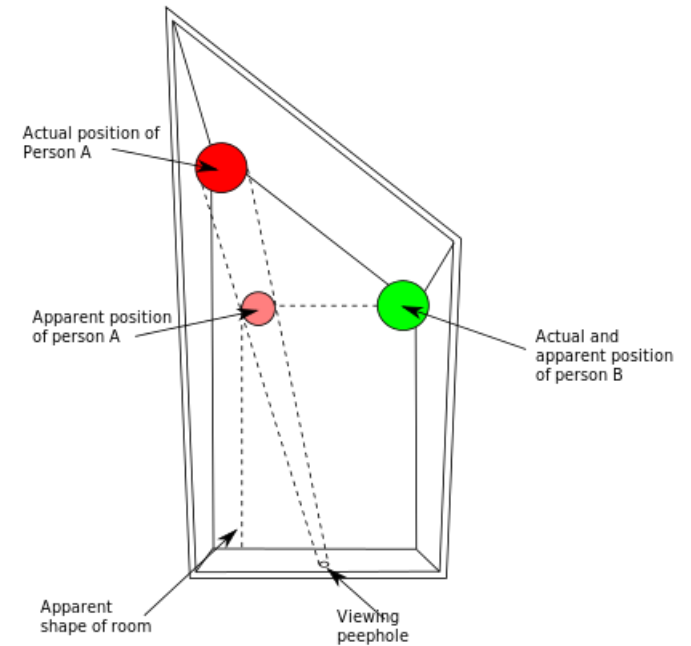


First photo on paper, 1800s



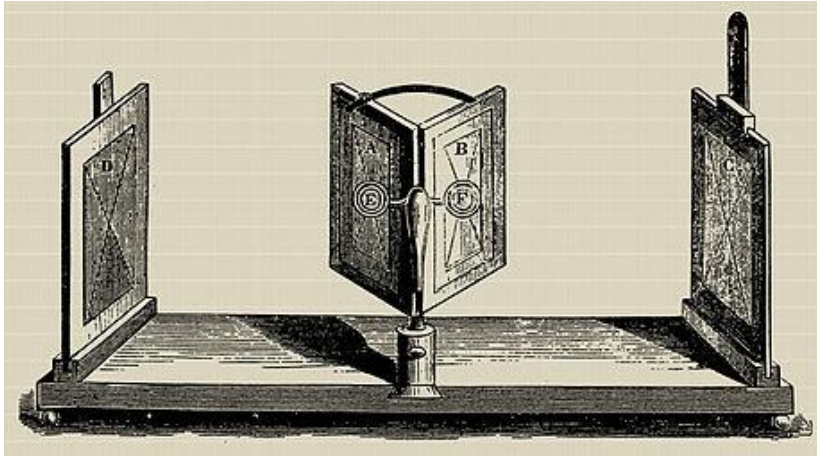
Kodachrome, 1935

# 3D Illusion with Perspective



Ames Room, by Adelbert Ames, Jr., 1946

# Seeing 3D from Stereo



Wheatstone mirror stereoscope, 1838



Holmes stereoscope, 1861



# Audio: From Mono to Spatial 3D



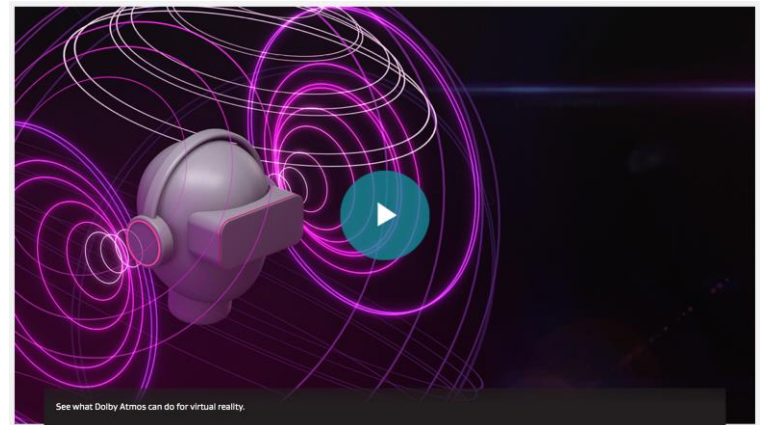
Edison cylinder phonograph, 1899



Invention of headphones, 1910s



Dolby Stereo, 1977



Dolby Atmos for VR

# Interaction Modalities



Typewriter keyboard, Christopher Sholes 1870s



Mouse, Douglas Engelbart, 1963



Dataglove, Thomas Zimmerman, 1982



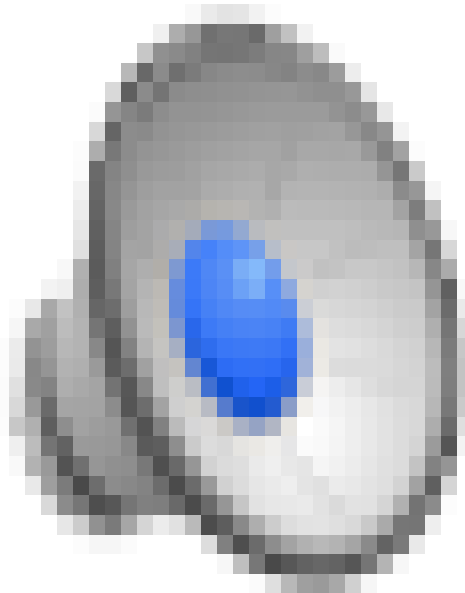
iOS and Siri, Apple



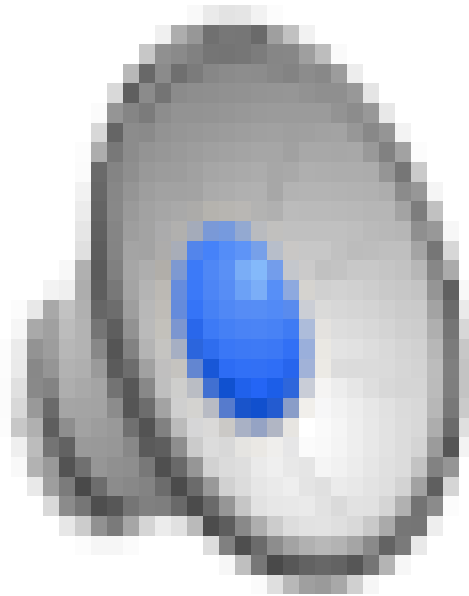
# Outside-In Localization (Vive Lighthouse)



# Inside-Out Localization (Google Tango)



# Tilt Brush in Virtual 3D





# AR on Smart Phones



# Other Forms of Space Augmentation



# Definition: Virtual Reality

- **VR** is a computer technology that uses head mounted displays, sometimes in combination with other sensory devices, to generate realistic images, sounds, and other sensations (touch, smell, motion, etc.) that simulate a user's physical presence in a virtual environment.

# Definition: Augmented Reality

- **AR** is a computer technology that augments a physical, real-world environment directly or through its indirect view computer-generated sensory information, including graphics, video, and sound. AR may alter a user's view of reality, and may also enhance one's perception of reality.