

# The Great Rebalancing

9/30/16

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Entertainment Technology Center @ USC



**2016 AES INTERNATIONAL CONFERENCE ON  
AUDIO FOR VIRTUAL AND AUGMENTED REALITY**

C L O U D S

A VR and traditional monitor experience



The background is a dark blue field filled with a grid of small, light blue dots. In the center, there is a perspective effect where lines converge towards a vanishing point, creating a sense of depth. The word "CLOUDS" is centered in the middle of the image.

C L O U D S

# Commercial Definition

VR – Blocks out world



AR – see-thru overlay





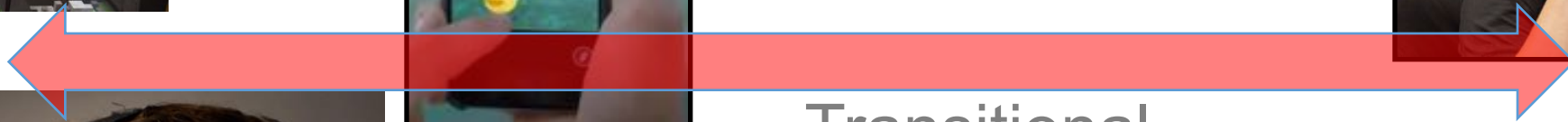
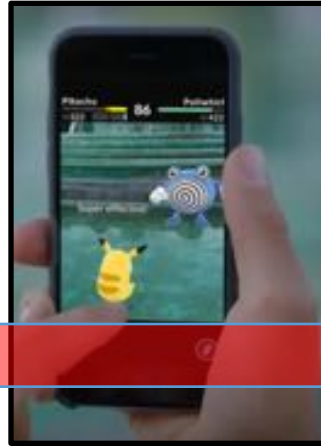
In **Augmented Reality**, the world that you would normally see if you walked down the aisle without the screen is being **augmented – enhanced, supplemented, added to** - with additional data and experiences.

In **Virtual Reality** you are **virtually – nearly, almost** – but not really there in the grocery store aisle.

# The AR – Reality – VR Continuum

Augmented Reality  
Reality

Virtual Reality



Transitional  
Mixed Reality  
Blended Reality



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*Milgram's Reality-Virtuality Continuum (1994)*



# VR platforms and markets



**Magic Window**



**Cellphone-based VR**



**Niche  
\$\$\$**

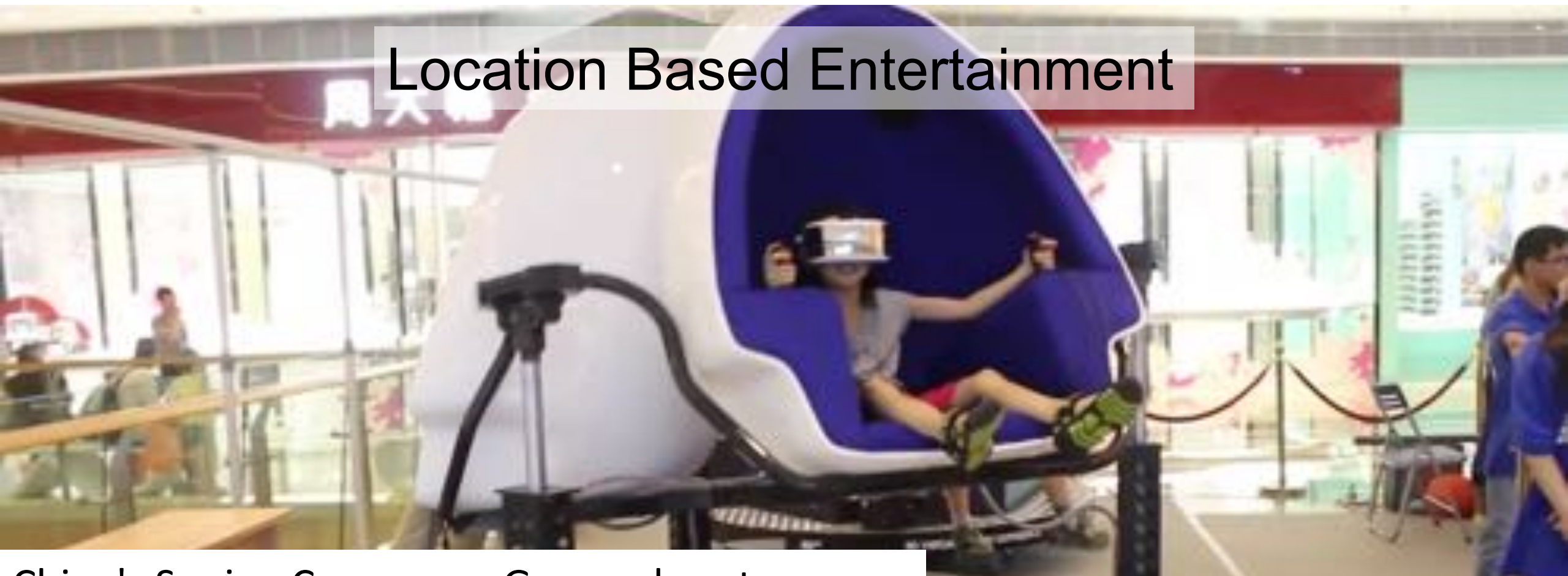
**HMD – Head Mounted Display**



**Group or Location-based VR**

# Location Based Entertainment

China's Suning Commerce Group plans to open 300 9D VR experiences in the next 3 months



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# Strong vs. Weak AR

- **Weak AR**

- Imprecise tracking
- No knowledge of environment
- Limited interactivity
- Handheld AR



- **Strong AR**

- Very accurate tracking
- Seamless integration into real world
- Natural interaction
- Head mounted AR



# Core Characteristics of VR

# Sense of Presence



# Heightened Sense of Empathy



# Agency





VR/AR

UX / UI

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Sound

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Image



# The 10 VR Commandments every VR experience creator should follow

1. Thou shalt limit the bounds of player space
2. Thou shalt recall that not every sense works
3. If thine avatar sits, thou should also be sitting
4. Thou shalt establish trust with the player
5. Thy gloves are thy friends
6. Thou shalt cast out unworthy menus
7. Thine kingdom need not be realistic
8. But thine kingdom must be carefully built
9. Thou hast nice legs. Cast thine eyes upon them
- 10. Thou shalt rest only when sound is also worthy**

Source:  
Techradar.com

# Decision

Camera-captured VR  
Locked to camera position

The Director's Journey



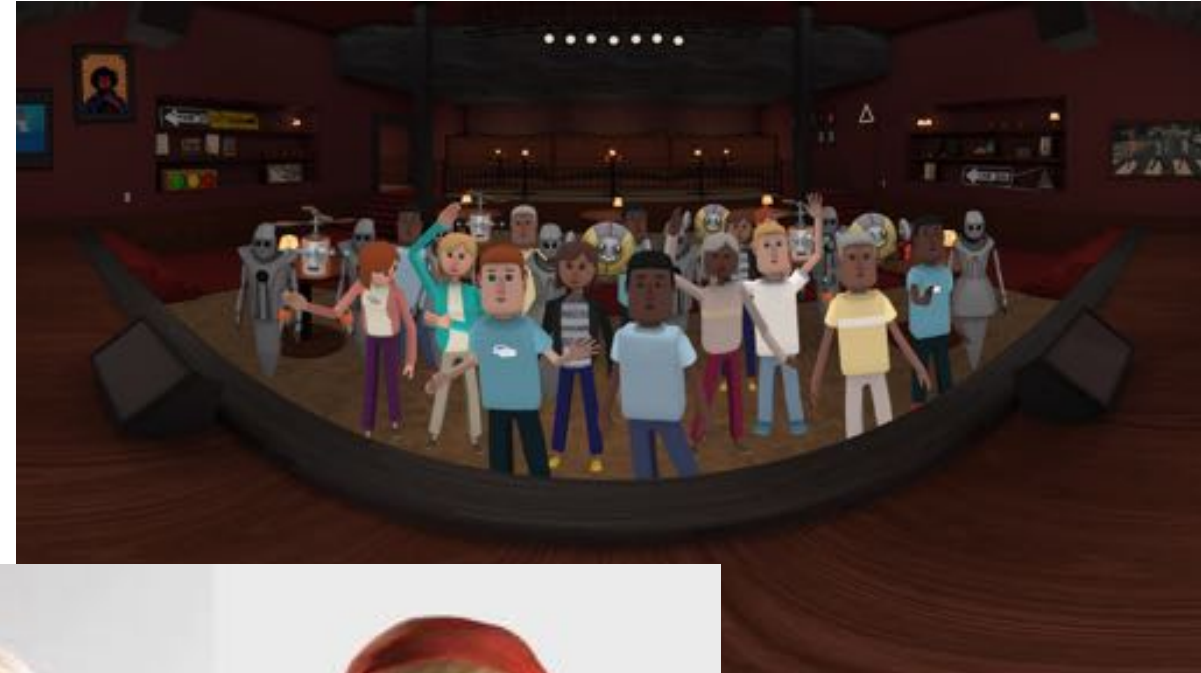
Computer Rendered VR  
Free to wander (Story world)

Subtle coercion





# Social VR as killer app



Split Screen  
 $360^{\circ} = 2 \times 180^{\circ}$

WITH WATER

WITHOUT WATER

‘Airlines’

From “Water Poverty” by Andrick Bregman



# Abel Gance's Napoleon 1927





# Live VR Production

## NY Philharmonic – Concerts in the Park



If you 'teleport' from one camera location to the next, how do you transition the spatial audio?

# Walk-around concert experience



## Vrtify

- Immersive 360 4D Sound
- Many mikes let you move around in the VR concert space
- 70/30 split with artists [PLelyveld@ETCenter.org](mailto:PLelyveld@ETCenter.org)



# VR is transforming industries





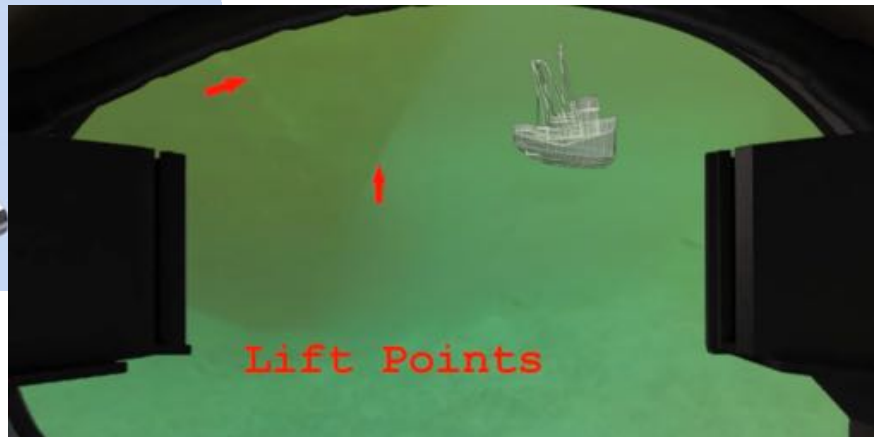
# Architectural modeling including acoustic modeling



# AR will dominate



## Workplace efficiencies





Remote Expert (Parent)



# F-35's \$400,000 AR HMD Helmet

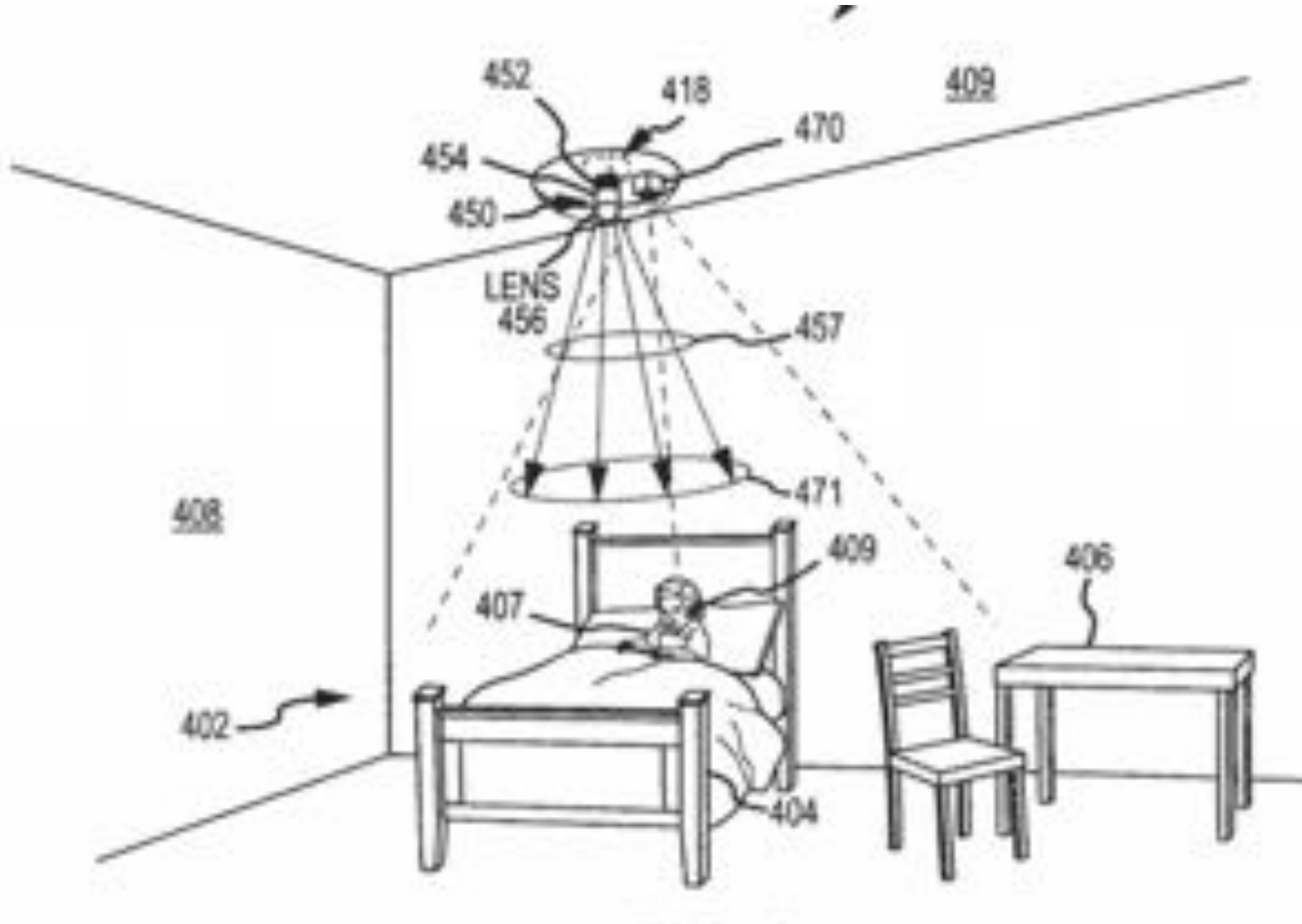
Full spherical view around jet  
Identifies, zooms in on, and can target  
objects of interest



360 VIEW OF AIR SPACE  
"X-RAY" LIKE VISION



# Disney patent turns hotel rooms into interactive environments



Projection and audio, plus sound and motion capture

# Disney and Google Cloud Vision 'Pokemon' plus image recognition





YOU ALSO HAVE  
TO WEAR  
HEADPHONES, AS  
SOUND IS A BIG  
PART OF THE  
EXPERIENCE

# THIS IS NIGHT TERRORS

IT CREATES A MAP OF YOUR HOME  
IN REAL TIME AS YOU MOVE,  
USING YOUR PHONE'S CAMERA

Lack of **standardization**  
slows consumer adoption

How would you define a  
**“Hollywood-Quality VR Experience”**?

Winning VR experiences will shape hardware development



Plural  
A variety

**What can we standardize?**

The latest and greatest VR content for your device

Distribution is defining the budgets  
Potential eyeballs and ROI






# 78% of AR/VR Developers Not Planning Platform-exclusive Content

**Will your next title be exclusive for a single VR/AR platform?**

**Yes 21.9%**



**No 78.1%**

Source the [VR/AR Innovation Report survey published by VRDC](#)

Huge issues  
currently being ceded to  
'the market'

# Ethics / Psychology

**Trauma**

Presence, Empathy, Proximity, and  
**Children**

‘Emotional intensity’ controls or ratings?



# Social / Psychology

Personal space controls or ratings?



# You are a node on the internet of things!



Reinforce the  
echo-chamber of  
curated ideas?

Revisit the click-license?

## Back-channel data

- Every move and response is tracked
- Ownership, monetization, ethics,...

# Social Norms and Responsibilities (+ Legal issues)



“Pokemon Go is just some markers on a map.  
The politics is **someone else's problem**,...”

Brendan Keogh, Australian Journalist

Online gamer died on Poolbeg Pier ‘capture’ mission

5/12/16 Irish Times



VR/AR

UX / UI

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Sound

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Image

# The 5 Universal UI Components

Navigation

Selection

Manipulation

System Control

Data Input

Wanted  
Intuitive User Interface



# Hand tracking and avatar interaction



Oculus Rift + Leap Motion  
Midas Touch



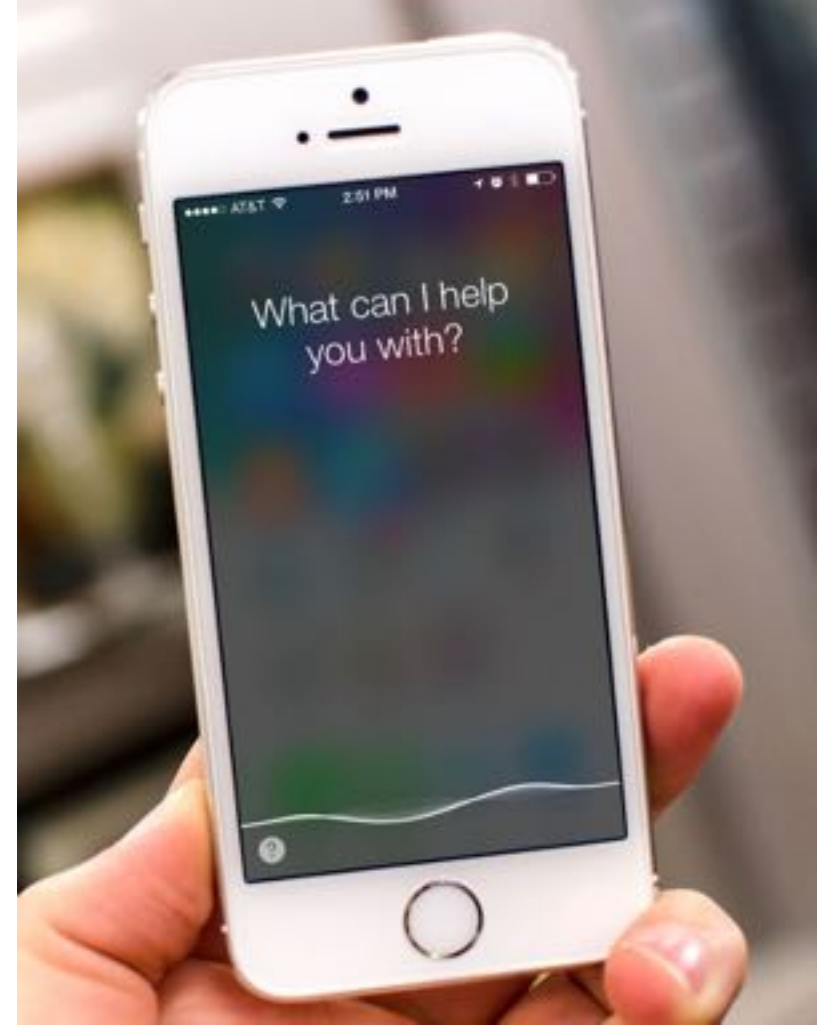
# UI – Voice Recognition



Amazon  
eEcho<sup>SM</sup> | ENTERTAINMENT  
TECHNOLOGY  
CENTER



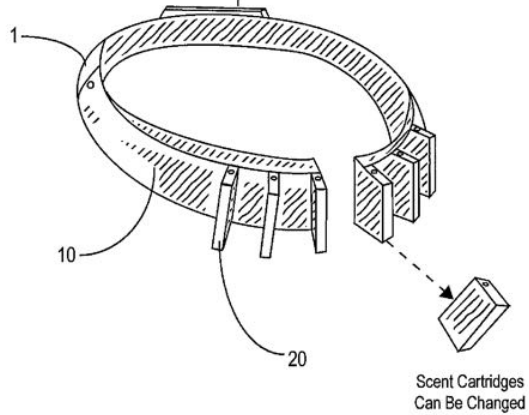
Google  
Home  
Pteleveld@ETCenter.org



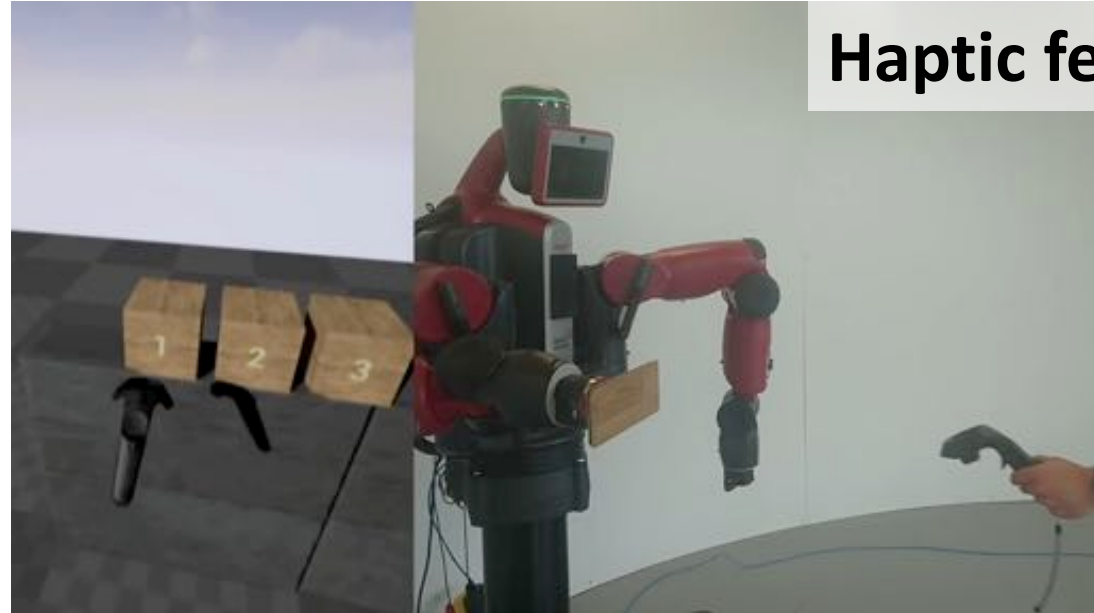
Apple  
Siri

# Other sensory I/O

Scent necklace / collar



Haptic feedback



Galvanic  
Vestibular  
Stimulation

17 subjects

Synchronized heartbeats  
Out-of-body experience





# World Building Storymaking

**Engagement** + storytelling







Part of the challenge of “Jungle Book” was to make the technology disappear.  
I want to find the humanity in the technology.  
Director Jon Favreau



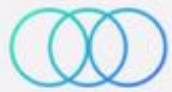
World Building occupies the space between  
goal-oriented gaming and passive  
storytelling for both play and work!

Jon Favreau's 'Gnomes & Goblins'



# World Building → Infinite Possibilities → OS

Windows Holographic OS (VR/AR OS)



Low Persistence Displays



High Performance SoCs



Low Latency,  
High Quality Sensors

Google Daydream VR

*WebVR work at W3C*

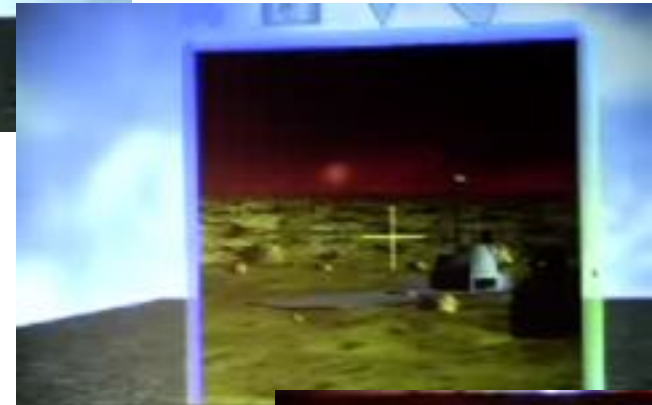
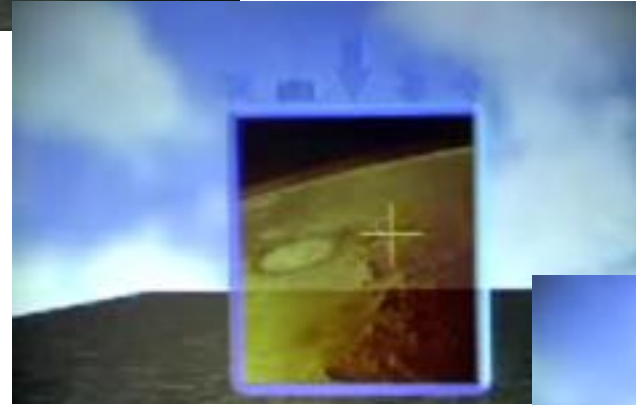
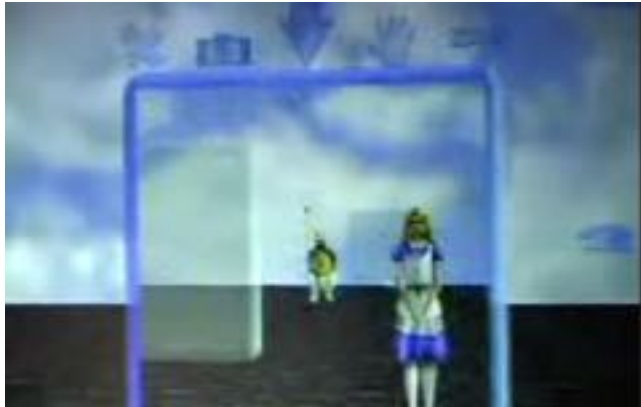


# Open Croquet

## 3D Virtual Space Environment

complete dynamic object-oriented language

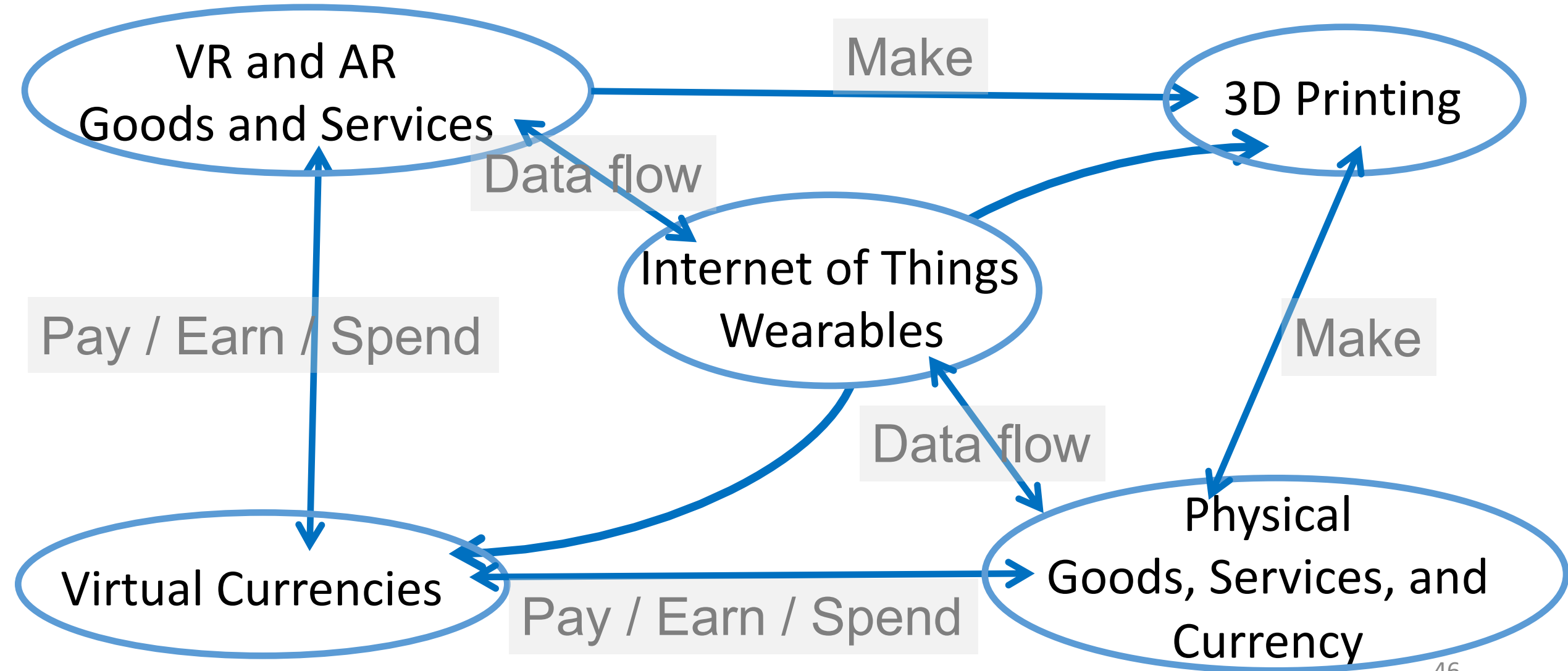
**Alan Kay and David A. Smith**



Avatars of Alice and the White Rabbit  
True shared space - they see each other  
Windows are portals to other worlds  
Alice can place the portal to a world into her pocket



# Erasing the boundaries between real and virtual work and play



# IoT (Internet of Things)

The background features a complex network diagram with numerous nodes and connecting lines. The nodes are represented by circles of varying sizes and colors, including green, yellow, and grey. Some nodes contain specific icons: a smartphone with a green plus sign, a speech bubble, a hand cursor, a thumbs up, and a person silhouette. The overall theme is digital connectivity and networked devices.

## Input

Everything is a node on the network,  
**including you!**

## Output

New ways of **experiencing and understanding**  
the world around you



# IoT, Wearables, Sensory Enhancement (Computer Vision, Spatial Audio I/O)

**Cognitive enhancement** via visual and auditory cues,  
symbols and reminders

**Audio for pattern detection** (ex. SETI project; “Contact”)

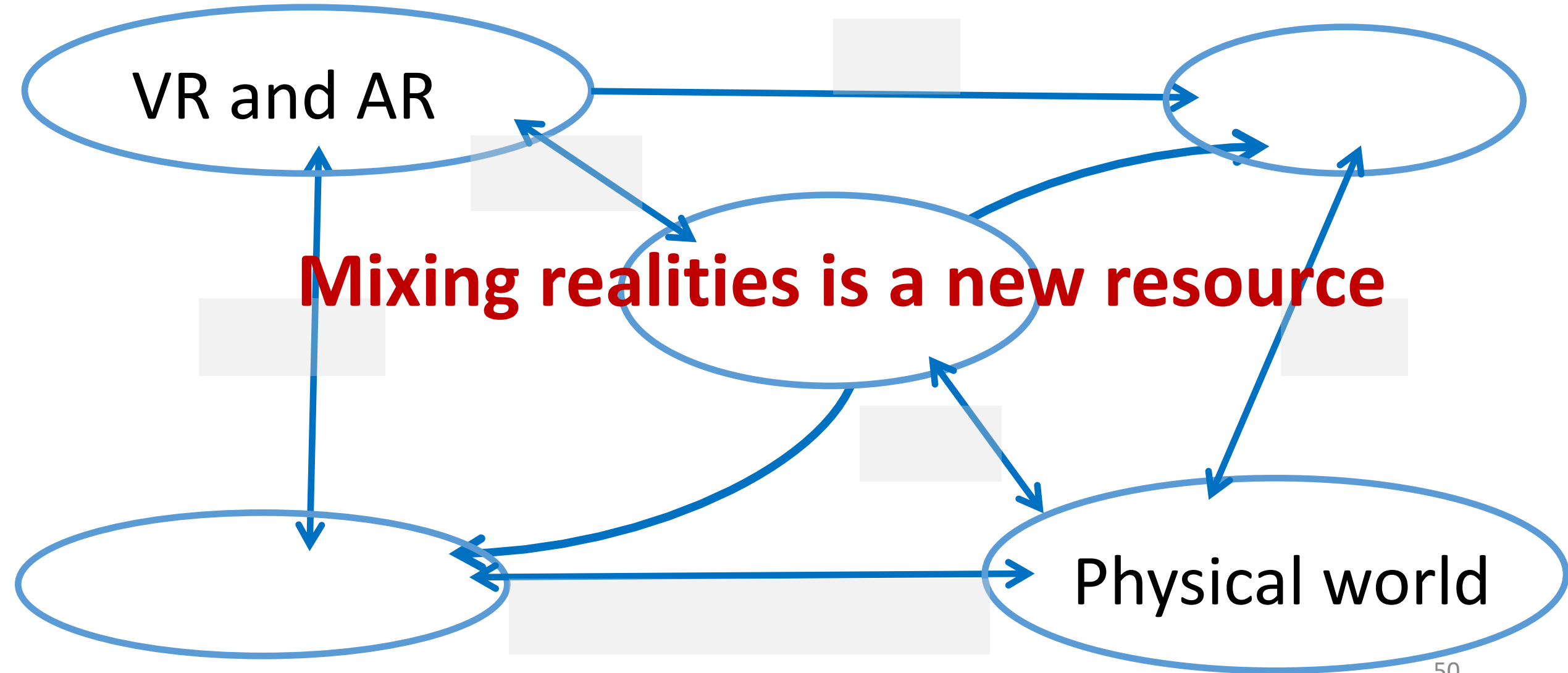
Auditory and visual sensations to compensate for  
**common age-related maladies**

# Redefining reality

A blurred background image showing a man wearing a VR headset and a woman in a digital, orange and yellow suit, standing in a virtual environment with architectural structures.

Where do 'I' begin and end?  
What is public vs private information?  
How do I know what only I experience?

# Erasing the boundaries between real and virtual







# Presence



# Empathy



# Agency





A large crowd of people is gathered in a dimly lit room, likely at a tech conference or exhibition. In the foreground, a man in a grey t-shirt and blue jeans is walking towards the camera. Behind him, several people are seated or standing, many wearing VR headsets. One person in the center is using a laptop. The background is filled with a dense crowd of people, some looking at devices, others talking. The overall atmosphere is one of a busy, high-tech event.

Technology is morally neutral





“The culture is ready for [VR+AR] now,  
given the amount of tech that we touch right now  
and the devices that we use daily.”

Ted Schilowitz, Futurist, Fox Studio

**Consumers don't buy technologies,  
they buy the experiences that the  
technologies deliver**





# Thanks!

## Phil Lelyveld

### Entertainment Technology Center @ USC

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