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Realidade Virtual em Engenharia

PROF. DR. TIAGO ARAÚJO

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Classes

Introduction and Human Immersion

Core concepts

Laboratory

Final project

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Evaluation

Written test

Laboratory project

Final project

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Course Objectives

What Mixed Reality really is

History of MR

Current MR commercial market

Different MR applications

Human perception side of MR

MR technology

- 3D user interface guidelines
- How to design good MR experiences
- How to build your own MR applications
- Important directions for future research in MR

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The Ultimate Display

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 a room would be fatal. With appropriate programming such a display could literally be the Wonderland into which Alice walked.

Ivan Sutherland, 1965

What is the pathway?

Spatial aware technology

Sensorial Stimuli

Digital Immersion

What do we really have **today**?

VR Techonology

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Sketchpad

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How it started

Ivan Sutherland - Head Mounted Display

Invisible Interfaces

Trend from room scale to invisible computing

Making Computers Invisible

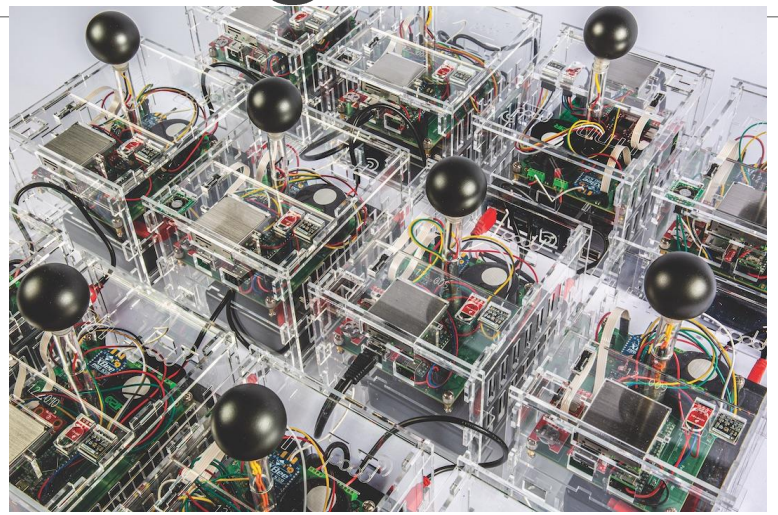
- hide the computer in the real world

Ubiquitous Computing

- put the user inside the computer

Ubiquitous Computing

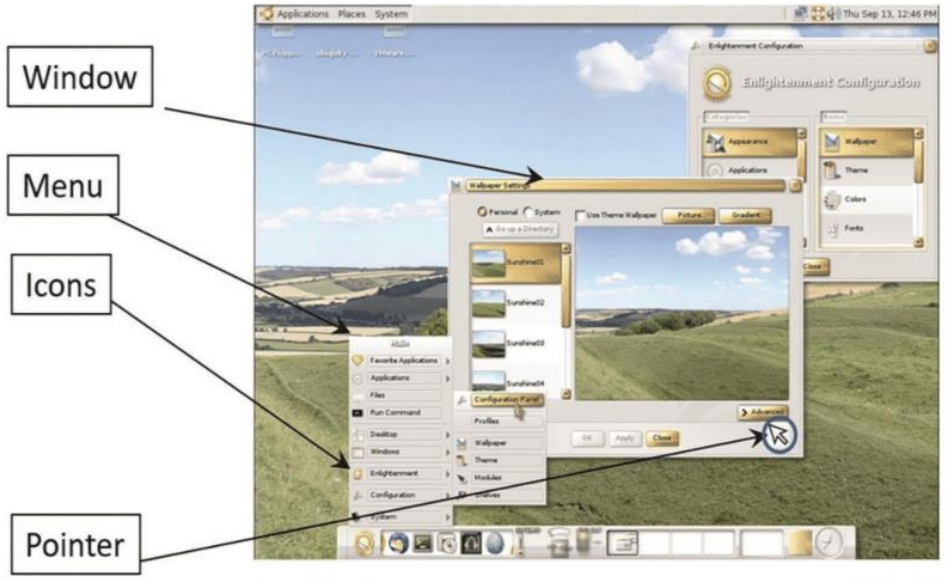
(a)

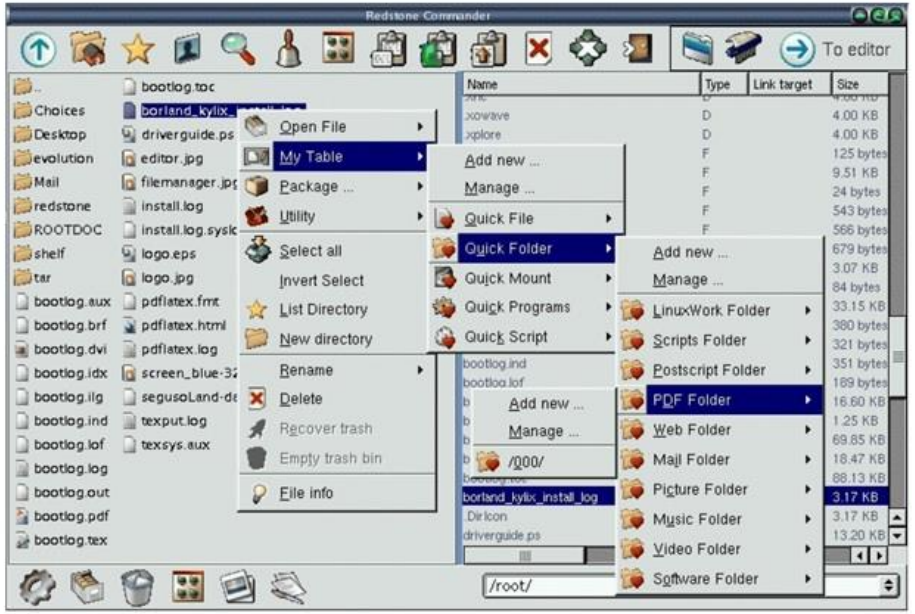


Computing and sensing embedded in real world

- Particle devices, Bluetooth, RFID, arduino, etc

Graphical User Interfaces





Separation between real and digital worlds

- WIMP (Windows, Icons, Menus, Pointer) metaphor

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What is Virtual Reality?

virtual reality noun

: an artificial environment which is experienced through sensory stimuli (such as sights and sounds) provided by a computer and in which one's actions partially determine what happens in the environment

also : the technology used to create or access a virtual reality

https://www.merriam-webster.com/dictionary/virtual%20reality

an interactive, immersive experience generated by a computer

REALIDADE VIRTUAL:
CONCEITOS, EVOLUÇÃO, DISPOSITIVOS E APLICAÇÕES

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What is Virtual Reality?

Immersive VR

- Mainly with head mounted display, joysticks
- Separation from the real world

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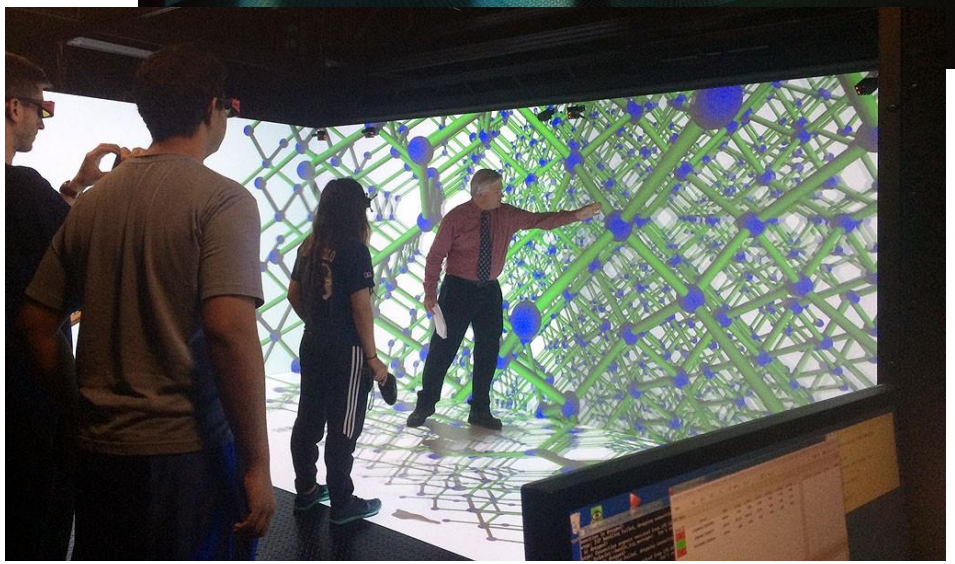
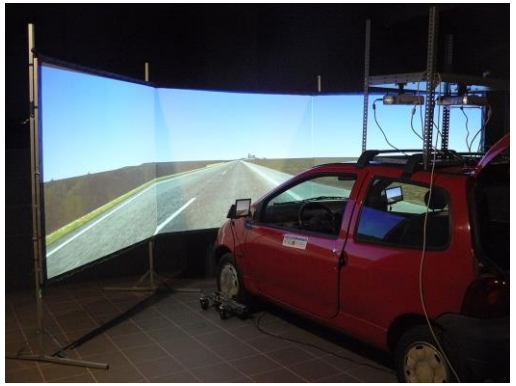
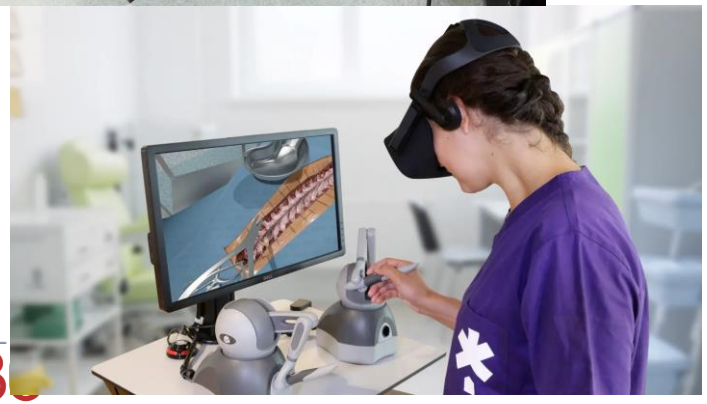
Types of VR







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VR Technology

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VR Technology

Oculus Rift S

Oculus Quest 2

Playstation VR

HP Reverb G2

Nintendo Labo Kit VR

Lenovo Mirage Solo

VR Shinecon

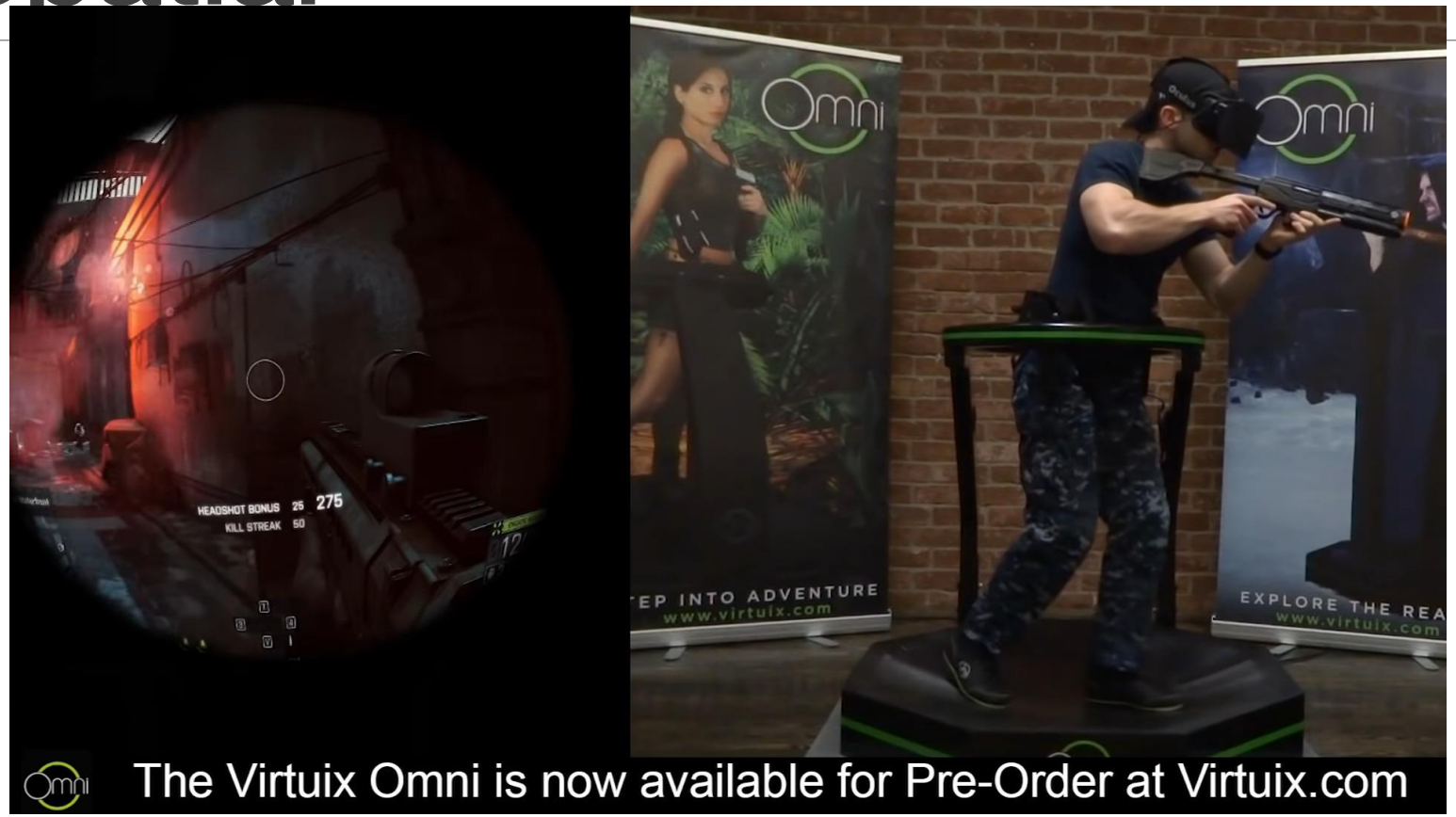
Samsung Gear VR

Bnext3D VR Headset

VR Presence

My 90 year old grandmother tries the Oculus Rift.

VR Spatial



Virtuix Omni - Battlefield 4

Defining VR - Presence

Presence is the key to defining VR in terms of experience

Presence is defined as the sense of being in an environment

Telepresence is defined as the experience of presence in an environment by means of a communication medium.

A "**virtual reality**" is defined as a real or simulated environment in which a perceiver experiences telepresence.

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Defining VR – User experience

Inducing targeted behavior in an organism by using artificial sensory stimulation, while the organism has little or no awareness of the interference.

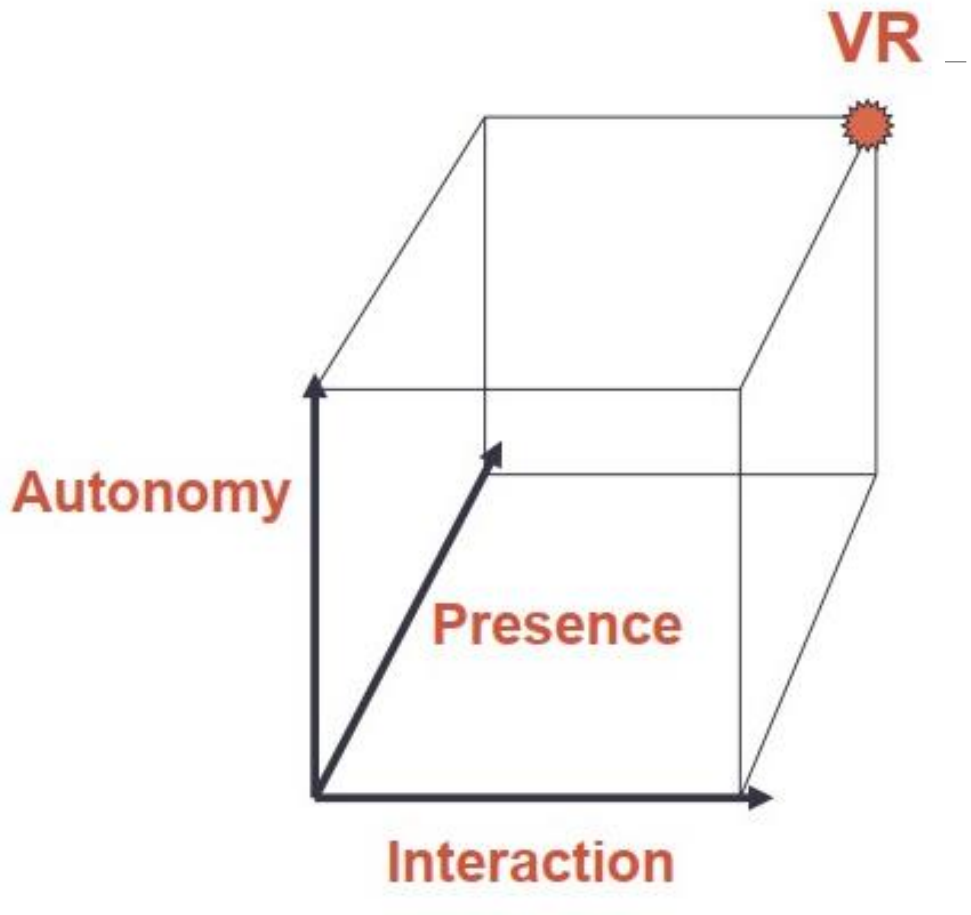
- Targeted Behavior: Having an experience designed by another person.
- Organism: Person or other life form
- **Artificial Sensory Stimulation**: One or more sensors replaced by artificial means
- **Awareness**: Organism unaware of the interface

David Zeltzer's AIP Cube

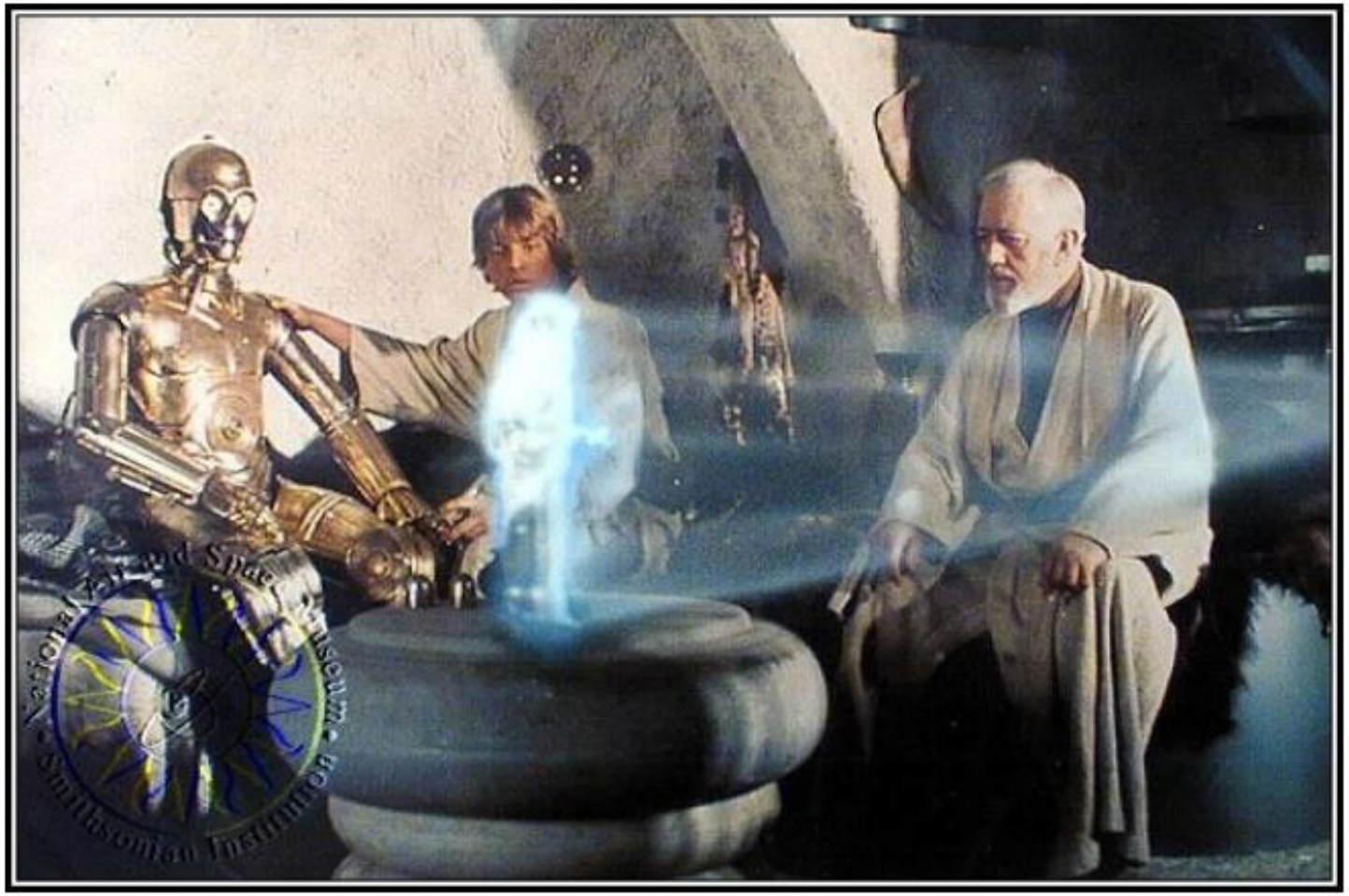
Autonomy – User can react to events and stimuli

Interaction – User can interact with objects and environment

Presence – User feels immersed through sensory input and output channels



What is Augmented Reality?



1977 – Star Wars

Characteristics

Combines Real and Virtual Images
- Both can be seen at the same time

Interactive in real-time
- The virtual content can be interacted with

Registered in 3D
- Virtual objects appear fixed in space

CNN Hologram TV

Exampl

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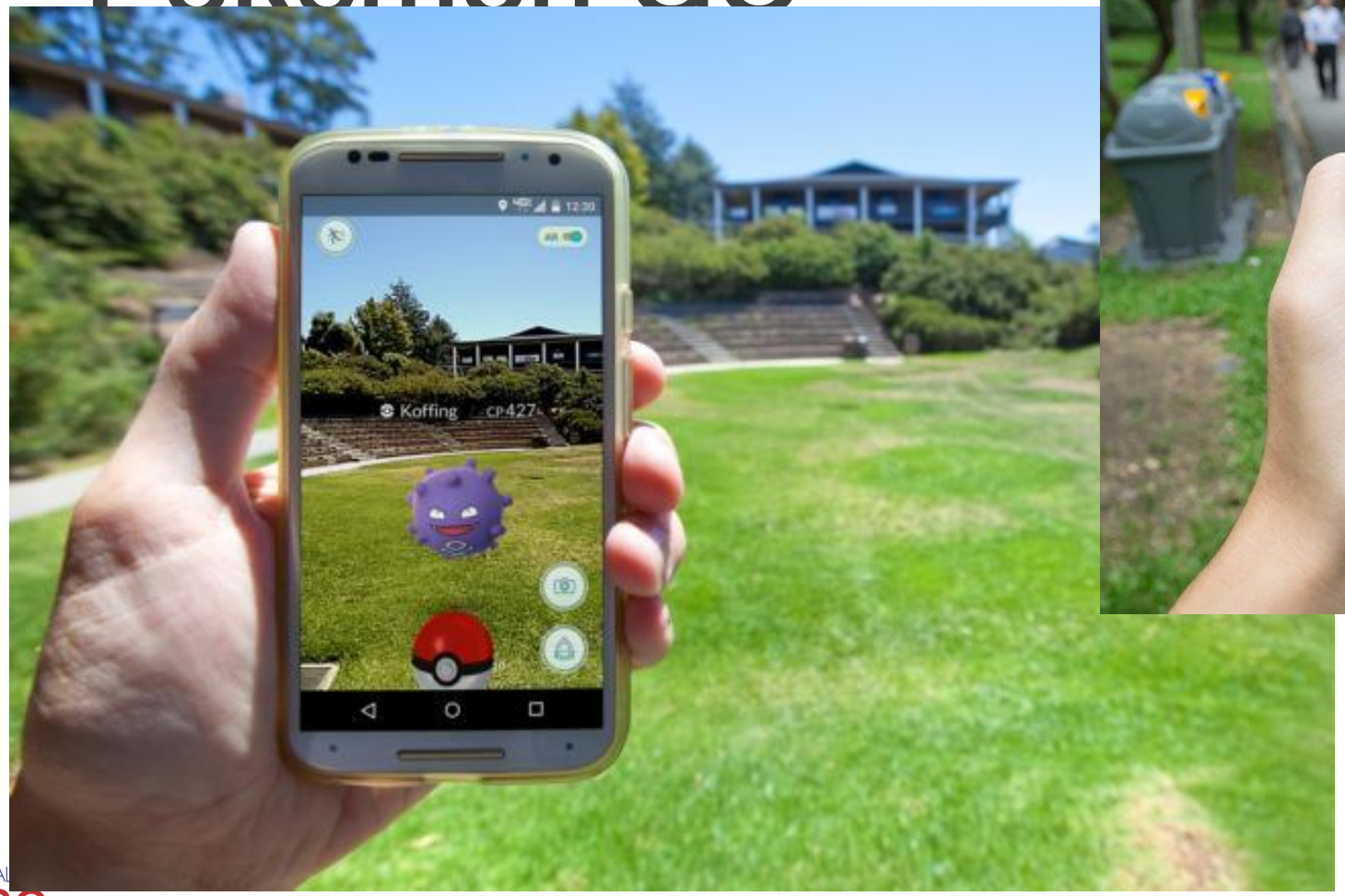
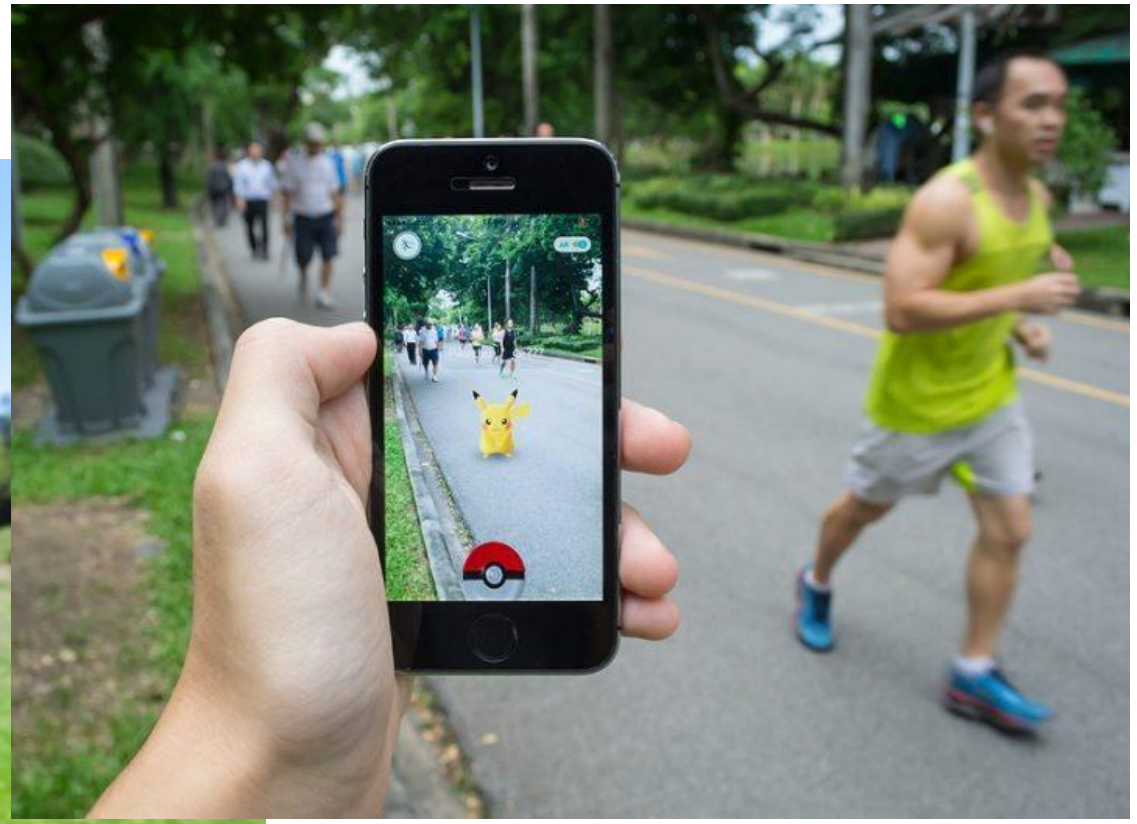
Pokémon GO





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Features

	Virtual Reality *Replaces Reality*	**Augmented Reality** *Enhances Reality*
Scene Generation	Requires realistic images	Minimal rendering okay
Display Device	Fully immersive, wide field of view	Non-immersive, small field of view
Tracking	Low to medium accuracy is okay	The highest accuracy possible

Terminology

Virtual Reality

Augmented Reality

Extended Reality

Mixed Reality

opinion

DOI:10.1145/3590959

Rick Skarbez, Missie Smith, and Mary Whitton

Opinion

It Is Time to Let Go of 'Virtual Reality'

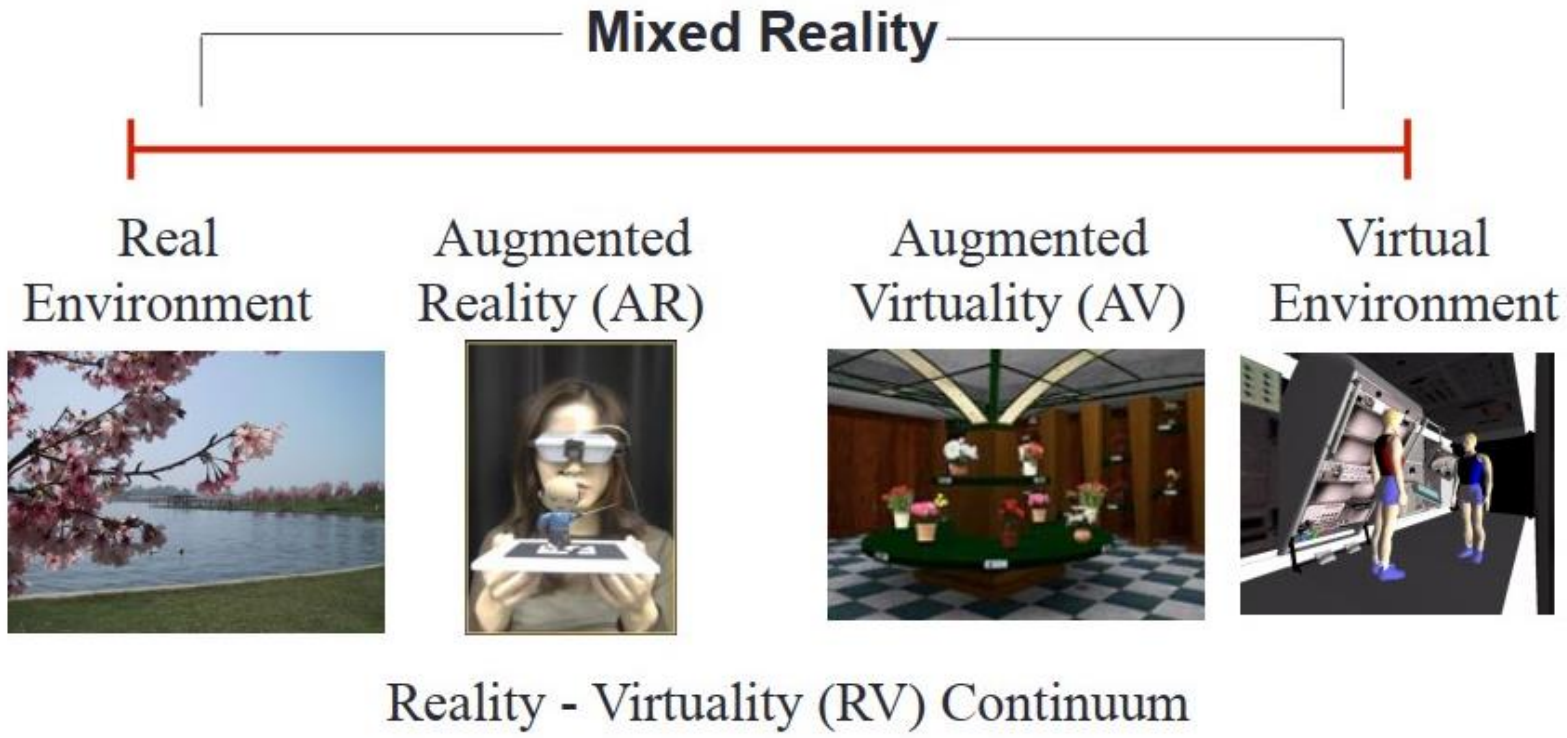
Advocating standardized terminology and reporting guidelines for mixed reality research.

IT SEEMS AS if the list of terms used to describe immersive experiences—here we use "immersive" very broadly to refer to computer systems that do not use a traditional 2D display plus keyboard and mouse interface—multiplies daily. At the IEEE Virtual Reality conference held in March 2023, one needed only to look at the titles of

It Is Time to Let Go of 'Virtual Reality'

Virtuality Continuum

"...anywhere between the extrema of the *virtuality continuum.*"



P. Milgram and A. F. Kishino, Taxonomy of Mixed Reality Visual Displays
IEICE Transactions on Information and Systems, E77-D(12), pp. 1321-1329, 1994.

A bit of history

Morton Heilig's Sensorama (Interview)

How is it going?

Introducing Oculus Quest 2

How is it going?

Introducing Microsoft HoloLens 2

Summary

Virtual Reality can be defined in a number of ways

- In terms of technology
- From a Presence perspective
- In terms of User Experience

VR can also be classified with other technologies

Invisible Interfaces

Milgram's Mixed Reality continuum

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Thoughts for home

What do you want to do in VR?

What does it need to work?

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