

# What is Augmented Reality?

Tue, June 23 (Week 1)



[https://youtu.be/8N\\_Cj3ZS9-A](https://youtu.be/8N_Cj3ZS9-A)

# Oxford English Dictionary

**augmented reality** *n.* the addition of computer generated output, such as images or sound, to a person's view or experience of his or her physical surroundings by means of any of various electronic devices.

# Oxford English Dictionary

**augmented reality** *n.* the addition of computer generated output, such as images or sound, to a person's view or experience of his or her physical surroundings by means of any of various electronic devices.



# Wikipedia

Augmented reality (AR) is an interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory and olfactory.

# Wikipedia

Augmented reality (AR) is an interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory and olfactory.



# Azuma (1997)'s Definition




1. Combines real and virtual
2. Interactive in real time
3. Registered in 3D

Example: Virtual objects and buttons in a 3D transparent display.







# Azuma (1997)'s Definition

	Jurassic Park (CGI effects)	Information Overlays (HUDs)	Virtual Reality		
Combines real and virtual					
Is interactive in real time					
Registered (positioned) in three dimensions					










# Azuma (1997)'s Definition

	Jurassic Park (CGI effects)	Information Overlays (HUDs)	Virtual Reality		
Combines real and virtual					
Is interactive in real time					
Registered (positioned) in three dimensions					










# Azuma (1997)'s Definition

	Jurassic Park (CGI effects)	Information Overlays (HUDs)	Virtual Reality		
Combines real and virtual					
Is interactive in real time					
Registered (positioned) in three dimensions					













# Azuma (1997)'s Definition

	Jurassic Park (CGI effects)	Information Overlays (HUDs)	Virtual Reality		
Combines real and virtual					
Is interactive in real time					
Registered (positioned) in three dimensions					













# Azuma (1997)'s Definition

	Jurassic Park (CGI effects)	Information Overlays (HUDs)	Virtual Reality	Pokemon Go	
Combines real and virtual					
Is interactive in real time					
Registered (positioned) in three dimensions					
















# Azuma (1997)'s Definition

	Jurassic Park (CGI effects)	Information Overlays (HUDs)	Virtual Reality	Pokemon Go	
Combines real and virtual					
Is interactive in real time					
Registered (positioned) in three dimensions					

# Azuma (1997)'s Definition

	Jurassic Park (CGI effects)	Information Overlays (HUDs)	Virtual Reality	Pokemon Go	Snapchat Filters
Combines real and virtual					
Is interactive in real time					
Registered (positioned) in three dimensions					

# Azuma (1997)'s Definition

	Jurassic Park (CGI effects)	Information Overlays (HUDs)	Virtual Reality	Pokemon Go	Snapchat Filters
Combines real and virtual					
Is interactive in real time					
Registered (positioned) in three dimensions					

# A Lesson from Virtual Reality

William Gibson (1984): Consensual Hallucination

Jaron Lanier (1987): A Term to Describe Machines His Company Created

Lesson: Definition may not include or be solely based on technology.

# Another Lesson from Virtual Reality

Once upon a time, virtual environments were considered virtual reality.

Now, in most cases, VR means VR headsets.

Lesson: Definition may become narrower over time.

# Device-based Definition

AR includes both

1. AR headsets and their applications,
2. AR smartphone applications, until AR headsets become widespread.



# Device-based Definition

AR includes both

1. AR headsets and their applications
  2. AR smartphone applications
- as they become widespread.

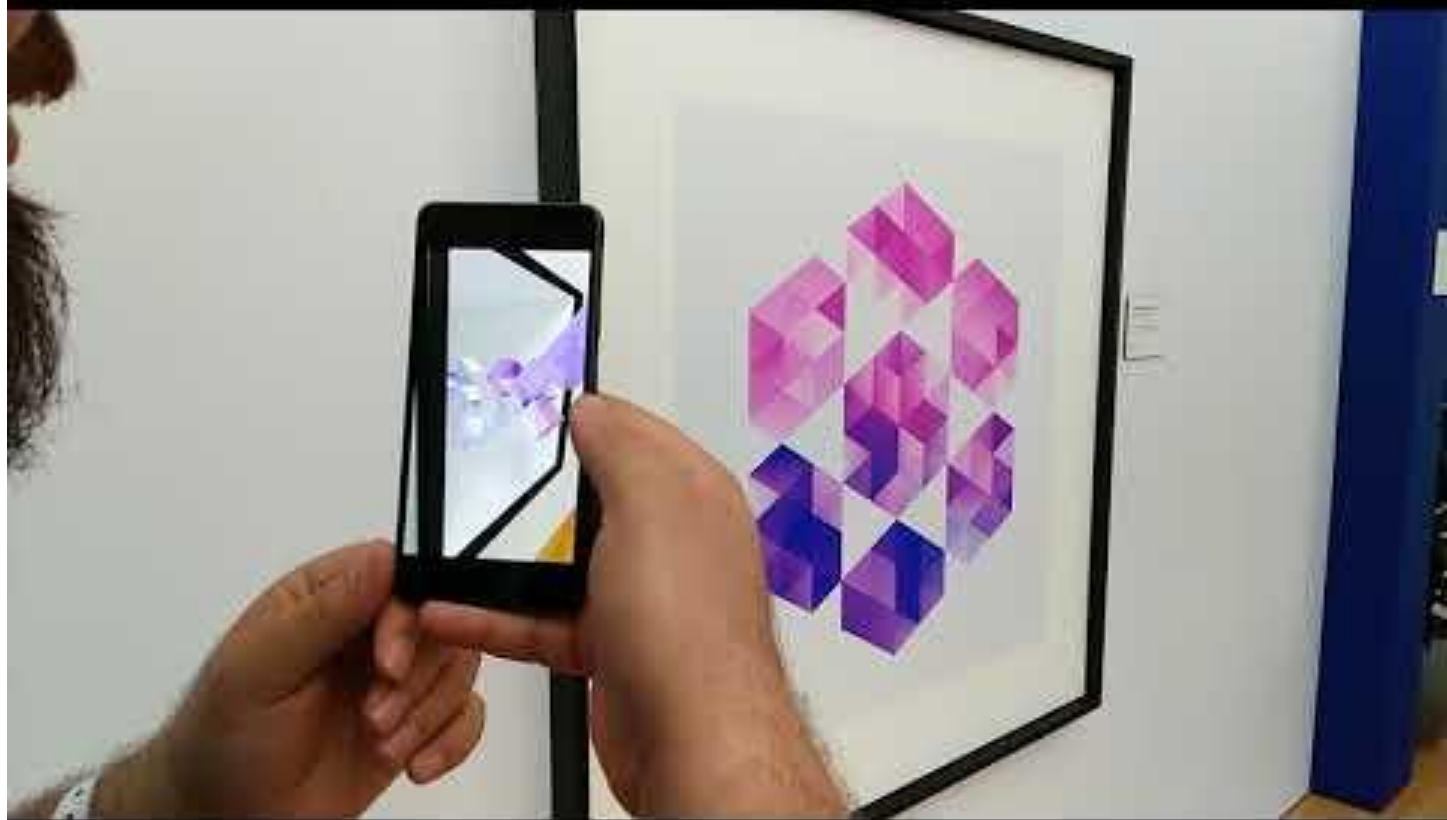


Head-worn Display Products and  
Prototypes 2017-2020  
Assisted and Augmented Reality





<https://youtu.be/uIHPtPBgHk?t=180>



<https://youtu.be/IJMD25qowRA>

# Headsets and Phones

Based on Azuma's Definition

1. Combines real and virtual
2. Interactive in real time
3. Registered in 3D

Headsets are more AR in 1 and 3.

# The Rs

VR: Virtual Reality

MR: Mixed Reality

AR: Augmented Reality

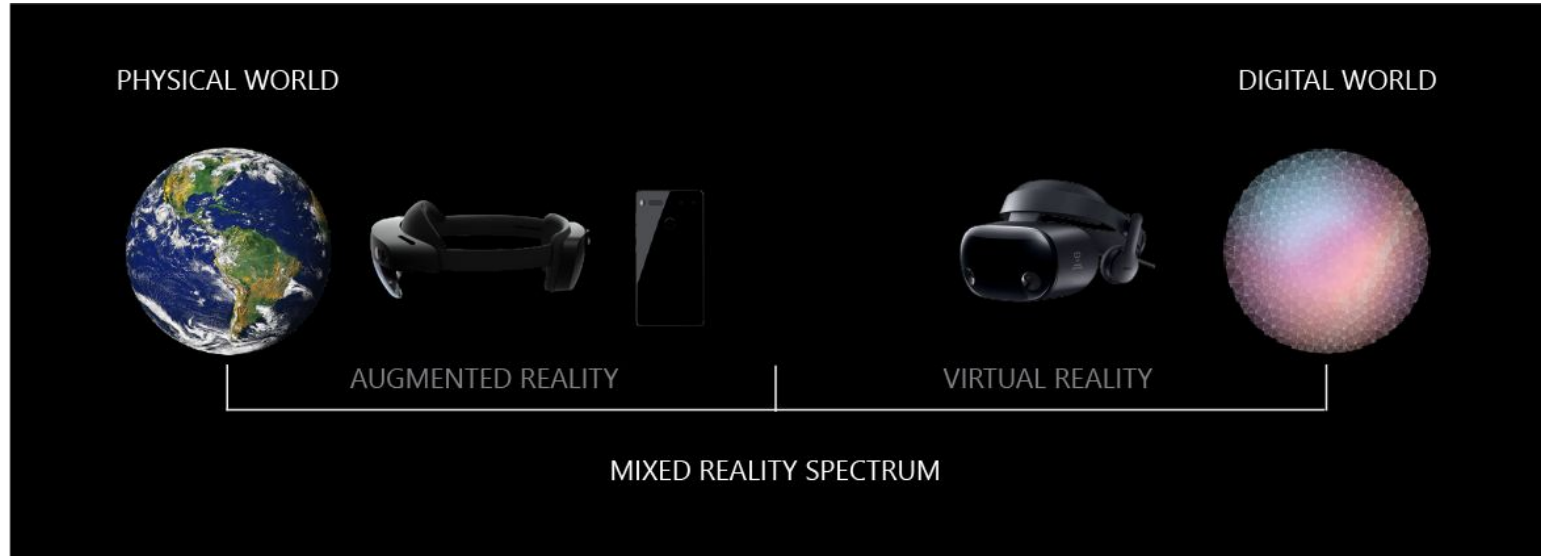
XR: Extended Reality or X as a Unknown Variable to indicate all Rs.

Where is the line between these terms?

# Milgram et al. (1995), Virtuality Continuum



# Microsoft's Version (2018)



# AR/MR

Questions:

Is one of them redundant and can be replaced by the other?

Are they even different from each other?

Can something become AR and MR at the same time?

# Headsets

VR	MR	AR	AR
Oculus Quest	Samsung Odyssey	Google Glass	Microsoft HoloLens
Opaque Display	Opaque Display	Transparent Display	Transparent Display
No See-through	Video see-through	Optical see-through	Optical see-through
Binocular	Binocular	Monocular	Binocular





<https://youtu.be/YJg02ivYzSs?t=30>

# A Hidden Definition

If you call it AR, it is AR.

# Why is this happening?

1. New field (e.g., no textbook definition)
2. Many people from different backgrounds
3. Many groups with different interests
4. No need to have a single definition

# Summary

1. There are multiple definitions of AR.
2. It is okay to have multiple definitions of AR.
3. A framework of Rs is useful.

\* I recommend developing your version of the definition.