



CS475/CS675 Computer Graphics

Augmented Reality

What is Augmented Reality?

Example: Cinema



Dawn of the Planet of Apes, Weta Digital, 2014

What is Augmented Reality?

Example: Advertising



National Geographic, 2011

What is Augmented Reality?

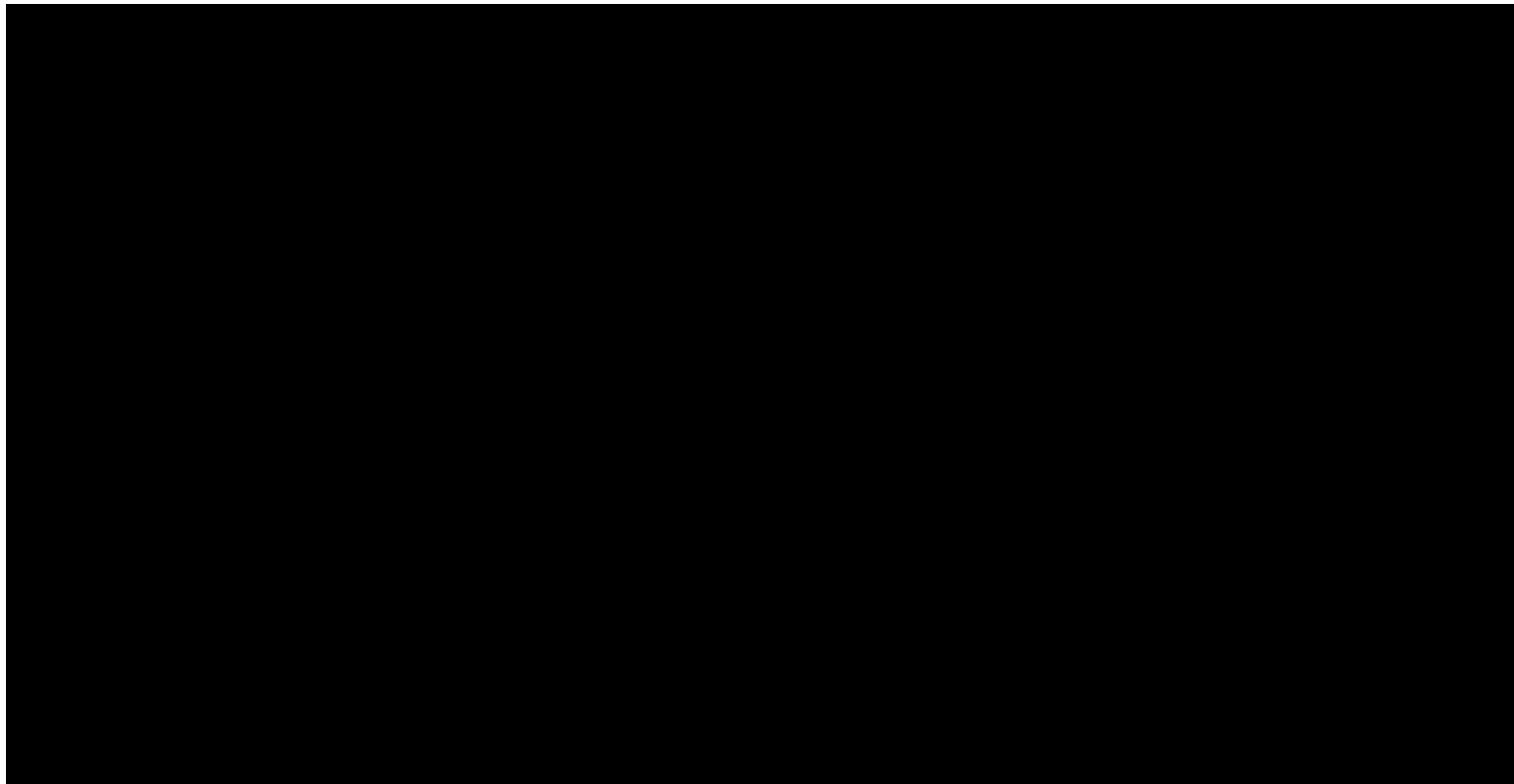
Example: Navigation



ROUTE 66 Maps + Navigation for Android, 2011

What is Augmented Reality?

Example: Digital Heritage



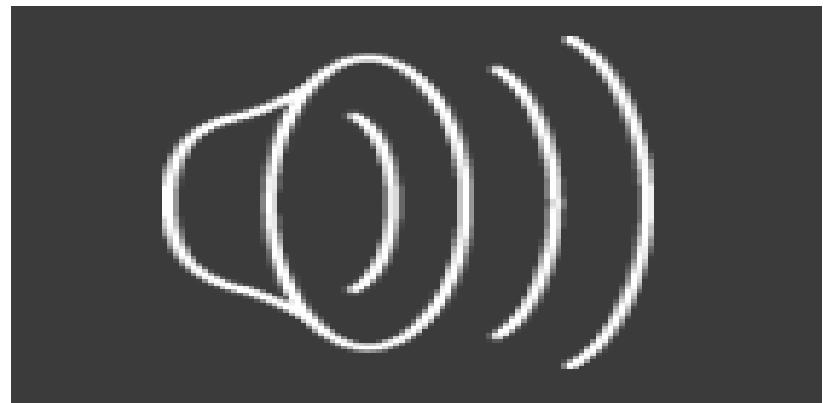
The Parthenon, SIGGRAPH 2004 Electronic Theater

What is Augmented Reality?

Example: Retail



Virtual Try-On, Zugara.com,



ViewAR, 2012

What is Augmented Reality?

Example: In the Lab



**Self Adaptive Animation
in
Augmented Reality**

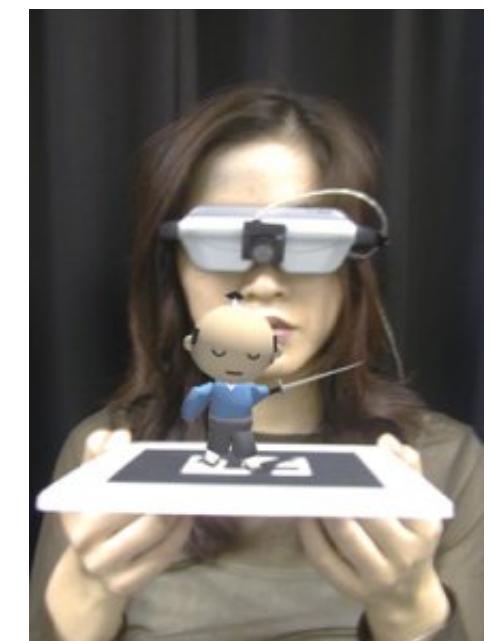
Self Adaptive Animation, Parag Chaudhuri, George Papagiannakis, Nada Magnenat-Thalmann, CGI 2008

What is Augmented Reality?

Augmented Reality (AR) is a view of the physical, real world environment that is augmented by synthetic, computer-generated elements.

It was coined by Thomas Caudell, in 1990, while working at Boeing.

AR straddles the disciplines of Computer Vision and Computer Graphics as it needs Vision to understand the real world and it needs Graphics to create the synthetic elements to augment it.



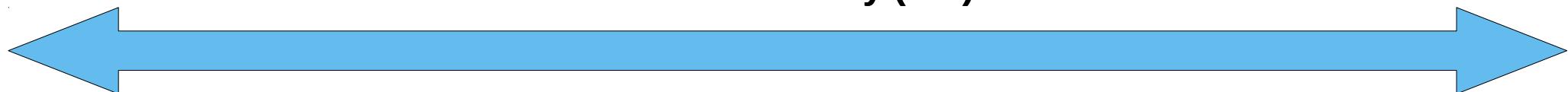
ARToolkit, Hirokazu Kato, Mark Billinghurst, IWAR 1999

The Real/Virtual Continuum

Real
Environment

Mixed Reality (MR)

Virtual
Environment



Augmented Reality: A class of displays on the reality-virtuality continuum, Milgram 1994

The Real/Virtual Continuum

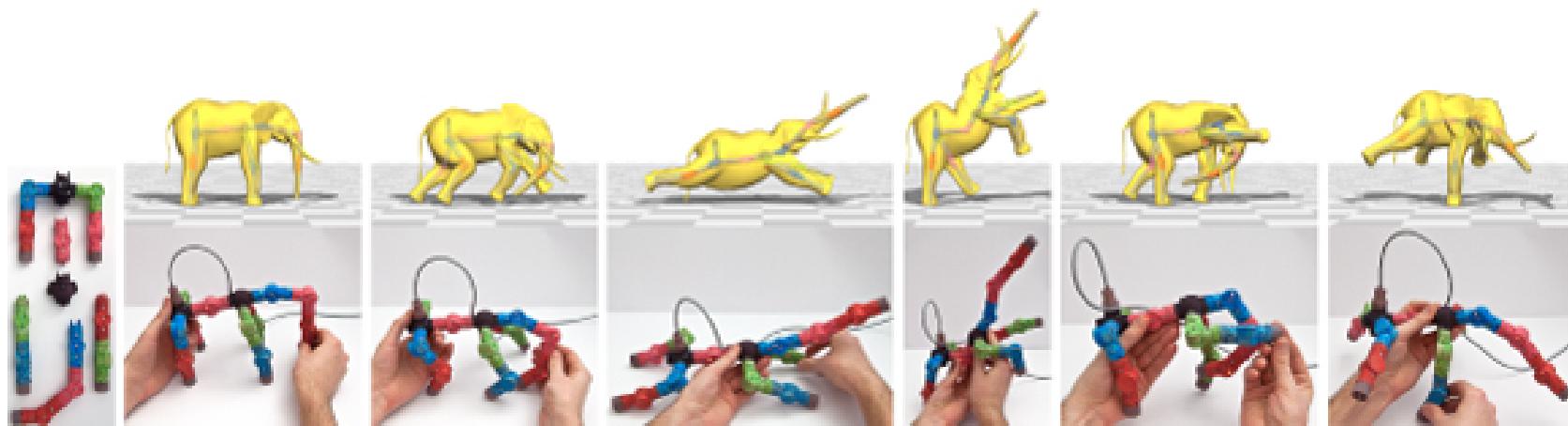
Real
Environment

Mixed Reality (MR)

Virtual
Environment



Tangible User
Interfaces (TUI)



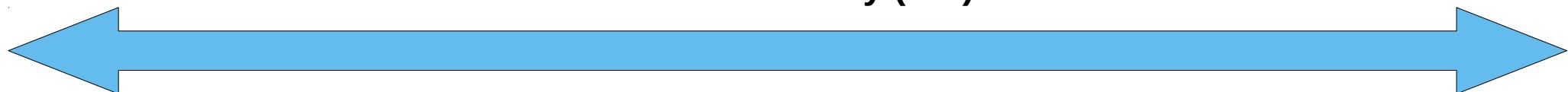
Tangible and Modular Input Device for Character Articulation, Jacobson et al., SIGGRAPH 2014

The Real/Virtual Continuum

Real
Environment

Mixed Reality (MR)

Virtual
Environment



Augmented
Reality (AR)



Spatial AR
Computer generated information is projected into a user's environment.

Augmented Reality Sandbox,
Oliver Kreylos et al., 2013

The Real/Virtual Continuum

Real
Environment

Mixed Reality (MR)

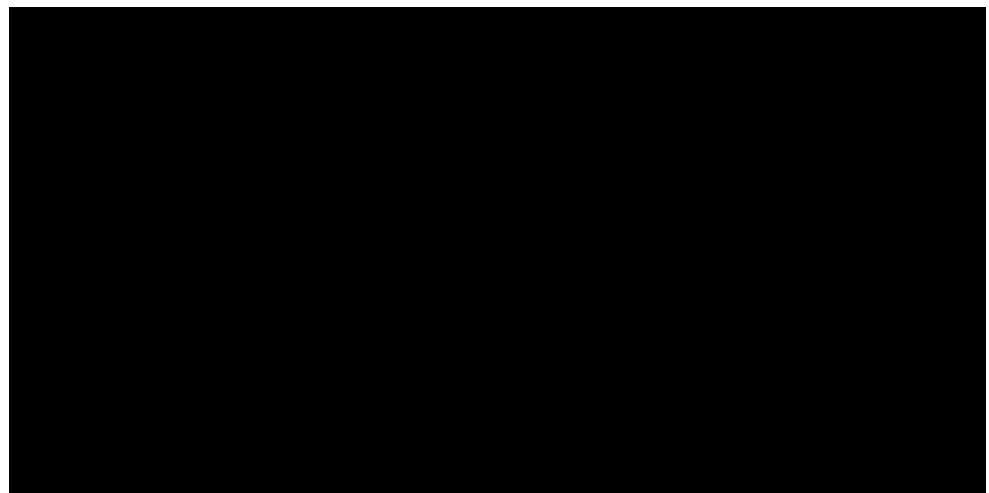
Virtual
Environment



Augmented
Reality (AR)

See-through AR

Computer generated information is projected into a user's view of the real environment via a HMD or a screen.



The Real/Virtual Continuum

Real
Environment

Mixed Reality (MR)

Virtual
Environment



Augmented
Virtuality (AV)



Elements of the real world added to a virtual environment.

www.arlsura.com
2012

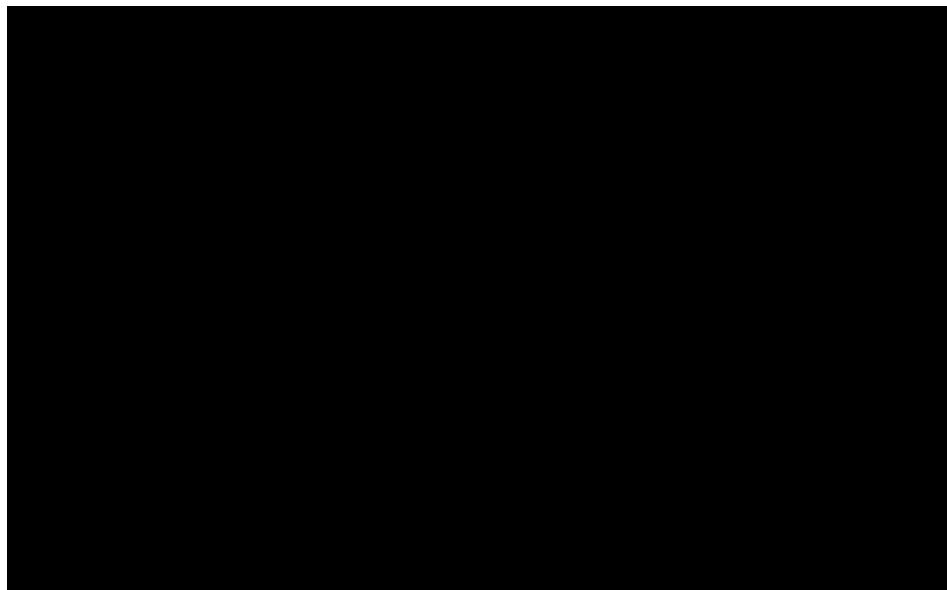
The Real/Virtual Continuum

Real
Environment

Mixed Reality (MR)

Virtual
Environment

Virtual
Reality (VR)



The virtual environment often completely fills the user's field of view in immersive VR.



Tachi Lab, 2012

Oculus Rift, 2013

Ingredients for AR



Capture the real world

Life of Pi, Rhythm and Hues, 2013

Ingredients for AR



Capture the real world



Life of Pi, Rhythm and Hues, 2013

Ingredients for AR



Capture the real world



Model the virtual world

Life of Pi, Rhythm and Hues, 2013

Ingredients for AR



Capture the real world



Model the virtual world



Augment

Life of Pi, Rhythm and Hues, 2013