Freie Universität Berlin

Mixed Reality - Opportunities and Challenges for Cultural Institutions

Prof. Dr. Claudia Müller-Birn

Institute of Computer Science | Freie Universität Berlin

Workshop „Virtual Reality im Museumskontext“ | Oct 23, 2017

We certainly had the dreams before,
but the computing just wasn’t good enough.

—Tom Furness

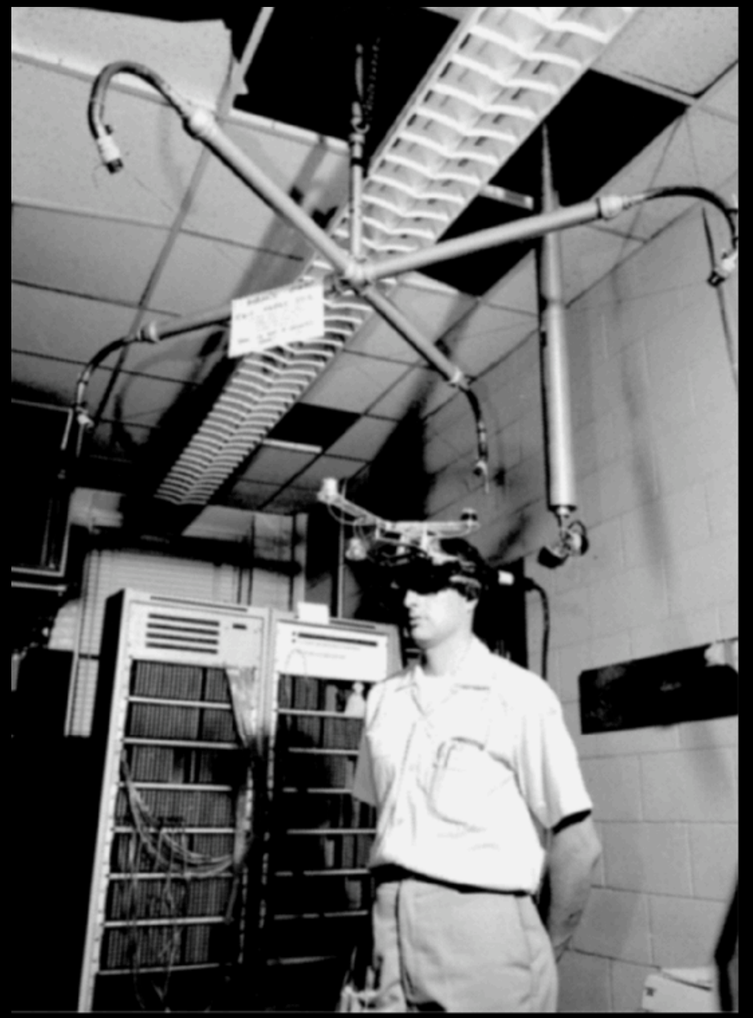
Sutherland, I. E. (1965). The Ultimate Display (pp. 506–508). Presented at the Proceedings of IFIP Congress.

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

The Sword of Damocles



Milgram, P., & Kishino, F. (1994). A taxonomy of mixed reality visual displays. IEICE TRANSACTIONS on Information and Systems, 77(12), 1321-1329.

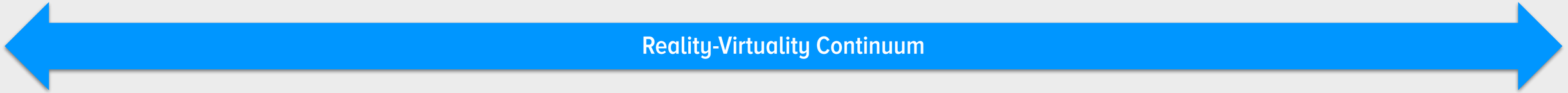
Reality-Virtuality Continuum

Tangible User Interface

Augmented Reality

Augmented Virtuality

Virtual Reality



Physical Environment (Atoms)

Digital Environment (Bits)

Milgram, P., & Kishino, F. (1994). A taxonomy of mixed reality visual displays. IEICE TRANSACTIONS on Information and Systems, 77(12), 1321-1329.

Reality-Virtuality Continuum

"[...] augment the real physical world by coupling digital information to everyday physical objects and environments". (Ishii & Ulmer, 1997)

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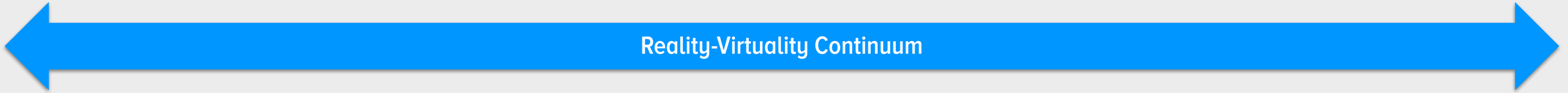
Augmented Virtuality

Virtual Reality



Physical Environment (Atoms)

Digital Environment (Bits)

Capurro, Carlotta, Dries Nollet, and Daniel Pletinckx. "Tangible interfaces for digital museum applications." Digital Heritage, 2015. Vol. 1. IEEE, 2015.

Milgram, P., & Kishino, F. (1994). A taxonomy of mixed reality visual displays. IEICE TRANSACTIONS on Information and Systems, 77(12), 1321-1329.

Reality-Virtuality Continuum

"[...] replicates an environment, real or imagined, and simulates a user's physical presence, allowing user interaction."

Tangible User Interface

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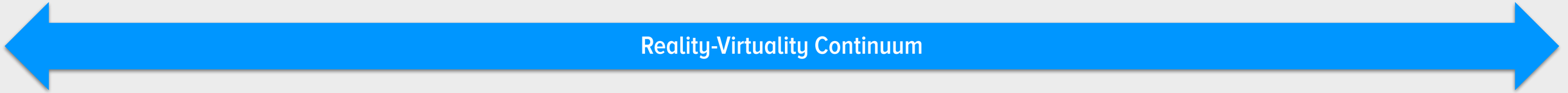
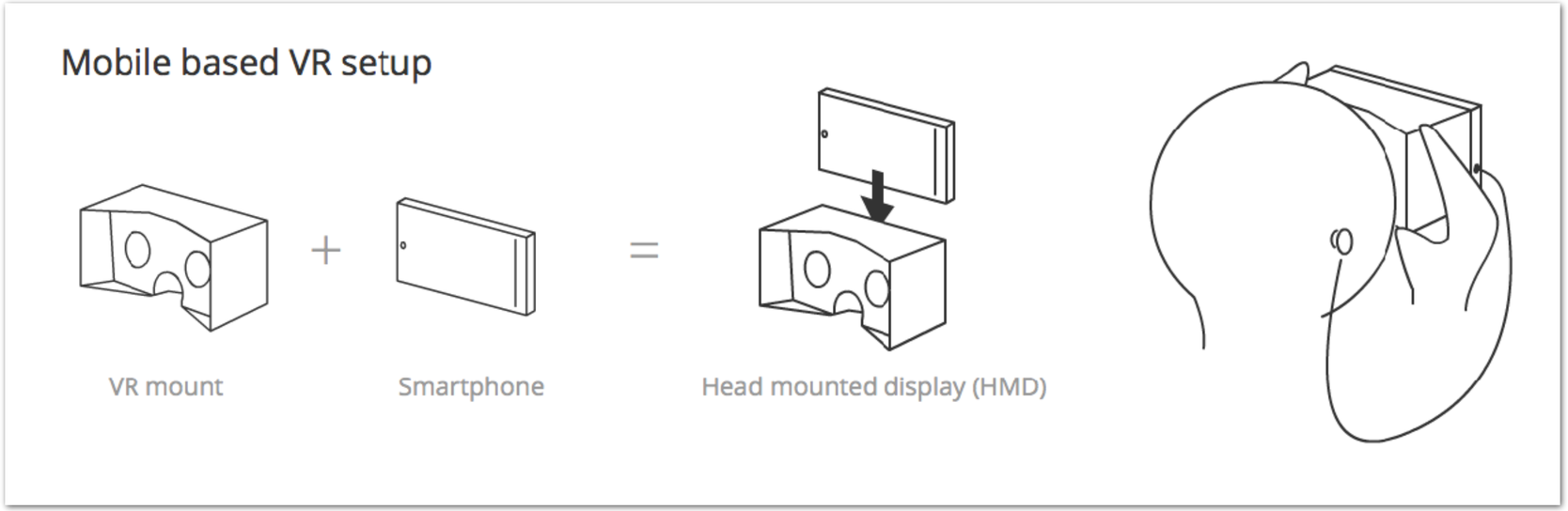


Physical Environment (Atoms)

Digital Environment (Bits)

Hardware Setup 1 (Low-fi VR)



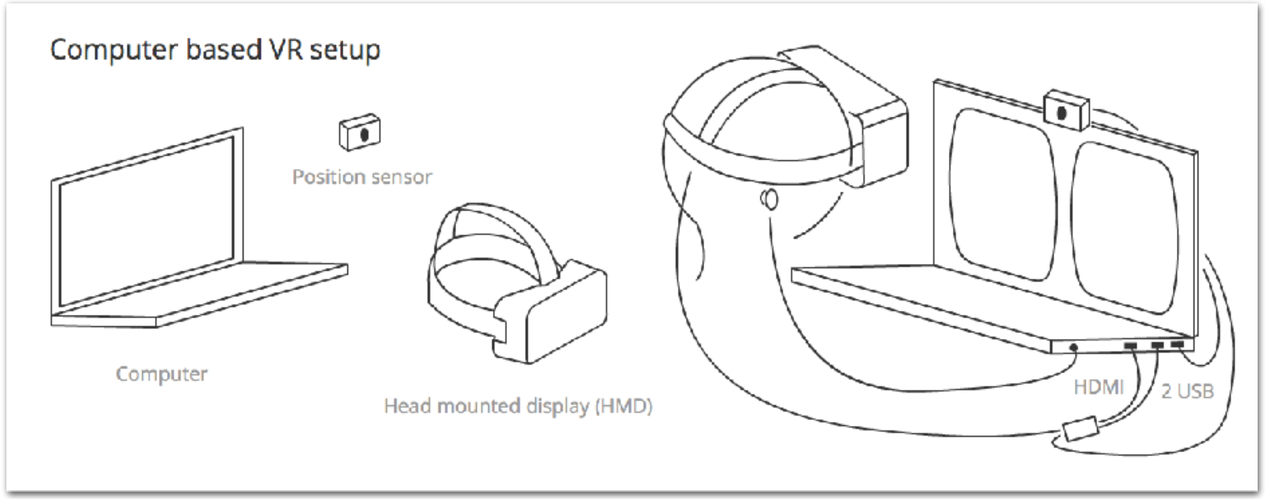
For example:

Google Cardboard, Samsung Gear VR

Google Cardboard V2

Pictures taken from:
https://developer.mozilla.org/en-US/docs/Archive/WebVR/Concepts

Hardware Setup 2 (High-fi VR)



For example,

Samsung Gear VR, Oculus Rift, HTC Vive

Pictures taken from:
https://developer.mozilla.org/en-US/docs/Archive/WebVR/Concepts

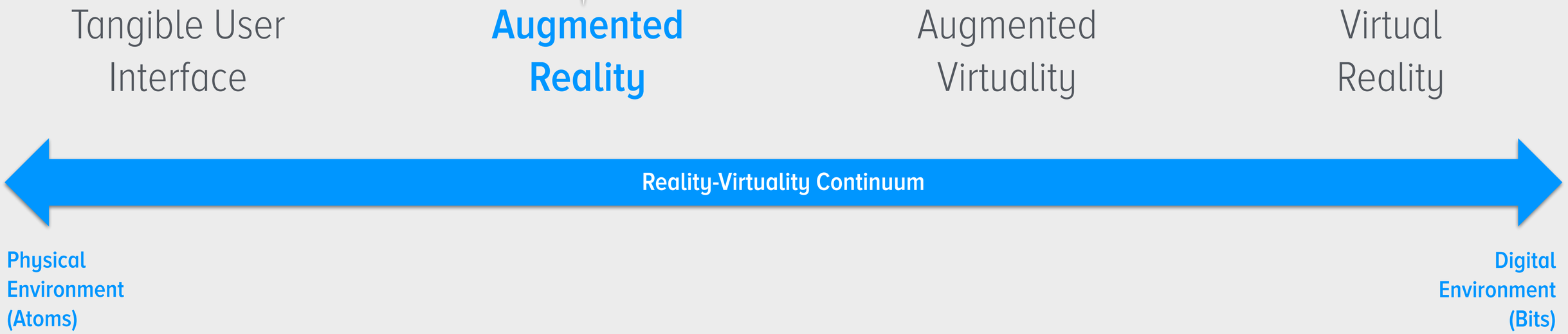
On the 26th of February 2015,

“RecoVR Mosul” (2015) https://www.economist.com/blogs/prospero/2016/05/virtual-reality
Further information: https://www.youtube.com/watch?v=0EazGA673fk

Milgram, P., & Kishino, F. (1994). A taxonomy of mixed reality visual displays. IEICE TRANSACTIONS on Information and Systems, 77(12), 1321-1329.

Reality-Virtuality Continuum

[...] is a technology that enhances human perception of physical world through the incorporation of computer generated data and simulations.



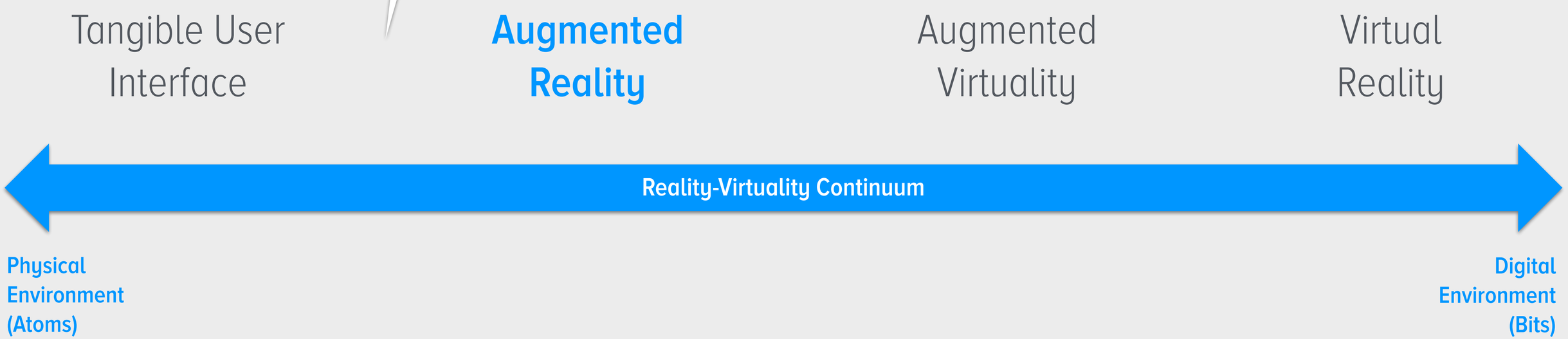

Check out the complete video here: https://vimeo.com/80896278

Check out the complete video here: https://www.youtube.com/watch?v=7agVb4IG16M

Milgram, P., & Kishino, F. (1994). A taxonomy of mixed reality visual displays. IEICE TRANSACTIONS on Information and Systems, 77(12), 1321-1329.

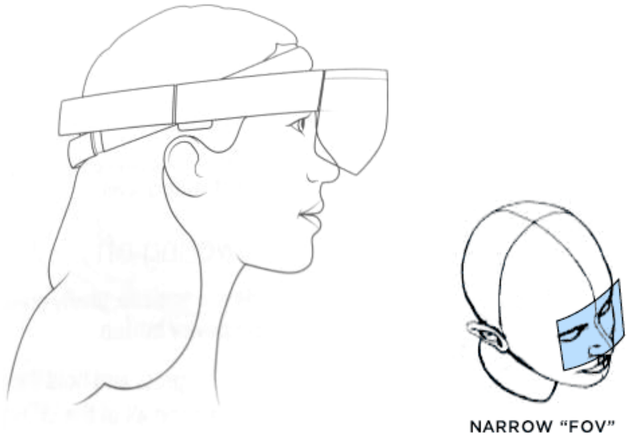
Reality-Virtuality Continuum

AR can be extended to **tangible AR** which merges physical and digital worlds to produce new environments and visualisations where **physical and digital objects co-exist** and interact in real time.



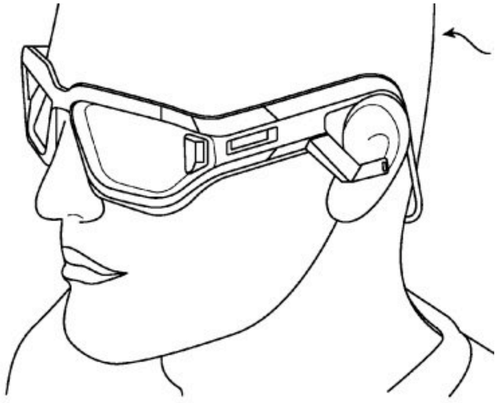
Reed, S. E., Kreylos, O., Hsi, S., Kellogg, L. H., Schladow, G., Yikilmaz, M. B., ... & Sato, E. (2014, December). Shaping watersheds exhibit: An interactive, augmented reality sandbox for advancing earth science education. In AGU Fall Meeting Abstracts. More information at: https://arsandbox.ucdavis.edu

Hardware Setup (See-Through AR)



For example,

Hololens



For example,

Magic Leap (patent concept)

Pictures taken from:
http://blog.aitgmbh.de/2016/08/09/hololens-erstkontakt-mit-der-hardware/

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Reality-Virtuality Continuum

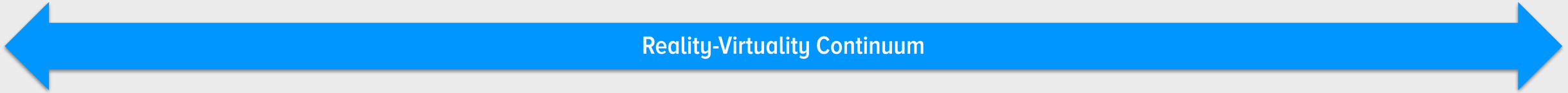
[...] inserts real world elements (e.g., objects, smell, wind, heat) to supplement the digital experience.

Tangible User Interface

Augmented Reality

Augmented Virtuality

Virtual Reality

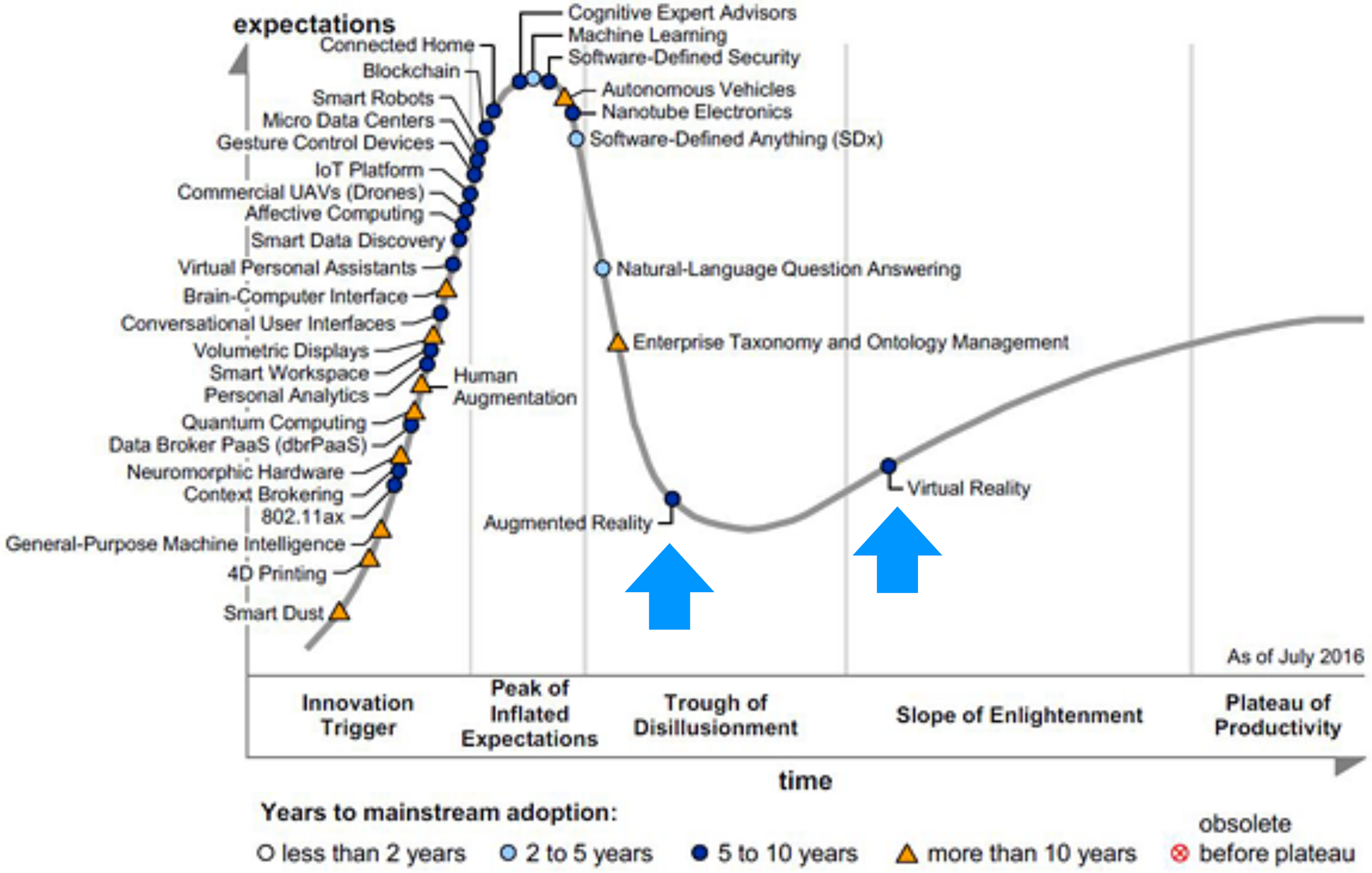


Physical Environment (Atoms)

Digital Environment (Bits)

Check out the complete video here: https://www.youtube.com/watch?v=cML814JD09g

How can you assess
your “Alice in wonderland” environment?



Source: Gartner (July 2016)

Hype Cycle for Emerging Technologies (2016)

Thoughts on Mixed Reality

» Existing MR environments are often **developed for a specific technical setup** (e.g. devices) with a clearly defined usage scenario, and a predefined information setup.

» Employing MR environments is still **challenging for both content creators** (e.g. only a niche audience, too expensive cameras) **and the audience** (e.g. high quality content is not conveniently accessible).

» Appropriate MR applications call for **new narratives of engagement**. **Interdisciplinary teams** (e.g., curator, computer scientists, designers) are needed to create such narratives.

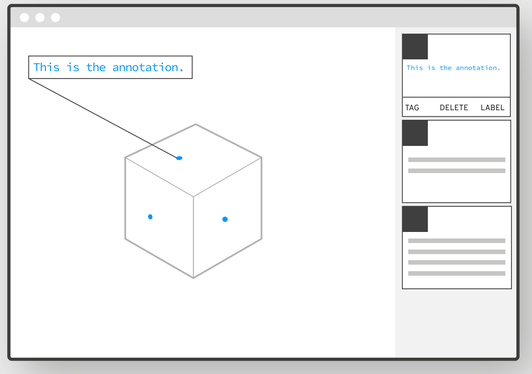
Hoffmeister, A., Berger, F., Pogorzhelskiy, M., Zhang, G., Zwick, C. & Müller-Birn, C., (2017). Toward Cyber-Physical Research Practice based on Mixed Reality. In: Burghardt, M., Wimmer, R., Wolff, C. & Womser-Hacker, C. (Hrsg.), Mensch und Computer 2017 - Workshopband. Regensburg: Gesellschaft für Informatik e.V..

Towards Cyber-Physical Research Practice

Image Knowledge Gestaltung
An Interdisciplinary Laboratory

Sponsored by DFG

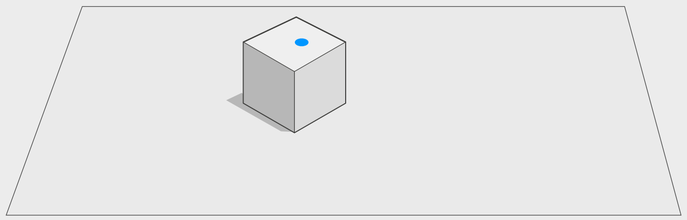
Software process.annotator based on Web VR



Natural Language Recognition/ Processing

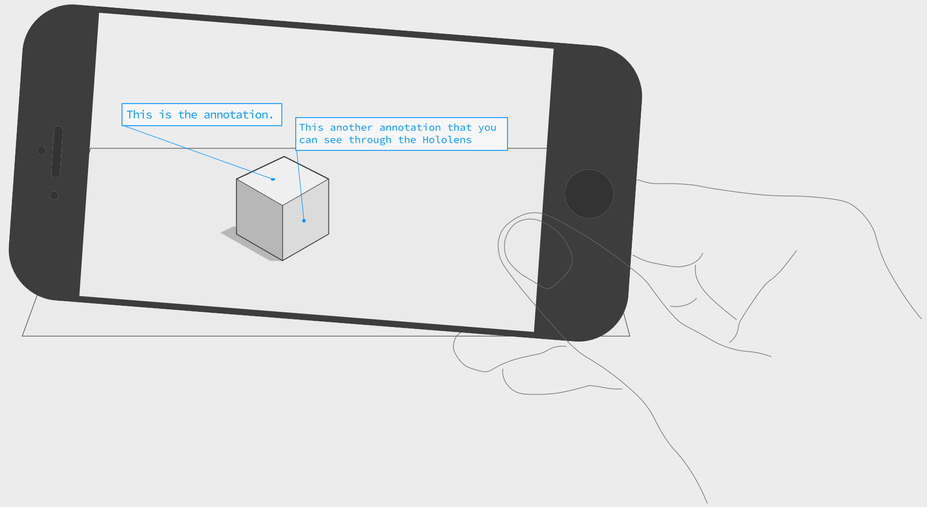
This is a spoken annotation.

Annotation Tool (Hardware Prototype)



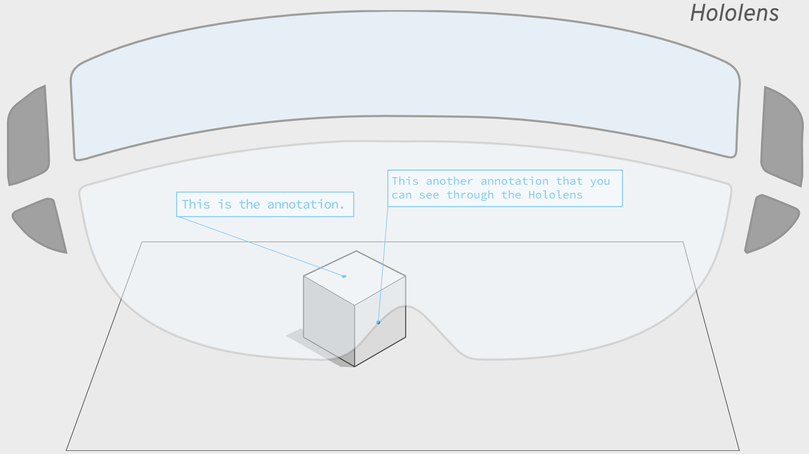
Physical Object

1



2

Hololens



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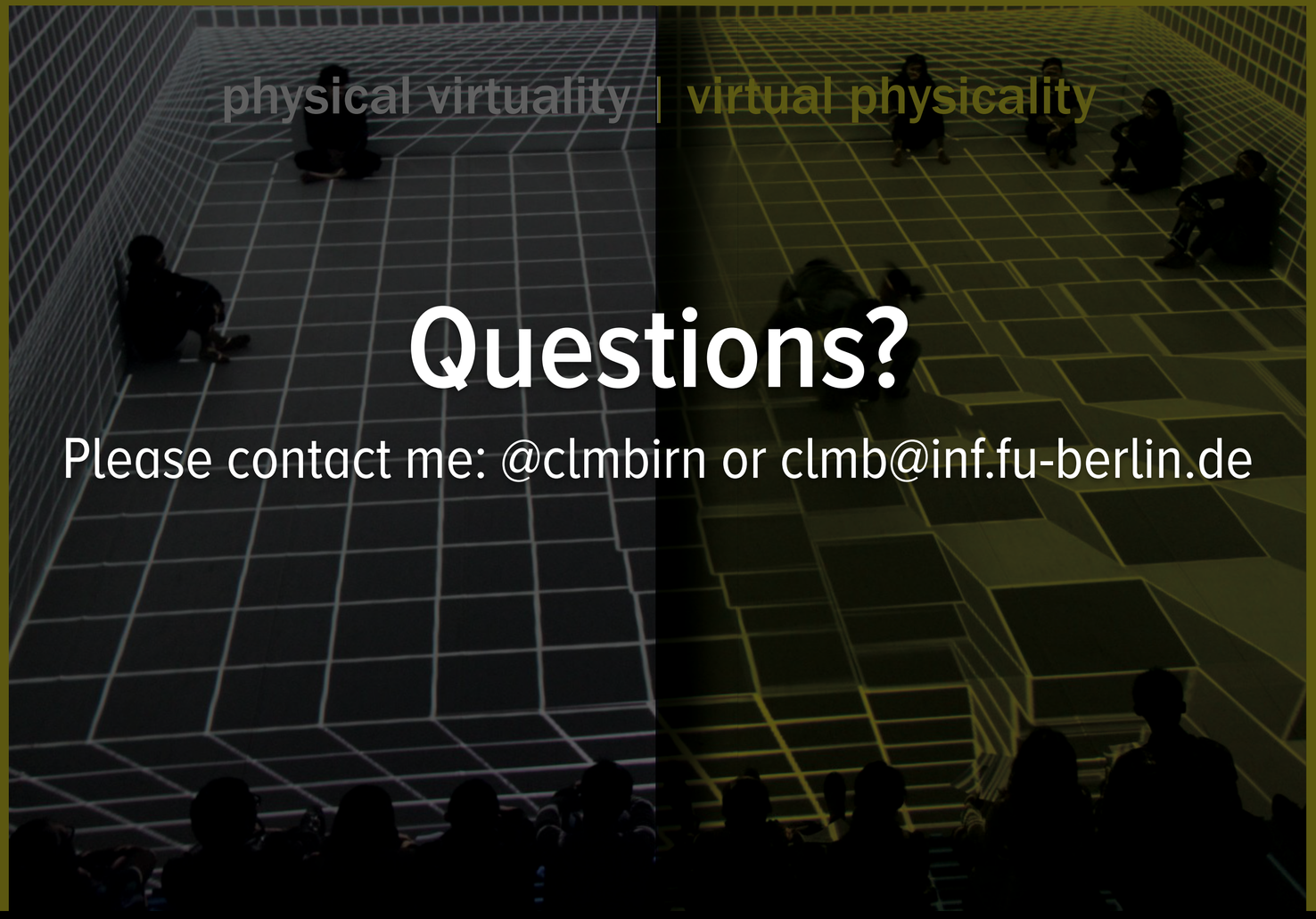
Human-Centered Computing
RESEARCH GROUP

Freie Universität Berlin



Questions?

Please contact me: @clmbirn or clmb@inf.fu-berlin.de