

# The Rise of Allocentric Interfaces and the Collapse of the Virtuality Continuum

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## ABSTRACT

The popular concepts of Virtual Reality (VR) and Augmented Reality (AR) arose from our ability to interact with objects and environments that appear to be real, but are not. One of the most powerful aspects of these paradigms is the ability of virtual entities to embody a richness of behavior and appearance that we perceive as compatible with reality, and yet unconstrained by reality. The freedom to be or do almost anything helps to reinforce the notion that such virtual entities are inherently distinct from the real world—as if they were magical. This independent magical status is reinforced by the typical need for the use of “magic glasses” (head-worn displays) and “magic wands” (spatial interaction devices) that are ceremoniously bestowed on a chosen few. For those individuals, the experience is inherently egocentric in nature—the sights and sounds effectively emanate from the magic glasses, not the real world, and unlike the magic we are accustomed to from cinema, the virtual entities are unable to affect the real world.

This separation of real and virtual is also inherent in our related conceptual frameworks, such as Milgram’s Virtuality Continuum, where the real and virtual are explicitly distinguished and mixed. While these frameworks are indeed conceptual, we often feel the need to position our systems and research somewhere in the continuum, further reinforcing the notion that real and virtual are distinct. The very structures of our professional societies, our research communities, our journals, and our conferences tend to solidify the evolutionary separation of the virtual from the real.

However, independent forces are emerging that could reshape our notions of what is real and virtual, and transform our sense of what it means to interact with technology. First, even within the VR/AR communities, as the appearance and behavioral realism of virtual entities improves, virtual experiences will become more real. Second, as domains such as artificial intelligence, robotics, and the Internet of Things (IoT) mature and permeate throughout our lives, experiences with real things will become more virtual. The convergence of these various domains has the potential to transform the egocentric magical nature of VR/AR into more pervasive allocentric magical experiences and interfaces that interact with and can affect the real world. This transformation will blur traditional technological boundaries such that experiences will no longer be distinguished as real or virtual, and our sense for what is natural will evolve to include what we once remember as cinematic magic.

## KEYWORDS

Virtual Reality, Augmented Reality, artificial intelligence, robotics, Internet of Things

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## BIO

Gregory Welch is a Professor and the Florida Hospital Endowed Chair in Healthcare Simulation at the University of Central Florida (College of Nursing, Computer Science Department, and the Institute for Simulation & Training), and Co-Director of the UCF Synthetic Reality Laboratory at UCF. He is also an Adjunct Professor in the Department of Computer Science at the University of North Carolina at Chapel Hill. In 1986 he received a degree in Electrical Engineering Technology from Purdue University (with *Highest Distinction*), and in 1996 a Ph.D. in Computer Science from the University of North Carolina at Chapel Hill. Prior to coming to UCF, Welch was a Research Professor at UNC. He also worked on the Voyager Spacecraft Project at NASA’s Jet Propulsion Laboratory, and on airborne electronic countermeasures at Northrop-Grumman’s Defense Systems Division. His research interests include human-computer interaction, human motion tracking, virtual and augmented reality, computer graphics and vision and healthcare-related applications. He has co-authored over 140 publications in these areas, and is a co-inventor on multiple patents. His awards include the IEEE VGTC Virtual Reality Technical Achievement Award in 2018 (VR 2018), and the Long Lasting Impact Paper Award at the 15th IEEE International Symposium on Mixed and Augmented Reality (ISMAR 2016). He has co-chaired conferences, workshops, and seminars; served on numerous international program committees; and is an Associate Editor for the journals *Presence: Teleoperators and Virtual Environments* and *Frontiers in Virtual Environments*. He maintains an internationally-recognized web site dedicated to the Kalman filter. He is a Senior Member of the Institute of Electrical and Electronics Engineers, and a member of the Association for Computing Machinery, the European Association for Computer Graphics (Eurographics), the Southern Nursing Research Society, the International Nursing Association for Clinical Simulation & Learning, and the Society for Simulation in Healthcare.

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