Why the VR You See Now Is Not the Real VR

Editors' Note: To celebrate Presence*'s 25th year of publication, we have invited selected members of the journal's original editorial board and authors of several early articles to contribute essays looking back on the field of virtual reality, from its very earliest days to the current time. This essay comes from founding editorial board member Mike Zyda, who highlights similarities between yesterday's and today's unsolved problems, and reminds us about the importance of researchers knowing their history.*

1 Introduction

In 1992, Nat Durlach and a number of us gathered on a dark and stormy night in New Orleans to chat about the future of virtual reality. We discussed the newly created MIT Press journal, *Presence: Teleoperators and Virtual Environments*, and the upcoming National Research Council Committee on Virtual Reality. I ended up saying "yes" to being first Associate Editor and later Senior Editor of *Presence* and saying "yes" to membership on the National Research Council Committee that put out the 1995 report *Virtual Reality: Scientific and Technological Challenges* (Durlach & Mavor, 1995).

The purpose of *Presence* was to be an archival journal for this new field of virtual reality, a place where researchers could record their attempts at solving some of the hard issues of virtual reality (locomotion, simulator sickness, tracking, etc.) and the systems being built from that technology. I remember putting together special issues on VR walkthrough technologies, and the hard issue of dealing with latency in a large networked virtual environment. And *Presence* had many other special issues on simulator sickness (including a cover picture for the ages), as well as medical and other applications of VR. All of these articles were carefully reviewed and put together to record the work done so that researchers and developers following could have an easier, more fruitful time. Archival literature seemed a key

part of that and *Presence* did the job well. This was at a time when the only other outlets for VR papers were conferences, some good, some sketchy, so *Presence* played a key role in the promotion packages of many, many faculty researchers.

I ended up being an editor for *Presence* for some 12 years, only ending when the Editor-in-Chief changed from Nat Durlach to Mel Slater.

In parallel with the startup of *Presence* was the standup of the National Research Council Committee in 1992 whose report came out in 1995 to wide dissemination (Durlach & Mavor, 1995). That NRC report, some 500+ pages, provided guidance to the U.S. government sponsor for that study as to what were the hard research and development issues in VR that the government ought to consider funding for basic research. Listed as the topics that needed to be solved were pretty much the same topics you would list today, including development of improved understanding of possible deleterious effects of spending substantial portions of time in synthetic environments, simulation sickness (sopite syndrome), technology development for whole body motion and locomotion, position tracking, speech communication, augmented reality real-world calibration, navigational cues in virtual space, autonomous actor behaviors, issues of latency in networked virtual environments and just about everywhere really, evaluation of virtual environments for their effectiveness, and a narrow list of potential application areas including design, manufacturing and marketing, medicine and health care, hazardous operations and training. No mention of VR for games, as HMDs were about $6,000 and 320 × 240

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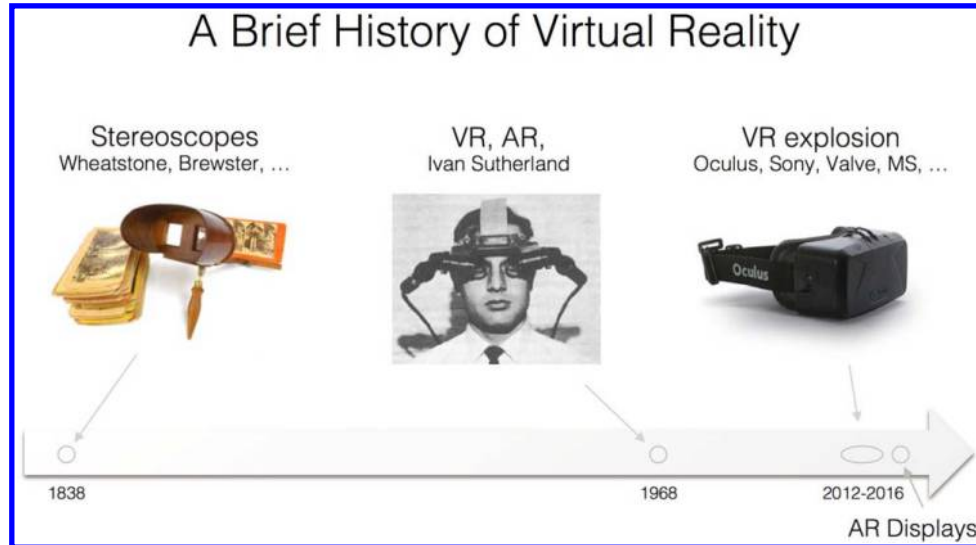
Figure 1. *Slide from the EE-267 virtual reality course taught at Stanford University by Gordon Wetzsten, Spring 2016.*

resolution per eye when that study came out. And work got done on these areas but most government funding in VR disappeared about 1996 except for defense and medical applications. Much of that was due to Congress changing the rules so that defense R&D funding had to be spent *directly* on warfighter application and not R&D, a complete disaster for the future of defense-funded technology, leaving our technological future to mega-monster companies like Google and Apple whose research rationales may be driven more by profitability arguments than societal good.

So, VR mostly went to sleep for a decade and a half and then Oculus did their Kickstarter and restarted interest in VR at a price point an order of magnitude lower than before but with the same R&D issues, no tracking to speak of, simulator sickness still there with the wrong piece of software . . . In fact, there are many people even in academia and at prestigious places that deny the VR work archived in *Presence* and that the NRC study exists at all. Recently a colleague sent me a slide from the VR class at Stanford (see Figure 1). No mid 1980s to 1990s VR work of any mention there on the slide! Now, the same week I received this slide, I had a VC tell me he did not fund VR startups that did not include Stanford grads

or faculty. I guess because the rest of us are too well educated, maybe?

Anyway, enough of my snarkiness. We, the R&D community of mid-1980s–mid-1990s did a phenomenal amount of research and development in those years that framed the hard questions for the future of VR and then all went to sleep and now it is all reopened with some of those issues still front-and-center. And not much of an R&D focus anywhere in sight.

2 Now

If you have a 90-day horizon and a commercial bent, then all you see in VR are either Samsung or Apple mobile VR solutions or, for those of you who prefer wires, the tracking-less Oculus and the temperamental, but great tracking, HTC Vive. And you just see graphics. There is a much bigger future for VR—VR is going to be the start of a new, larger platform that will bring computing closer to the human.

We are at the primitive stage for virtual reality where we can see and move through and interact with either 50,000 triangles per frame on a mobile device or 2M triangles per frame on a device tethered with a very thick

cable that lies in danger of pulling your $2,000 desktop off the desktop. While all of this is exciting, we have greater things that will come out in this field and give us experiences just barely even thought of—if we just do the right R&D and get those results into archival publications that others can read and respond to.

We will see lighter headsets, augmented reality systems that project directly into our eye, tracking that becomes nonintrusive and less finicky, speech recognition that becomes first rate and AI characters we can talk to and interact with, characters imbued with emotions that react to our sensed emotions. The biggest issue is how we author story in all of this and make it as competitive for our emotional engagement as film and the best of non-VR games. And how do we get there? We have to put aside some R&D funding for smart researchers to do great things that bring us our future. And we document that work in the open, preferably on papers online and searchable without fee, maybe in a journal like *Presence*.

VR is going to be bigger, badder, and not just 1990s graphics on a mobile phone stuck on our face, if only we do the right things.

3   About the Author

Michael Zyda is Founding Director of the USC GamePipe Laboratory, and Professor of Engineering Practice in the USC Department of Computer Science. At USC, he founded the B.S. in Computer Science (Games), the M.S. in Computer Science (Game Development), and the USC Games joint Advanced Games course and took that program from no program to the #1 Games program in the world. That program has been rated #1 by the *Princeton Review* for six straight years. His alums have shipped games played by over 2.5 billion players, about $100B in revenue. From fall 2000 to fall 2004, he was Founding Director of the MOVES (mod-

eling, virtual environments, and simulation) Institute located at the Naval Postgraduate School, Monterey, and Professor in the Department of Computer Science at NPS as well. Professor Zyda's research interests include computer graphics, large-scale, networked 3D virtual environments and games, agent-based simulation, modeling human and organizational behavior, interactive computer-generated story, computer-generated characters, video production, entertainment/defense collaboration, modeling and simulation, and serious and entertainment games. He is a pioneer in the following fields: computer graphics, networked virtual environments, modeling and simulation, and serious and entertainment games. He holds a lifetime appointment as National Associate of the National Academies, an appointment made by the Council of the National Academy of Sciences in November 2003, awarded in recognition of "extraordinary service" to the National Academies. He is a member of the Academy of Interactive Arts & Sciences. He served as the principal investigator and development director of the *America's Army* PC game funded by the Assistant Secretary of the Army for Manpower and Reserve Affairs. He took *America's Army* from conception to three million plus registered players and hence, transformed Army recruiting. The creation of the *America's Army* game founded the serious games field. He co-holds two patents that form the basis for the nine-axis sensor in the Nintendo Wii U. He is known as the "Indiana Jones of virtual reality" and the "Raymond Chandler of technical computer science."

Reference

Durlach, N. I., & Mavor, A. S. (Eds.) (1995). *Virtual reality: Scientific and technological challenges.* Washington, DC: National Academies Press.