

Clinical Virtual Reality: A Brief Review of the Future!

Albert "Skip" Rizzo, Ph.D.
Research Scientist and Professor
Institute for Creative Technologies, Dept. of Psychiatry and School of Gerontology
University of Southern California, Los Angeles, CA, USA
arizzo@usc.edu

Virtual reality (VR) has undergone a transition in the past 15 years that has taken it from the realm of expensive toy and into that of functional technology. Revolutionary advances in the underlying VR enabling technologies (i.e., computation speed and power, graphics and image rendering technology, display systems, interface devices, immersive audio, haptics tools, tracking, intelligent agents, and authoring software) have supported development resulting in more powerful, low-cost PC-driven VR systems. Such advances in technological "prowess" and accessibility have provided the hardware platforms needed for the conduct of human research and treatment within more usable, useful and lower cost VR systems.

At the same time, there has been a growing awareness of the potential value of VR by scientists and clinicians, in addition to the general public. While much of this recognition may be due to the high visibility of digital games and massive shared internet-based virtual worlds (World of Warcraft, Halo and 2nd Life, etc.), clinical research applications routinely come into the public consciousness via the popular media. Whether this can be considered as "hype" or "help" to a field that has a storied history of alternating periods of public enchantment and disregard, still remains to be seen. Regardless, growing public awareness coupled with solid scientific results delivered from VR clinical and research applications, have brought the field past the point where skeptics can be taken seriously when they characterize VR as a "fad technology". It is not 1994 anymore!

When discussion of the potential for VR applications in the human clinical and research domains first emerged in the early-1990s, the technology needed to deliver on the anticipated "visions" was not in place. Consequently, during these early years, VR suffered from a somewhat imbalanced "expectation-to-delivery" ratio, as most users trying systems during that time will attest. The "real" thing never quite measured up to expectations generated by some of the initial media hype, as delivered for example in the films *The Lawnmower Man* and *Disclosure*! Yet the idea of producing simulated virtual environments that allowed for the systematic delivery of ecologically relevant stimulus events and challenges was compelling and made intuitive sense. As well, a long and rich history of encouraging findings from the aviation simulation literature lent support to the concept that testing, training and treatment in highly proceduralized VR simulation environments would be a useful direction for psychology and rehabilitation to explore. Since that time, we have seen the development of VR systems that have demonstrated added-value for addressing a variety of clinical conditions and research objectives including: fear reduction with phobic clients, stress management in cancer patients, acute pain reduction during wound care with burn patients, exposure therapy for Post Traumatic Stress Disorder, body image disturbances in patients with eating disorders, navigation and spatial training in children and adults with motor impairments, functional skill training and motor rehabilitation with patients having central nervous system dysfunction (stroke, TBI, SCI cerebral palsy, multiple sclerosis, etc.) and in the assessment (and in some cases, rehabilitation) of attention, memory, spatial skills and executive cognitive functions in both clinical and unimpaired populations. To do this, scientists have constructed virtual airplanes, skyscrapers, spiders, battlefields, social events populated with virtual humans, fantasy worlds and the mundane (but highly relevant) functional environments of the schoolroom, office, home, street and supermarket. These efforts are no small feat in light of the technological challenges, scientific climate shifts and funding hurdles that many researchers have faced during the early development of this emerging technology.

This presentation will provide a brief overview of the many forms of Virtual Reality that have been applied across a diverse range of clinical disorders and research questions. I will then present a detailed overview of the use of VR for Exposure Therapy for anxiety disorders, addictive behaviors and with OIF/OEF military personnel with PTSD. This will be followed by overviews of research and clinical applications of VR for cognitive assessment/rehabilitation, motor rehabilitation, pain distraction and social interaction. The social interaction overview will conclude with the detailing of an emerging project area that involves the creation of artificially intelligent virtual human "patients" for clinical training.

Biographical Sketch:

Albert "Skip" Rizzo received his Ph.D. in Clinical Psychology from the State University of New York at Binghamton. He is a Research Scientist at the University of Southern California Institute for Creative Technologies and has Research Professor appointments with the USC Dept. of Psychiatry and Behavioral Sciences, and at the USC School of Gerontology. Dr. Rizzo conducts research on the design, development and evaluation of Virtual Reality systems targeting the areas of clinical assessment, treatment and rehabilitation. This work spans the domains of psychological, cognitive and motor functioning in both healthy and clinical populations. In the psychological domain, his latest project has focused on the translation of the graphic assets from the Xbox game, *Full Spectrum Warrior*, into an exposure therapy application for combat-related PTSD with Iraq War veterans. Additionally, he is conducting research on VR applications that use 360 Degree Panoramic video for exposure therapy (social phobia), role-playing applications (anger management, etc.), and recently has used this technology to capture news scenes for future multimedia journalism applications. He is also working with a team that is creating artificially intelligent virtual patients that clinicians can use to practice skills required for challenging clinical interviews and diagnostic assessments (sexual assault, resistant patients, suicide lethality, etc.). His cognitive work has addressed the use of VR applications to test and train attention, memory, visuospatial abilities and executive function. In the motor domain, he has developed VR Game systems to address physical rehabilitation post stroke and Traumatic Brain Injury and for prosthetic use training. He is also investigating the use of VR for pain distraction at LA Children's Hospital and is currently designing game-based VR scenarios to address issues of concern with children having autistic spectrum disorder. His research also involves designing and evaluating 3D User Interface devices and interaction methods and he has created a graduate level Industrial and Systems Engineering course at USC entitled, "Human Factors and Integrated Media Systems". In the area of Gerontology, Dr. Rizzo has served as the program director of the USC Alzheimer's Disease Research Center and is currently conducting a VR study of visuospatial and wayfinding ability with persons with Alzheimer's.

He is the associate editor of the journals, *CyberPsychology and Behavior*; and *The International Journal of Virtual Reality*, is Senior Editor of the MIT Press journal, *Presence: Teleoperators and Virtual Environments*, is on a number of editorial boards for journals in the areas of cognition and computer technology (*Cognitive Technology*; *Journal of Computer Animation and Virtual Worlds*; *Media Psychology*) and is the creator of the Virtual Reality Mental Health Email Listserve (*VRPSYCH*). He has recently guest-edited theme issues for *Applied Psychophysiology and Biofeedback* on "VR and Psychophysiology", two new journal issues on "Virtual Rehabilitation" (in *CyberPsychology and Behavior* and in the *International Journal on Disability and Human Development*) and one for the MIT journal *Presence: Teleoperators and Virtual Environments* on "Virtual Reality and Neuropsychology". Previously, he guest edited a theme issue in *CyberPsychology and Behavior* on "Aging and Information Technology". He served as General Chair for the IEEE VR2003 conference in Los Angeles and co-chaired this conference in 2004. He was also the Conference Chair of the 4th Annual Workshop on Virtual Rehabilitation on Catalina Island, Los Angeles in Sept. of 2005. He will be chairing a military sponsored conference on "Technological Approaches for the Treatment of Wounded Warriors" in November of 2009. In his spare time, he plays rugby, listens to music and rides his motorcycle.

Contact Info:

Albert "Skip" Rizzo, Ph.D.

Research Scientist and Research Professor

Institute for Creative Technologies and Dept. of Psychiatry/School of Gerontology

University of Southern California,

13274 Fiji Way, Marina del Rey, CA. 90292; email: arizzo@usc.edu

Office: 310-301-5018 Cell: 213-610-4737 Fax: 310-574-5725

VRPSYCH Lab: <http://projects.ict.usc.edu/vrpsych/>

