



IMSC
Integrated
Media Systems
Center

INTEGRATED MEDIA SYSTEMS CENTER
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**USER CENTERED SCIENCES – The Virtual Office: A Virtual Reality
Environment For The Assessment and Rehabilitation of Cognitive and
Functional Impairments in Adults**



BRIEF DESCRIPTION OF DEMONSTRATION We have developed a HMD-delivered Virtual Reality (VR) system for the assessment and possible rehabilitation of a range of cognitive/functional processes in adults. Widespread occurrence of impairments in these processes that also impact vocational potential are seen in a variety of clinical conditions and it is our belief that VR provides specific assets to address these impairments that are not available using existing methods. Virtual reality HMDs are well suited for these types of applications as they serve to provide a controlled stimulus environment where cognitive challenges can be presented along with the precise delivery and control of “distracting” auditory and visual stimuli. This effort has involved the development of a virtual “office” that can be used as a tool to test and train both component cognitive processes and functional work behaviors. Clinical populations that are currently being tested in the “office” include persons with multiple sclerosis, traumatic brain injury, stroke and Alzheimer’s Disease. Within the environment, the user sits at a real desk, but within the HMD, they see the scenes that make up the virtual “office”. The virtual desk contains a phone, computer screen, and message pad, while throughout the office, a virtual clock ticks in real-time, and a variety of human avatar representations of co-workers/supervisors can be actively engaged. Various performance challenges can be delivered via the computer screen (visual mode), the phone (auditory mode), and from the avatar “supervisors” verbal directions. These commands can direct the user to perform certain functions within the environment that can be designed to assess and rehabilitate attention, memory, and executive functions. For example, to produce “prospective” memory challenges, the user might receive a command from the virtual supervisor to “turn-on” the computer at a specific time to retrieve a message that will direct a response. This will require the user to hold this information in mind, monitor the time via the wall clock and then initiate a response at the appropriate time. By adding multiple contingent commands, both attention and executive functioning can be addressed. As well, the influence of distraction can be tested or trained for via the presentation of ambient office sounds (i.e., radio announcements, conversations, etc.), activity occurring outside the window (cars rumbling by), or by producing extraneous stimuli on the desktop (i.e., irrelevant, yet “attention-grabbing” email messages appearing on computer screen). Essentially, functional work performance challenges typical of what occurs in the real world can be systematically presented in an ecologically valid VE.

UNIQUE OR DISTINGUISHING CHARACTERISTICS RELATIVE TO STATE-OF-THE-ART

- Immersive environment for cognitive assessment/rehabilitation; Fully adjustable delivery of cognitive challenges and distractions; Recording and storage of cognitive/motor behavior within a naturalistic, ecologically valid environment, fully laptop deliverable.

APPLICATIONS

- Neuropsychological, Educational and Cognitive diagnosis, assessment, and training for school systems, clinicians, and researchers.

RECENT HIGHLIGHTS, LEVEL OF DEVELOPMENT, UPCOMING MILESTONES

- User-centered design trials have provided a foundation for successful implementation of the system in the initial clinical trial.
- Pilot data supports use of the system for discriminating memory performance of non-impaired vs. clinical groups.
- Initial clinical trial underway at the Kessler Medical Rehabilitation Research Center in New Jersey testing memory performance in patients with multiple sclerosis and brain injury.
- International consortium of test sites currently beginning clinical trials using the virtual office and classroom environments.

LIST OF PUBLICATIONS, REFERENCES, URLs

- Rizzo, A.A., Buckwalter, J.G., van der Zaag, C. (2002). Virtual Environment Applications for Neuropsychological Assessment and Rehabilitation, In Stanney, K. (Ed.) Handbook of Virtual Environments, L.A. Earlbaum: New York. pp. 1027-1064.
- Schultheis, M.T. & Rizzo, A.A. (2002). The Virtual Office: A New Tool for Cognitive/Functional Assessment and Rehabilitation. Paper presented at the 10th Annual Medicine Meets Virtual Reality Conference. Los Angeles, CA. January 24, 2002.
- Rizzo, A.A., Buckwalter, J.G., Bowerly, T., McGee, J., van Rooyen, A., van der Zaag, C., Neumann, U., Thiebaut, M., Kim, L., Pair, J. & Chua, C. (2001). Virtual Environments for Assessing and Rehabilitating Cognitive/Functional Performance: A Review of Project's at the USC Integrated Media Systems Center. *Presence: Teleoperators and Virtual Environments*. Vol. 10 (4), 359-374.

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