USC UNIVERSITY OF SOUTHERN CALIFORNIA | IMSC Integrated Media Systems Center

INTEGRATED MEDIA SYSTEMS CENTER
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USER CENTERED SCIENCES – The Virtual Classroom: A Virtual Reality Environment For The Assessment and Rehabilitation Of Attention Deficit Hyperactivity Disorders In Children

USC STUDENTS, DEGREES Laehyun Kim, M.S., Todd Bowerly, Ph.D., Randall Taylor, M.S.

BRIEF DESCRIPTION OF DEMONSTRATION We have developed a HMD-delivered Virtual Reality (VR) system for the assessment and possible rehabilitation of attention processes. Our rationale for choosing this cognitive process relates to the widespread occurrence of attention impairments seen in a variety of clinical conditions and 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. Our first effort in this area has involved the development of a virtual "classroom" specifically aimed at the assessment of Attention Deficit Hyperactivity Disorder (ADHD) in children. The prevalence of ADHD is estimated at 3%-5% in school age children with data on its occurrence in adolescence and adulthood being somewhat limited. The scenario consists of a standard rectangular classroom environment containing three rows of desks, a teacher's desk at the front, a male or female teacher, a blackboard across the front wall, a side wall with large window looking out onto a playground and moving vehicles. On each end of the wall opposite the window, there is a pair of doorways, through which distracting activities occur. Within this scenario, children are assessed in terms of attention performance while a series of typical classroom distracters (i.e. ambient classroom noise, movement of other pupils, activity occurring outside the window, etc.) are systematically controlled and manipulated within the virtual environment. The child sits at a virtual desk within the virtual classroom and the environment can be programmed to vary with regards to such factors as seating position, number of students, gender of the teacher, etc. On-task attention can be measured in terms of performance on a variety of attention challenges that can be adjusted based on the child's expected age or grade level of performance In addition to these attention performance indicators, behavioral measures that are correlated with distractibility and/or hyperactivity components (i.e., head turning, gross motor movement) are measured and quantified using magnetic tracking and data mining tools.

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 provided a foundation for successful implementation of the system in the initial clinical trial.
- Initial clinical trial indicated that performance in the Virtual Classroom system successfully discriminated clinical groups producing significant results in 20 minutes time that were concordant with 2.5 hours of testing using traditional psychometric tools.
- Distraction testing produced results that discriminated groups in a manner that is not possible with traditional methods.
- Hyperactive motor movement tracking and analysis using ImmersiData mining tools in collaboration with Cyrus Shahabi's lab further discriminated groups in a manner not possible with traditional methods.
- No critical incidents of negative side effects were found with the use of the system.
- A second clinical trial using an iteratively evolved VR Classroom with both female and male users has commenced.

LIST OF PUBLICATIONS, REFERENCES, URLs

Rizzo,A.A., Buckwalter, J.G. van der Zaag, C. Virtual Environment Applications for Neuropsychological Assessment and Rehabilitation, In Stanney, K. (Ed.) Handbook of Virtual Environments, 2002, L.A. Earlbaum: New York. pp. 1027-1064.

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