



4th VR SYMPOSIUM

Virtual Reality, Associated Technologies and Rehabilitation

**A Research Workshop of the
Israel Science Foundation
June 20-22, 2006**

Showcase

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Acknowledgements

Caesarea Edmond Benjamin de Rothschild Foundation
Institute for Interdisciplinary Applications of Computer
Science

Faculty of Social Welfare and Health Studies

Department of Occupational Therapy

University of Haifa

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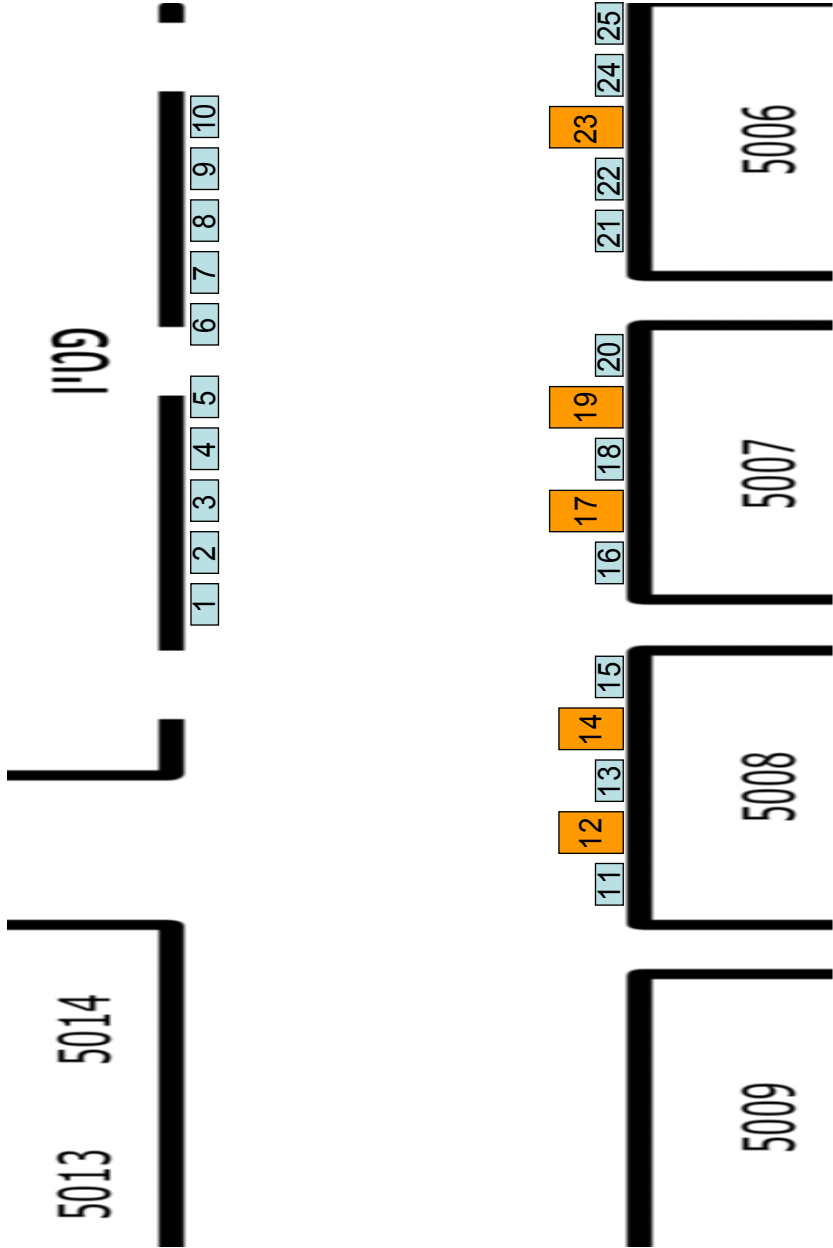
**Day 2: Wednesday June 21, 2006
15:30-18:30**

**VR Showcase
5th Floor patio area, Rabin Building
University of Haifa**

**“Hands-on” stations demonstrating the
latest innovations in virtual reality hardware and
software**

Meir Shahar – convener

Showcase Floor Plan



Station 1

Research and Clinical Applications of Haptic Feedback in Simple Virtual Environments

Dr. Uri Feintuch

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In this research we employ low cost, off-the-shelf products for research and intervention, which require haptic feedback. Our software tool allows the researcher or clinician design simple geometric audio-visual-haptic environments. Potential candidate research fields include studies of cross-modal learning and way-finding for people who are blind.

Station 2

Game Play Technologies with VR-based Applications for Cognitive, Psychological, Emotional and Motor Disorders

Prof. Albert A. “Skip” Rizzo

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This presentation will include descriptions of a variety of ongoing projects at USC that integrate game play and technology with VR-based applications for the assessment, treatment and rehabilitation of cognitive, psychological, emotional and motor disorders. These projects have focused on the development of applications for: 1. Exposure therapy in returning Iraq War veterans with PTSD, (2) Pain distraction in children undergoing painful medical procedures and chemotherapy, (3) Motor rehabilitation for persons with central nervous system dysfunction (i.e. stroke, brain injury) and (4) Cognitive/functional assessment and training in children with ADHD, Down’s Syndrome, and social anxiety

Station 3

Mindreader Software

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Mind Reading is a unique reference work covering the entire spectrum of human emotions. Using the software you can explore over 400 emotions, seeing and hearing each one performed by six different people. Mind Reading is for everyone interested in emotions. It has been designed with awareness of the special needs of children and adults who have difficulties recognizing emotional expression in others. It is also an invaluable resource for actors, directors, writers and anyone involved in the dramatic arts. The title enables the user to study emotions and to learn the meanings of facial expressions and tone of voice, drawing on a comprehensive underlying audio-visual and text database.

Station 4

VR Simulators of Driving and Other Real-world Navigation

Dr. Robert Astur

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We will display our driving simulator that is used to assess driving skill in elderly patients as well as other psychiatric groups. In addition, we will display software used to assess hippocampus function and other spatial navigation skills. Lastly, we will display our environment used to assess place preferences for rooms where cocaine was previously administered.

Station 5

Assessment of Neck Disorders in a Virtual Environment

Hilla Sarig Bahat, Dr. Yocheved Laufer

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Mechanical neck disorders are common in western countries, they are partly known as whiplash injuries as a result of motor vehicle accidents, or with atraumatic etiology, due to degenerative changes. Various studies explored ways of cervical assessment and used different outcome measures, e.g. range of motion, repositioning ability, muscle bulk etc. A great variability in methodology exists amongst these studies, and their reliability and validity in many cases is restricted. This supports the need for a sensitive and reliable assessment of neck movement, which is evaluated in real time, and stimulates spontaneous neck movements.

Station 6

Tangible Cognitive Interfaces: ActiveCubes

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Tangible Cognitive Interfaces (TCIs) are dynamic tools for monitoring a variety of perceptual-motor processes required when performing constructional tasks. Cognitive Cubes were designed as a TCI for the examination of three-dimensional (3D) spatial constructional ability. ActiveCubes are an electronic Lego-like tangible user interface designed to construct 3D objects. To date, Cognitive Cubes have been used to investigate adult spatial cognitive ability. Their use as a concrete, ecologically valid tool to understand dynamic functional processes underlying constructional ability in either typically developed children or in children with neurological pathology has not yet been explored. The overall goal of the present research is to develop and evaluate a paradigm in which TCIs are used for the study, assessment and intervention of dynamic constructional ability.

Station 7

Computerised Penmanship Evaluation Tool (ComPET)

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Handwriting is a complex perceptual-motor human activity. Recent developments in data collection technology now permit the examination of a much richer set of handwriting outcome measures than were traditionally available. Using ComPet software (POET in the past) with the aid of a digitizing tablet and instrumented pen, enable monitoring the handwriting process in real time and store objective temporal, spatial and pressure data in a format amenable to sophisticated analyses. The system is suitable for use in different languages. The uniqueness of the system concealed in the ongoing development of analysis and visualization methods for clinician's use, which will advance the client's insight about his deficits and promote the evaluation and intervention methods. Previous studies have established ComPET's reliability and validity.

Station 8-9

ERGIS 2.0 – Enriched Reality Geographical Info System

Ehud Dayan , Dan Golan , Dana Schlesinger

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ERGIS is a "context sensitive" personal info system which uses multiple sensors, and overlays relevant information derived from the Internet directly onto the see through eyeglasses of mobile users. Information is superimposed over the objects the user is looking at when the user needs information about those objects. ERGIS introduces the concept of "Query by looking" whereby the geographical position of the person and their field of view (FOV) are used to determine the context and display relevant data onto the "see through" Head-Up Display.

Station 10

Jerusalem Tele-Rehabilitation System

Dr. Joseph Tiran, Dr. Heidi Sugarman, Eyal Ben Moshe, Arnon Laudén, Dr. Aviva Weisel-Eichler, Ehud Dayan

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We are developing a low cost robotic system - The Jerusalem Tele-rehabilitation System - using a commercially available force feedback joystick, an ordinary home PC and a standard high-speed internet connection. The system is designed to be used both at home and in the clinic. Using the joystick, the patient performs exercises designed to aid in recovering motor function of the upper limb. The system monitors the status and progress of the patient, records the kinematic parameters of his movements, and summarizes the results. There are two modes of operation – the cooperative mode in which therapist and patient are online together and the therapist can guide the patient's movements, and the stand-alone mode in which the patient works by himself, not necessarily online.

Station 11-12

Video Capture VR Systems, VMall, TheraGame, Sony PlayStation II EyeToy

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Video capture VR consists of a family of camera-based, motion capture platforms. When using a video-capture VR platform, users stand or sit in a demarcated area viewing a large video screen that displays one of a series of simulated environments. Users see themselves on the screen, in the virtual environment, and their own natural movements direct the progression of the task. Currently, the main video capture platforms used for rehabilitation are GestureTek's GX and IREX. Sony's PlayStation II EyeToy applications have begun to be used as an intervention tool as well. "TheraGame" is a novel video capture VR system. It operates on a standard PC with a simple webcam. The software is programmed using a Java-based visual interaction system. This system enables a quick and easy definition of virtual objects and their behavior.

Station 11

Virtual Street Crossing

Yuval Naveh rynaveh@012.net.il

Meonot Macabi Migdal Hazahav

<http://pluto.huji.ac.il/~msyuvaln/vr/index.html>

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The street crossing virtual environment is a non-immersive desktop computer application, with successively graded levels of difficulty that provide users with an opportunity to decide when it is safe to cross a virtual street. Recent research results showed that unilateral neglect patient's achievements using the VR street crossing intervention equaled, at the very least, those achieved by conventional visual scanning tasks. For some measures, the VR intervention even surpassed the scanning tasks in effectiveness, supporting also the contention that effectiveness of visual perceptual tasks increases with task complexity.

Station 13

Multimedia intervention software - applications for children with autism

Adi Ne'eman, Orit Hetzroni

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A set of applications investigating the effects of multimedia for enhancing various abilities and skills by children with autism. One of the applications investigated the use of social stories for enhancing various social skills and interactions of children at middle school age levels. Another application investigated the use of a multimedia application for teaching basic spatial concepts. A set of small vignettes were used to increase identification of facial expressions and an understanding of feelings associated with social events. The importance of color was investigated as part of a study investigating the use of stories for teaching graphic symbols to young children identified as having PDD. All study results demonstrated success. The software used in those studies will be demonstrated during the showcase.

Station 14

Virtual Reality Teaching Game

Dr. Dorothy Strickland

Do2Learn

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www.do2learn.com

This virtual reality teaching game, which is created using the Unreal Engine, is designed to help children learn to recognize the boundaries of a yard when engaged in play. Since most pedestrian accidents occur when children dart into a street without looking, this program tries to help a child become cognizant of when they move outside a safe area. An animated avatar teaches boundaries and what to do when you need something outside that boundary.

Station 15

Diamond Touch StoryTable: Enforcing collaboration to enhance social communication of children with high-functioning autism

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MERL's DiamondTouch Hardware is a multi-user touchable interface that detects multiple simultaneous touches by two to four users. Each user sits or stands on a receiver such that touching the table surface activates an array of antennas embedded within its surface. Zancanaro et al. (2003) have developed a Story-Table interface which enforces collaboration between children while telling a story. The application is multimodal in character, providing visual stimuli, responding to touch commands, and enabling the recording of narratives. We use the Story-Table to help children with HFA to facilitate verbal and non-verbal interaction during story-telling situations.

Station 16

Virtual Jumping Rope

Daphna Talithman, Orna Portugaly

Independent artists

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Jumping Rope integrates a familiar playground game with the computerized world. Characters turning a rope are projected onto two opposing screens. Participants are invited to stand in the area between the two screens and jump. The participants are able to see that the characters are holding and turning a rope. The middle part of the rope does not exist; therefore the participants have to visually imagine the rope in order to jump on time. The success or failure of the participants is monitored by a camera serving as a sensor, using video tracking technology. If they manage to synchronize their jump with the (virtual) rope, the characters encourage them and continue to turn the rope. When they fail to synchronize their jumps, the characters react to their failure. The installation consists of three different scenarios, each featuring a different situation, in which two characters turn the rope. The aim is to return the participant to a state where he functions as a "child" and finds himself "trapped" between two characters, each with his own nature, sensitivities and expectations. The jumping enables the scenario to progress. The installation creates integration between the physical and virtual worlds. The installation is suitable for one or several participants.

Station 17

XTR Xtreme Reality 3D Video Capture

Pazit Reuven, Dor Givon

XTR Xtreme Reality

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Extreme Reality (XTR) established in early 2005,
develops:

"Plug & Play" Real Time 3D Human Machine Interface
kit.

The kit is an advanced mechanism for 3D tracking, a
tracker-less full human body in real time using any
simple camera. The kit includes thin plastic lens (easily
attached to any simple camera) and dedicated software.

XTR is an Israeli high tech company backed by US
investors.

XTR has 10 employees and operates in Tel Aviv
Headquarters.

Station 18

Virtual Environments for Assessment and Rehabilitation of Cognitive Functions

Dr. Evelyne Klinger

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In a Virtual Supermarket, participants are engaged in a task of shopping list. During the session various data are regularly recorded. An analysis of the performance is then carried out, with a review of the participant's path. A specification of the cognitive alteration can be achieved.

Station 19

Motorika ReoGo Rehabilitation Robot

**Dr. Samuel Faran, Doron Yoeli, Omer Einav,
Ronit Zadicario, Michael (Mika) Smoly, Doron
Shmilovitch**

Motorika

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The Reo™ family aim of use is to improve the rehabilitation of upper limb impairments due to hemiplegic event after stroke (CVA). The Reo is a robot that takes the impaired patient hand and applies programmed exercises and games in order to improve the upper extremity range-of-motion, strengthen muscles, reduce pain due to enhanced tonus and spasticity and get a better ADL quality of life. The system applies few modes of operation, including a combination of these modes, starting from full robotic guiding movement and end-up with full patient free self-operating movement. The patient activity is based on patient visual recognition of the activity through visual screen dynamic presentation and cognitive motivation to achieve the goal. The system is fully computerized, evaluates patient status, grades patient performance and issues clinical reports of patient progress. Target users are physical medicine physicians, PT's, OT's.

Station 20

Virtual Reality for Post-Traumatic Stress Disorder for Victims of Terrorist Bombing

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The recent introduction of virtual reality (VR) as an adjunct to imaginal exposure therapy has led to promising initial results. Via the presentation of natural but controlled simulated environments, VR affords opportunities to capitalize on the patient's imagery ability, and to supplement them with visual and auditory simulated experiences. VR also allows for graded exposure to increasingly realistic virtual objects and events that can be monitored and tailored to the individual patient. As a result, VR therapy may increase a patient's feelings of self-efficacy and of being an active agent of his own experience. The objective is to develop a clinical tool for PTSD therapeutic intervention. Simulated scenarios, based upon a variety of audiovisual materials originating from terrorist bombings in Haifa, have been programmed by collaborators from the University of Washington (Seattle, Washington).

Station 21

Diagnosing Schizophrenia with Virtual Reality

Dr. Avi Peled, Anna Sorkin

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Schizophrenia is a brain disorder of multimodal disintegration. Our goal is to develop a new family of automatic tools for the diagnosis of schizophrenia, using Virtual Reality Technology (VRT). VRT is specifically suitable for this purpose, because it allows for multimodal stimulation in a complex setup, and the simultaneous measurement of multiple parameters. In this work we studied sensory integration within working memory, in a navigation task through a VR maze.

Station 21

Virtual Reality and Auditory Feedback Cues for Improvement of Gait in Movement Disorders Patients

Prof. Yoram Baram

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This innovative device uses virtual reality to improve walking in the elderly, as well as in Parkinson's patients, stroke victims and, more generally, people with movement disorders - possibly reducing their need for medication or surgery. The apparatus - a small device strapped to the patient's clothing - displays a tiled floor through a tiny device attached to the patient's eyeglasses. The tile patterns provide continuous, stabilizing visual information which safeguards against stumbling and falling while walking. The patented innovation is the first of its kind to respond to the patient's motions rather than just providing a constant visual display. The image reacts to the patient's motions just like in real life.

Station 22

STISIM Drive Interactive Driving Simulator

Dr. Rachel Kizony, Yehuda Katzman

IMCO simulations

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Interactive driving simulator with a single driving display and 45 degree driver field-of-view, commercial game-type driving controls and STISIM Drive simulation software with a simple vehicle dynamics model. The system is designed for: * Driver assessment, * Pre-license training, risk analysis, * Introduction to emergency situations on the road.

Station 23

VISSTA

**Dr. Asnat Bar Haim Erez, Prof. Noomi Katz, Dr.
Racheli Kizony, Meir Shahar**

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VISSTA is a computerized system designed to assist the clinician in the evaluation and treatment of individuals with visual spatial attention deficit. It is based on visual search and attention theoretical models and enables running different levels/programs and registering accuracy of performance and reaction time. VISSTA was found to be sensitive to levels of visual spatial attention by means of accuracy and reaction time and was tested on healthy and stroke populations.

Station 24

CAREN - Computer Assisted Rehabilitation Environment

Orit Elion¹, Yotam Bahat², Dr. Itzhak Siev-Ner³

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We present examples of the CAREN® system in a clinical setting for improving balance and motor perceptual skills in individuals with a variety of impairments. CAREN® (Computer Assisted Rehabilitation Environment) is a versatile, multi sensory system for diagnostics, rehabilitation, evaluation and registration of human balance characteristics and movement control. The system works in real-time and enables the creation of a variety of experiences in a controlled and repeatable environment by using several VR principals. CAREN® consists of a motion platform, that enables manipulation of the surface on which the person is standing, while motion capture systems measure and register the individual's movements, placing the individual in a predictive feedback loop. This enables simulation of familiar surroundings and creating usually unnatural situations: a state where the person controls and influences the surface one stands on, in a dynamic and active way.

Station 25

HabiTest - Virtual environments for Design and Evaluation of Settings for People with Physical Disabilities

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We aimed to construct and evaluate a simulative tool, known as HabiTest, which will overcome the inherent limitation of a posteriori design by providing a priori opportunities to verify the suitability of a proposed design for a particular user, using the option of virtual reality platform. This tool has been designed to address the needs of the environmental modification intervention process as well as the needs of a newly designed rendering. Being a VR tool, meaning a tool that is visual and interactive, HabiTest is also designed in a way that enables all the participants of the design process (client, architect and occupational therapist) to evaluate the environment from the view point of its actual user – the client.

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