ISVR Newsletter

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ISVR

NEWSLETTER

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IN THIS ISSUE

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UPCOMING EVENTS

VISIGRAPP 2015 : Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications
March 11 - 14, 2015, Berlin, Germany
http://www.visigrapp.org/

TAR 2015: Technically Assisted Rehabilitation Conference
March 12 - 13, 2015, Berlin, Germany
http://www.tar-conference.de/

Rehab Tech Asia 2015
March 26 - 28, 2015, Singapore
http://www.rehabtechasia.com/

International Congress on NeuroRehabilitation and Neural Repair
May 21 - 22 May, 2015, The Netherlands
http://wfnr.co.uk/

9th International Conference on Pervasive Computing Technologies for Healthcare
May 21 - 23, 2015, İstanbul, Turkey
http://pervasivehealth.org/2015/show/home

Rehab Week 2015
Recent Advances in Neurorehabilitation (ICRAN) / International Neurorehabilitation Symposium (INRS) / International Conference on Virtual Rehabilitation (ICVR)
June 9 - 12, 2015, Valencia, Spain
http://www.rehabweek.org/sys/

9th World Congress of the International Society of Physical and Rehabilitation Medicine
19 - 23 June, 2015, Berlin, Germany
http://www.isprm2015.org/

20th Anniversary CyberPsychology, CyberTherapy & Social Networking Conference (CYPSY20)' on iACToR!
June 29 - July 2, 2015, San Diego, California
http://tinyurl.com/qcea5e9

TECHNOLOGY PROFILE

Interactive Communication and Ergonomics of New Technologies – ICE-NET Lab lab Applied Technology for Neuro-Psychology lab (ATN-P Lab)

Andrea Gaggioli
Researcher at Department of Psychology, Catholic University of Milan, Italy

http://dipartimenti.unicatt.it/psicologia-home
www.auxologico.it

Where is your lab located?

I collaborate with two labs, both coordinated by Prof. Giuseppe Riva: the Interactive Communication and Ergonomics of NEw Technologies – ICE-NET Lab at Catholic University of Sacred Heart in Milan and the Applied Technology for Neuro-Psychology lab (ATN-P Lab) at Istituto Auxologico Italiano, a biomedical research institute also based in Milan. The research activity at LICENT lab is mainly focused on basic research on cyberpsychology and communicative interaction, whereas at Auxologico we mainly focus on healthcare applications of emerging technologies (ranging from VR to mobile and wearable tools).

How did it start, how long has it been around?

Both Labs are around since the late nineties and were started by the need of investigating the psychological implications/ applications of new technologies, with a special focus on virtual reality.

Who are the members?

There is an high turnover, however the team includes mainly psychologists, neuroscientists, and developers.

a Virtual Reality stress therapy session

What research interests does your lab have?

ATN-P LAB: In its first decade, the lab pioneered much of the applications that enabled the diffusion of Virtual Reality and Internet in the field of health care. Specifically, its research work led to the development of a new scientific discipline - Cybertherapy - integrating innovative research ranging from clinical psychology and cognition, to mobile devices and simulation apparatus. According to ISI Web of Science, the ATN-P lab is among the leading labs worldwide for numbers of publications in the field of Virtual Reality. The key feature of the ATN-P lab is its interdisciplinary approach including cognitive scientists, clinical psychologists, HCI experts, computer scientists, and biomedical engineers. ATN-P lab best-practice procedure model is based on experience gained from a great number of national and international projects. Strong emphasis is given to the role of prototyping and decisive orientation toward user goals. The ATN-P lab has collaborated in a number of international projects focused on virtual reality and ambient intelligence applications in neuroscience and medicine, acting in some of them as coordinating partner.

The Interactive Communication and Ergonomics of NEw Technologies – ICE-NET Lab: This laboratory developed out

(continued from page 2)

of the interests of a group of researchers and professors active in psychosocial and technology studies. Its main concerns are:
the study of cyberpsychology from three main perspectives: (1) fundamental (underlying psychological processes); (2) clinical (therapeutic effectiveness) and; (3) applied (practical applications in psychology);
communicative interaction and new communication technologies: virtual reality; multimedia technology; communication networks; ubiquitous computing;
ergonomics and new theoretical and methodological paradigms.

What makes your approach unique?

I think there are two aspects that make our approach unique: the idea that there are many ways of combining psychology and technology, but only one way to do it effectively. And the key to this unique way is to start from a well-defined need and identify the most effective commercial technology combination to solve it. Our added value does not lie in developing new technologies, but using existing technologies in the cleverest possible way.

What technologies are available for general use?

We have several ready-to market technologies and applications, such as the VR platform NeuroVR and several apps for mental health and wellbeing.

You can download NeuroVR from here: http://www.neurovr2.org/.

An example of a mobile application for mental health/wellbeing is available in AppStore for iPhone and iPad

Screen capture of the Positive Technology app for mobile stress management

CLINICAL PROFILE

Kessler Foundation

Denise Krch
Research Scientist in the Traumatic Brain Injury Laboratory at Kessler Foundation Research Center

New Jersey, United States
http://kesslerfoundation.org

Where is your facility located?

Kessler Foundation (KF) is a non-profit research foundation that supports rehabilitation research and community employment programs. Our mission is to improve the lives of people with physical and cognitive disabilities caused by stroke, multiple sclerosis, brain and spinal cord injury, and other chronic neurologic and musculoskeletal conditions.

Kessler Foundation maintains two locations in West Orange, New Jersey. The primary location, which adjoins Kessler Institute for Rehabilitation (KIR), houses the following laboratories: Human Performance and Engineering Laboratory, Outcomes & Assessments, Spinal Cord Injury Research Laboratory, Stroke Rehabilitation Research Laboratory, Traumatic Brain Injury (TBI) Research. An off-campus facility houses the Neuropsychology and Neuroscience Laboratory (NNL) and the Foundation's Grant Programs and administrative offices. Currently, the labs in which the VR work is being conducted are the TBI Lab and NNL.

What patient populations do you serve? How many per year?

The NNL and TBI Labs utilize magnetic resonance imaging (MRI), functional MRI (fMRI), and neuropsychological (paper and pencil) tests to conduct research on cognitive and psychological functioning in individuals with multiple sclerosis and traumatic brain injury. We currently have 17 ongoing studies funded through private, state, and federal agencies. Approximately 200 individuals participate in our research each year.

What VR rehab system(s) do you have installed?

Kessler Foundation's initial work in VR ten years ago focused on a VR driving simulator designed to help people with disabilities relearn driving skills. At that time, we had a state-of-the-art VR driving system. More recently, Kessler Foundation has shifted focus to two new areas of VR research: assessment and rehabilitation of executive dysfunction, and the rehabilitation of balance dysfunction. To carry out research in these domains, we have installed the Assessim Office (Katana Simulations), a comprehensive VR framework for the assessment of cognitive functions in a virtual office environment. KF has also been employing Mystic Isle (University of Southern California's Institute for Creative Technologies), a Microsoft Kinect-based software that allows for the rehabilitation of upper extremity and balance, as well as basic attention and working memory functioning.

Assessim Office screenshot

What benefits do you gain from using this VR rehab system?

The Assessim Office is currently being utilized to collect pilot data in individuals with MS and TBI. Analysis of preliminary data combined with qualitative feedback from participants has helped us to gain clinical and technical insights regarding delivery of software that is functional and user-friendly. It has also helped to improve our understanding of how to optimize

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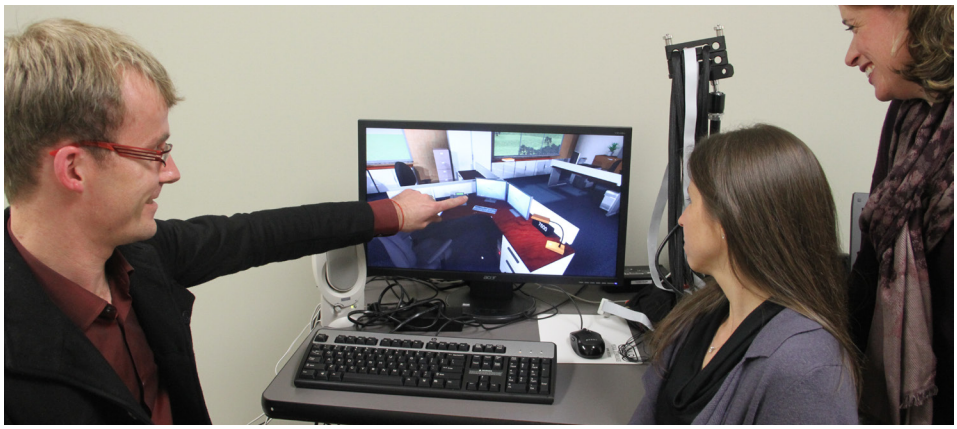
the level of difficulty of the cognitive tasks so that individuals with varying levels of cognitive impairment may be evaluated. Such feedback has been instrumental in development of an evaluation tool that is valid and appropriate for target populations. The Mystic Isle system is being utilized to help enhance the rehabilitation experience for patients at KIR. Its implementation has provided users with an alternative to traditional therapies, one that is not just beneficial, but that is also novel, motivating, and fun. Additionally, feedback from patients' use of the Mystic Isle system has allowed the software to be optimized for use with individuals with brain injury. Such feedback has also been critical for tailoring this software to be applied as a treatment for balance dysfunction after TBI.

What problems did/do you have with using these systems?

Challenges were encountered during the implementation of these systems and during the development of tasks. From a logistical standpoint during setup, it was discovered that existing computers in our laboratory were not equipped with adequate graphics cards, so new machines had to be purchased for the purpose of our VR pursuits. Once the hardware was obtained, we faced and continue to face challenges loading new iterations of software onto the VR-dedicated machines due to IT policies. During task administration, some minor issues with usability arose. Some users encountered mild dizziness when in the virtual office environment, whereas users in the virtual island encountered difficulty calibrating their body with the Kinect sensor. We have been working closely with the developers of the software to provide feedback and improve the system.



Assessim Office demonstration

Are you involved in clinical research using VR rehab systems?

Clinical research using VR systems involves several systems. The Assessim Office evaluates processing speed, divided attention and complex decision-making through realistic, functional tasks. The Assessim Office is currently being piloted in several ongoing cognitive rehabilitation clinical trials in MS and TBI populations. In an extension of the Assessim Office project, we are receiving funding from the National Institute on Disability and Rehabilitation Research to develop a VR-based treatment for executive dysfunction. Once development is complete, we will conduct a small pilot clinical trial to determine preliminary efficacy of the treatment. In regard to Kessler Foundation's work with Mystic Isle, this software is currently being utilized as an adjunct to traditional therapies in inpatient neurorehabilitation at KIR for individuals with acquired and traumatic brain injury. We have also recently received funding from the Department of Defense (CDMRP) to investigate Mystic Isle as a balance treatment in a multi-site trial for individuals with TBI.

What do you see as the most important challenge for VR rehab research and development?

The most important challenge will be to move the current VR systems we have from the evaluation realm to the rehabilitation domain. Currently there are a large number of VR evaluation tools in existence. These evaluation tools have proven to be superior to some of the existing means of assessment, thereby improving the diagnostic capabilities of the field. However, the greatest potential of VR technology is to apply it to the rehabilitation of specific skills, functions, and deficits in various patient populations. The VR field is only just now beginning to make this shift from evaluation to treatment. During this process, it is imperative that we demonstrate the efficacy of these novel rehabilitation tools in order to increase appeal to clinicians to use the tools and to convince insurance companies to reimburse for their use.

CONTRIBUTED ARTICLE

Gesture Therapy: A democratic virtual rehabilitation platform

Luis Enrique Sucar, Felipe Orihuela-Espina, David Reinkensmeyer, Ronald Leder and Jorge Hernández Franco

Back in 2006, virtual rehabilitation was already pushing hard to come out from academia into regular use in hospitals in developed countries; mainly in its hybrid form as a complementary feature for robotics platforms but also with some noteworthy pure virtual rehabilitation examples. Developing countries were not benefitting of this revolution and one of the reasons was the excessive cost of the hybrid solutions. At this time, Dr. Ronald Leder, Prof. David Reinkensmeyer and Prof. Enrique Sucar who had been collaborators for a while, met at the University of California at Irvine. They came up with the idea of Gesture Therapy (GT), a low cost solution viable for middle income countries like Mexico, where hardware demands were reduced to a minimum, and a strong artificial intelligence would compensate for any possible compromise in features.

Gesture Therapy has become a highly competent platform without sacrificing its original goal; to remain inexpensive so that it could be used for home treatment in middle income countries. Gesture Therapy is a virtual rehabilitation platform targeting the rehabilitation of the upper limb. Its hardware requirements are small; a low specifications computer, whether a desktop PC or a laptop, a webcam for tracking arm and hand movements, and its characteristic controller that we call the gripper which further permits sensing gripping pressure.
Rehabilitatory tasks are presented in the form of videogames and in this sense, GT is no different from the many solutions that now can be regularly found in scientific literature. Furthermore, the appearance of solutions based on commercial videogame consoles, such as the Wii or the Xbox-Kinect, has made redundant its advantage of being low price.

Nevertheless GT remains an attractive solution thanks to its powerful artificial intelligence; an intelligence capable of dependably performing distinct necessary tasks during the therapeutic session including detecting trunk compensation, adapting intra-game challenge level, and learning from the therapist to deploy optimal decisions. Research to make GT a distinguished platform continues and we expect to see new features coming soon to enrich the platform.

Back to history

Despite their solid experience on biomedical applications, being both engineers, Prof. Sucar and Dr. Leder lack the clinical insight necessary to support the development of Gesture Therapy. Hence, they team up with Dr. Jorge Hernandez, head of the rehabilitation ward at the National Institute of Neurology and Neurosurgery in Mexico. Dr. Hernández, who was already aware of the recent developments in virtual rehabilitation, quickly became deeply involved with the project. Initial steps focused on developing the gripper to control the virtual scenarios, recognising basic gestures and being able to track the limb from stereoscopic vision. An initial trial pilot proved the concept and new funding was obtained to keep the platform evolving.

The second stage enlarged GT with new capabilities for detecting trunk compensation, and further reduced the cost by eliminating one camera; moving from stereoscopic to monoscopic video whilst keeping full 3D tracking. Monoscopic 3D tracking is achieved by means of a particle filter and estimating depth of the arm holding the gripper based on a priori knowing the size of the gripper. Detection of trunk compensation exploited a caveat of face detectors which quickly fail to detect a face when that face is not facing directly to the camera, and assuming that as a proxy of trunk compensation. This naive assumption despite insufficiently supported by theory or experimental evidence at first, proved to work quite reliably in reality and has been maintained since then. A first full clinical trial was made and MRI based evidence of neuroplastic changes associated to the therapy was gathered. At this point, GT still lack its own virtual scenarios, and therefore the trial capitalised on Armeo games by Hocoma.

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Artificial intelligence for adapting therapy to the patient progress

The third transformation saw GT incorporating its own set of games and its first adaptation module. An initial package of 3 games was launched focusing on very specific movements. Adaptation was accomplished using a partially observable Markov decision process that delivered a decision over changing game challenge based upon the patient speed and control. As the patient showed balanced progress on speed of movement and masters trajectory the adaptation policy shall recommend increasing game challenge. As these two variables advance in disequilibrium perhaps due to tiredness, stress or pain, the intelligent decision maker will suggest a decrement in game challenge. This first computational solution to the adaptation problem, was soon superseded by a more ambitious solution combining a Markov decision process with reinforcement learning allowing not only the game challenge to change with patient progress, but also permitting the intelligence to learn from the therapist to mimic its clinical decisions so that the continuous demand on the presence of medical personnel could be reduced, opening the door to home usage.

This was a busy period at our group. More funding arrived, the group grew and started considering other aspects regarding research in virtual neurorehabilitation.

We started to pay attention to other aspects such as the human-computer interaction in terms of game design criteria and platform usability with a brand new menu based on the home paradigm evoking daily activities, we progressed from restricting to stroke patients alone to get preliminary evidence of the use of GT on children with palsy (still unpublished) and the MRI evidence gave us a useful depiction of the brain function reorganization following administration of virtual reality therapy with GT.

Gesture Therapy window cleaning task

(continued from page 7)

Gesture Therapy window cooking task

Affective computing for accessing the cognitive state of the patient

Nowadays, virtual rehabilitation solutions with more or less features can be easily found in scientific literature and commercial platforms have become cheap enough so that solutions can be quickly developed over off-the-shelf hardware. Nevertheless, the field of virtual rehabilitation is still formulating its decisions over the progress of the therapy mostly based on observable performance. Collateral advances in affective computing have gave the scientists a powerful tool to decode emotional aspects of a technology user from behavioural correlates. The scientific community in virtual rehabilitation is now ready to undertake its next challenge, to interrogate the brain online.

GT is no exception to this current limitation and it is yet short on accessing the cognitive state of the patient; a necessity that we hope to cover soon. In the meantime, we are also improving GT by polishing some of the existing features and adding new ones; enlarging our game set, eliminating wires for the controller, incorporating an accelerometer to the gripper, developing a new prototype of controller which allow better training of finger extension and revisiting our internal software architecture for enhanced modularity among others. Moreover, a large multicenter clinical trial is in progress which will fully validate the clinical performance of GT.

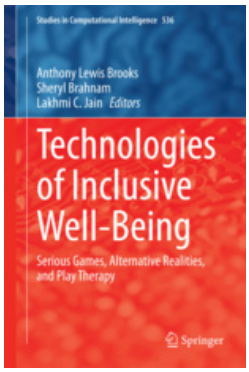
Conclusions

It seems now long ago since the seed of GT, a virtual rehabilitation solution for countries like Mexico was conceived in Irvine. Over the years, GT has become a solid piece of science. We are now taking initial steps to transfer the technology to private hands, and hope that GT will soon come to the house of mainly stroke but also palsy patients in countries like Mexico. The journey has been long and at times frustrating due to slow progress especially because carrying out research is never fast in countries which, until recently, barely spend below half a point of the GDP on R&D like Mexico[1]. During these years, we have developed a strong expertise in the field of virtual rehabilitation and we are full of ideas of how to continue contributing to the field of virtual rehabilitation.

[1]Until 2 years ago Mexico's spending on R&D was below 0.5% of its GDP. Since then, Mexico has steadily increased its investment and now spends over 0.5% of its GDP in R&D and it is aiming to increase that investment with combined public and private sector funding to reach 1% of GDP by 2018.

RECENT BOOKS ON VIRTUAL REHABILITATION

Virtual rehabilitation is a rapidly expanding and developing field. We have compiled a list of some recent books summarizing some recent advances by leading researchers. If you know of other books on topics of interest to the Virtual Rehabilitation community or are writing your own, please email us at newsletter@isvr.org.



Technologies of Inclusive Well-Being Serious Games, Alternative Realities, and Play Therapy

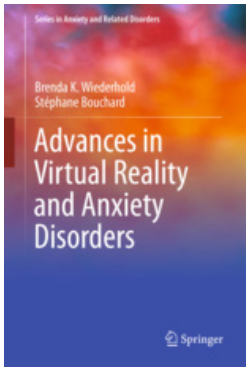
A.L. Brooks, Aalborg University, Esbjerg, Denmark; S. Brahnam, Missouri State University, Springfield, USA; L.C. Jain, University of Canberra, Canberra, Australia (Eds.)

http://link.springer.com/book/10.1007%2F978-3-642-45432-5

Series: Studies in Computational Intelligence, Vol. 536

- Latest research on emerging intelligent paradigms in the field of Serious Games, Alternative Realities, and Play Therapy
- Introduces and describes the latest intelligent technologies offering therapy, rehabilitation, and more general well-being care

This book is the first single volume that brings together the topics of serious games, alternative realities, and play therapy. The focus is on the use of digital media for the therapeutic benefit and well-being of a wide range of people–spanning those with special needs to the elderly to entire urban neighborhoods. This book brings together these topics to demonstrate the increasing trans/inter/multi-disciplinary initiatives apparent today in science, medicine, and academic research–interdisciplinary initiative that are already profoundly impacting society.



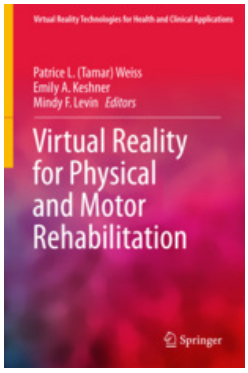
Advances in VR and Anxiety Disorders

Brenda Wiederhold, Stephane Bouchard

http://www.springer.com/psychology/book/978-1-4899-8022-9

The book is part of a series edited by Martin M. Antony and designed for mental health professionals. The series is reflecting the full spectrum of anxiety disorders and their current emphasis in the field of psychology. The books are designed to be used by clinicians, researchers, and students. The book is designed to provide a comprehensive review of the research conducted in the field of anxiety disorders. Topics such as presence and unwanted negative side effects induced by immersions in VR (cybersickness) are presented first in order to explain basic concepts that cut across all other chapters. The following chapters are addressing the various anxiety disorders and follow the same general structure: (a) an introduction of the disorder, (b) the presentation of at least one clinical trial establishing that there are effective psychological treatments for this disorder, (c) a descriptive review of outcome studies involving VR; and (d) a focus on a specific topic relevant to VR. The book provides a presentation of key clinical trials documenting the efficacy and effectiveness of VR for following a clear disorder by disorder sequence, plus an in depth coverage of evidences and knowledge coming from all anxiety disorders, such as lessons learned from clinical trials, experimental studies on treatment processes, the contribution of psychophysiological data, describing clinical manuals, the integration of virtual humans, or the development of virtual environments. The text is supported by numerous figures illustrating virtual environments and research results. The book concludes with a case example of the development of a virtual clinic and thoughts on the future of VR for anxiety disorders.

RECENT BOOKS ON VIRTUAL REHABILITATION



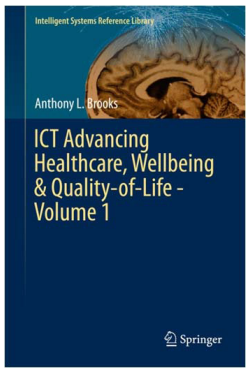
VIRTUAL REALITY TECHNOLOGIES FOR HEALTH AND CLINICAL APPLICATIONS

Edited by Patrice L. (Tamar) Weiss, Emily A. Keshner, Mindy F. Levin
http://link.springer.com/book/10.1007%2F978-1-4939-0968-1

This first volume of the Virtual Reality Technologies for Health and Clinical Applications series aims to provide a comprehensive overview of how VR technologies are applied to motor rehabilitation. The first part of this volume identifies the characteristics of VR that affect the mechanisms underlying the motor control processes that support motor relearning. The second part of the volume consists of critical overviews of VR applications that address (1) different therapeutic objectives (e.g., increasing muscle strength, improving sitting balance) and (2) user (client) goals including their relationship to the environment (e.g., participation in work, study, recreation). Chapter authors focus on the latest research findings on the clinical application of VR technology for remediation of motor disorders due to specific physical disabilities (e.g., Stroke, Traumatic Brain Injury, Parkinson's syndromes, Cerebral Palsy, degenerative conditions such as Amyotrophic Lateral Sclerosis and Multiple Sclerosis). Virtual Reality for Physical and Motor Rehabilitation reviews two decades of progress and anticipates advances to come. It offers current research on the capacity of VR to evaluate, address, and reduce motor skill limitations, and the use of VR to support motor and sensorimotor function, from the most basic to the most sophisticated skill levels. Expert scientists and clinicians explain how the brain organizes motor behavior, relate therapeutic objectives to client goals, and differentiate among VR platforms in engaging the production of movement and balance. On the practical side, contributors demonstrate that VR complements existing therapies across various conditions such as neurodegenerative diseases, traumatic brain injury, and stroke. Included among the topics are:

- Neuroplasticity and virtual reality
- Vision and perception in virtual reality
- Sensorimotor recalibration in virtual environments
- Rehabilitative applications using VR for residual impairments following stroke
- VR reveals mechanisms of balance and locomotor impairments
- Applications of VR technologies for childhood disabilities

Virtual Reality for Physical and Motor Rehabilitation distills a dynamic field to aid the work of neuropsychologists, rehabilitation specialists (including physical, speech, vocational, and occupational therapists), and neurologists.



ICT Advancing Healthcare, Wellbeing & Quality-of-Life - Volume 1*

Anthony L. Brooks, Aalborg University, Sensorama Lab, Esbjerg, Denmark

Series: Intelligent Systems Reference Library

- Introduces the contemporary field of intelligent technologies, apparatus and methods for inclusive well-being in healthcare
- Presents apparatus, methods and case studies along with core strategies for intervention and decision-making
- Presents pioneering research in the field of sensor-based digital media supported intervention in healthcare, wellness and quality of life across abilities, ages and situations.

*Available mid-2015

ISVR Society News

The website at http://www.isvr.org acts a portal for information about the society. We are keen to to enhance the community aspects of the site as well as to to make it the first port of call for people wanting to know what is going on in the field of virtual rehabilitation and its associated technologies and disciplines. Please do visit the site and let us know details of any upcoming events or conferences or news items you would like us to feature on the site. We intend to add further features in the coming year including member profiles; a directory of journals who publish virtual rehabilitation related work; and a list of Masters and PhD level theses completed or currently being undertaken in the field. As well as sending us details of events and news for display, we would welcome suggestions from members about what else they would like to see on the site, or ideas for how we can further develop the virtual rehabilitation community through it. Please mail r.j.mccrindle@reading.ac.uk with any information/ideas using ISVR INFO in the subject header.

Membership information

Membership of ISVR is open to all qualified individual persons, organizations, or other entities interested in the field of virtual rehabilitation and/or tele-rehabilitation. Membership (regular or student) entitles the member to receive a reduced registrations at ISVR sponsored conferences (ICDVRAT, the next to be held in Gothenburg, Sweden, in September 2014; and ICVR, to be held in 2015 in Valencia, Spain) and affiliated meetings (see webpages for more details). There is also an active ISVR facebook page, which is another source of useful information, currently with 1006 members.

ICDVRAT 2014 Conference

ICDVRAT 2014 was held in Gothenburg, Sweden, from September 2-4, 2014. The 10th the series, inaugurated in 1996, was co-organised through the University of Reading, UK, Gothenburg University's Sahlgresnka Academy, and University West, Trollhätten, Sweden.

With 33 full papers presented over the three days, the programme was complimented by a further 29 short papers presented as posters, with a brief summary of each being presented by the authors during the quick fire podium Short Paper/Poster Session. The programme was completed with two keynote talks: Martin Rydmark of the Sahlgrenska Academy, and conference co-chair, gave an overview of his team's research in neurological care and rehabilitation, focussing on remote or home-based ICT solutions for patient centred care, whilst Nils-Krister Persson of the University of Borås, Sweden, overviewed the use of smart textiles as a future technology in the fields of disability and rehabilitation.

The topics spanned elderly/dementia studies, stroke rehabilitation, cognitive training, behavioural and psychological disorders, haptics, speech training, upper limb rehabilitation, body movement training, technology evaluation and comparative studies between real and virtual systems. In a departure from previous years, where papers were posted online after a three month hiatus, the Full Proceedings were made available as a download on the first day of the conference, allowing those who could not attend to gain full access to the latest research as it was being presented in Sweden. This is available at the extensive ICDVRAT Archive: www.icdvrat.org/archive.htm.

The conference awarded four prizes. Papers were pre-selected before the conference based on the outcome of the peer review process. A panel was convened, chaired by Lena Pareto, to then consider the papers in detail, together with the presentation at the conference. The Best Paper was awarded to Penny Standen et al. for their paper: *Adapting a humanoid robot for use with children with profound and multiple disabilities*. The Best Student Paper was awarded to Roberto Lloréns et al. on *Functional improvement of hemiparetic upper limb after a virtual reality-based intervention with a tabletop system and tangible objects*. The Best Short Paper was awarded to Stephanie Glegg et al. for their paper: *Kinecting the moves: the kinematic potential of rehabilitation-specific gaming to inform treatment for hemiplegia*. The Best Student Short Paper was awarded to Mitchel Just et al. for: *A comparison of upper limb movement profiles when reaching to virtual and real targets using the Oculus Rift: implications for virtual-reality enhanced stroke rehabilitation*. The final outcome of the awards was a difficult process, with very little to distinguish between those papers finally awarded prizes and other papers that made the shortlists. Full details of the award winners and runners-up can be found on the conference website: www.icdvrat.org.

The organisers wish to express their gratitude to the main sponsors of the conference, to the ISVR and Bright Cloud International Corporation for sponsoring the four conference awards and to the two other sponsors of the conference, Nanco and the Business Region Gothenburg. The organisers would also like to thank those nice people who control the weather for providing three glorious days for the benefit of over 100 delegates from some 25 countries, as can be seen in the images below from the Conference Dinner, held in the Gothenburg Archipelago at the Älvsborg Fortress.

We look forward to seeing many delegates returning for the 11th 2016 in San Diego, California, and to welcome new delegates into the ICDVRAT community.

ICDVRAT Conference Dinner, Älvsborg Fortress, Gothenburg Archipelago