

NEWSLETTER

ISVR

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Editorial

February 2019 Newsletter 14

Welcome to the 14th issue of the ISVR newsletter. We wish all readers a great 2019! In this first issue of 2019 we are featuring a home-based rehabilitation technology, 2 start-up companies, and new reading material. Sergei Adamovich and colleagues from the Rutgers-NJIT Motor Control and Rehabilitation Lab present their Home-based Virtual Rehabilitation System (HoVRS) design allowing persons with stroke to perform simulated rehabilitation activities in their homes. Also, Kim Baden-Kristensen from the Brain+ startup introduces us to their approach to provide cognitive training for people, who have suffered brain injury or are suffering from brain disorders, such as stroke and Parkinson's disease. Paula Epure from VR Rehab introduces us to ReHub, a virtual rehabilitation platform that provides training and performance measurements for physical and cognitive rehabilitation. Anthony (aka Tony) Brooks describes the medialogy study program in Denmark and its spin-offs, combining engineering and arts, computing and design. Finally, if you are looking for reading material, a recently published book by Bobbie Ticknor could be an interesting option. The utilization of VR technologies in prison communities can provide promising new strategies to reduce recidivism, see our book tip with a review by Skip Rizzo. The new year also offers several interesting conferences and forthcoming events. Enjoy the reading, and we hope to see you at the upcoming 2019 International Conference on Virtual Rehabilitation (ICVR) in July 21-24 in Tel Aviv (Israel).

We are always looking for interesting contributions to the newsletter. If you would like to share your news, upcoming events or an overview of your research, lab, clinic or company, please contact us at newsletter@isvr.org.

Sergi Bermúdez i Badia, ISVR President

UPCOMING EVENTS

LAVAL VIRTUAL 2019
March 20-24, 2019 - Laval, France
<https://www.laval-virtual.com/>

1st International Conference on Teleneurorehabilitation
May 10-11, 2019 - Crotone, Italy
<http://www.1ictnr.it>

Neurorehabilitation and Neural Repair From Science to Evidence based Practice
May 22-24, 2019 - Maastricht, The Netherlands
<http://www.neurorehabrepair.eu>

13th International Society of Physical and Rehabilitation Medicine World Congress (ISPRM 2019)
June 9-13, 2019 - Kobe, Japan
<http://www.isprm2019.com>

RehabWeek 2019
June 24-28, 2019 - Toronto, Canada
<https://www.rehabweek.org/>

International Conference on Virtual Rehabilitation (ICVR 2019)
July 21-24, 2019 - Tel Aviv, Israel
<https://virtual-rehab.org/2019/>

European Congress of NeuroRehabilitation 2019
October 9-12, 2019 - Budapest, Hungary
<http://www.ecnrcongress.org>

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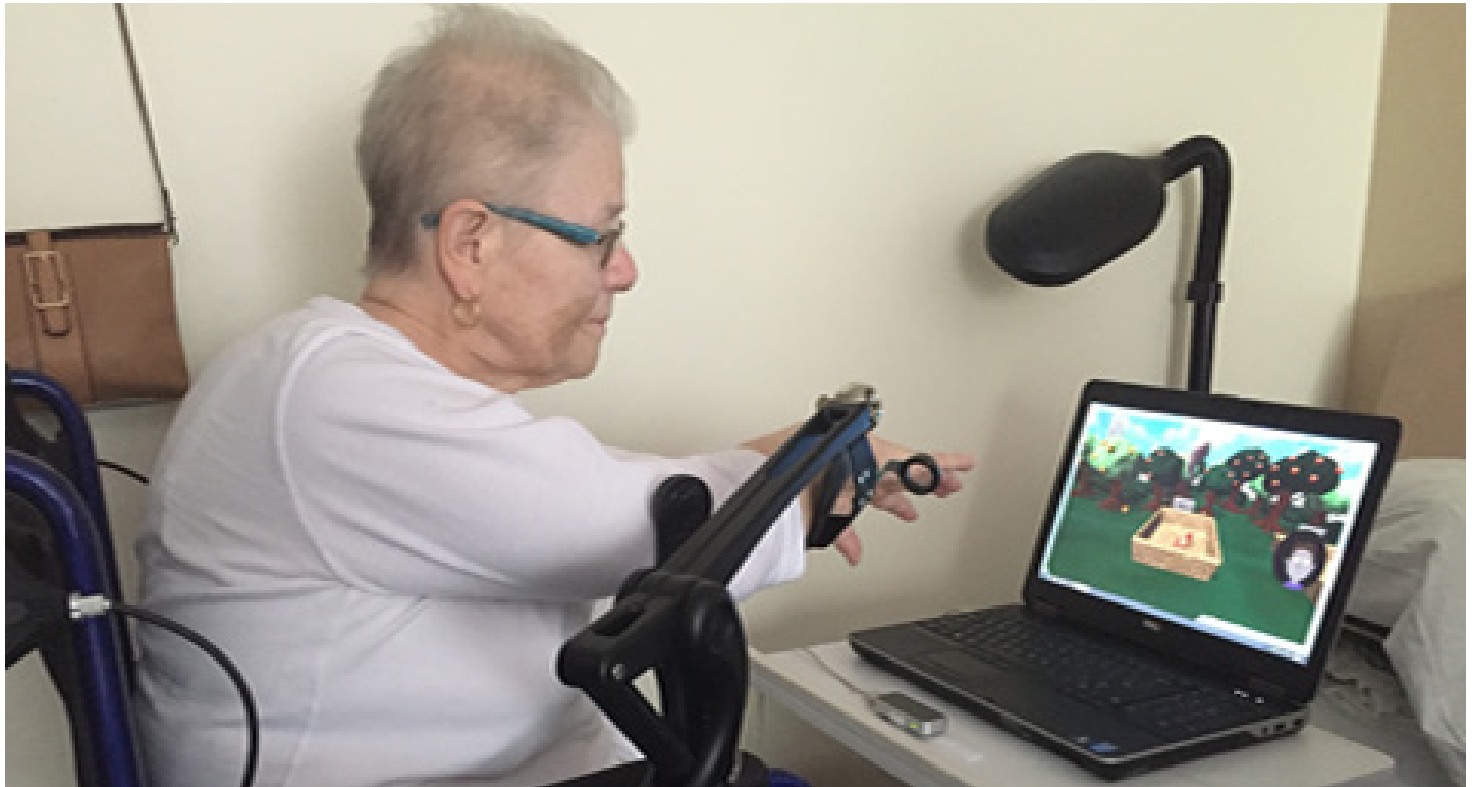
STUDY PROFILE

NJIT – Home-based Virtual Rehabilitation System (HoVRS)

Sergei Adamovich

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HoVRS configured for modified home use, utilizing a laptop and arm support mounted to a wheelchair

Where is your lab located?

Our lab is located in the New Jersey Institute of Technology, in Newark, NJ. Our study is being conducted in our subjects' homes in northern New Jersey, USA.

What patient populations do you serve? How many per year

We are studying adults (40 - 80 years of age) with mild to moderate upper extremity hemiplegia due to chronic stroke (at least six months post stroke - no upper limit). Our training system can accommodate persons with minimal finger, shoulder and elbow movement. We are averaging ten subjects per year, but we plan to ramp up in 2019.

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

We have designed the NJIT – Home – based Virtual Rehabilitation System (HoVRS) to allow persons with stroke to perform simulated rehabilitation activities in their homes. HoVRS has two sub-systems to deliver home-based training: 1) a patient based platform to provide the training and 2) a server based online data logging and reporting system. In the patient's home, a cross platform virtual reality training application runs video games (developed in the Unity 3D game engine using the language C#) on their home computer. The Leap Motion Controller (LMC) infrared tracking device is used to capture motion of the hand and arm movement without requiring wearable sensors.

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

The Leap Motion camera allows people to use our training simulations without having to don a data glove. It also allows for combination arm and finger movement activities that other cameras cannot. Our conferencing system allows our study therapist to visualize the extremity the subject is training and the screen the subject is seeing at the same time. This makes modifying cues to the patient and system settings very efficient.

STUDY PROFILE

(continued from page 2)

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

We encountered some issues with keeping the users hand in the capture area of the camera. We added some cuing to alert them if this occurred and it seems to solve the problem for most users. We expected to have more technical issues working with people from their homes, but a majority of our tech support activity has involved helping people with their internet providers.

What is the objective of your study?

Our goal is to assess the impact of a well-established game design strategy: the pairing of scaffolded increases in game difficulty with in-game

rewards, on motivation to perform a telerehabilitation-based home exercise program using HoVRS, adherence to the program and changes in hand function subsequent to the program. We have chosen not to schedule patient training sessions or prescribe an exact exercise time to subjects in order to test the impact of our training simulations on adherence.

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

Designing rehabilitation systems that are interesting / entertaining enough that subjects will use them frequently and long enough to elicit meaningful improvements in their ability to use their hands is very challenging. We are trying to implement motivational enhancement techniques utilized in

commercial gaming to address this issue, but the gaming industry invests financial resources beyond what is available to rehab researchers into the development and design of their games.



HoVRS simulation Urban Aviator which utilizes wrist motion to pilot a space-ship

REHABILITATION STARTUP

Brain+

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brain+
Care for your brain



Brain+ recover products

What product are you offering?

Brain+ helps people, who have suffered brain injury or are suffering from a brain disorder to restore their fundamental brain functions to better health and functionality, by engaging the patient in self-training on a clinical mobile app platform with computer games that are purpose-built for clinical neurorehabilitation, and with gamified behavioral therapy.

The Brain+ RECOVER app allows a person take ownership of their own recovery through self-training, while freeing time up for healthcare professionals and for the family caregivers. The overall purpose is faster and more effective recovery of cognitive functions.

What is unique about your product?

The product is a marriage between:

- A cognitive training method (Brain+™), providing cognitive training intensity and adaptation of the training to the specific needs

and cognitive deficits of the user.

- Immersive and engaging neuro-games using the psychology from the world of computer gaming, providing emotional engagement.
- Through machine learning, tasks are continuously adapted to the users' abilities, thereby maintaining a challenging level.

The app showed large effects in pilot trials with Parkinson patients, where patients had generalized improvements of working memory by 39% (Corsi block), reading speed by 12% and problem solving by 17% (Wisconsin card sorting). Large scale clinical trials underway in Parkinson's, Brain injury and Depression.

How does your product benefit patients and therapists?

Our product helps people to recover their independence after brain injury, like trauma, stroke, depression and other neurological disorders. The app is designed to accelerate time to recovery and effectiveness of recovery. (Brain+™) enables self-training at the

clinic or at home, and can facilitate the transition from clinic treatments to home treatments. Healthcare professionals can work more effectively by reducing one on one treatment time. Furthermore, the app provides rich data on treatment compliance and progress.

How can one obtain your product?

Contact Brain+, the price will depend on the number of users/licenses bought, but aims at make cognitive rehabilitation more widely used and affordable. At a later stage there will also be a version made available for direct use of people without support from a clinician.

REHABILITATION STARTUP

VR Rehab

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ReHub virtual kitchen

What product are you offering?

VR Rehab is developing virtual reality (VR) solutions for clinical rehabilitation. We combine innovative technology to create immersive training environments that encourage patients' independence. Our main product is ReHub - a virtual rehabilitation platform that supports VR training and performance measurements for patients in need of physical and cognitive rehabilitation. With ReHub, therapists can easily assess a patient physical level, conduct VR training, track patient performance from one session to another and document their sessions. There is a variety of 16 virtual tasks available on ReHub such as, brew coffee, water plants, play fetch with a dog and more.

What is unique about your product?

Our solutions have been developed with a user-centered approach involving physiotherapists, occupational therapists and patients. Our team has

over 5 years of research, development and testing in VR rehabilitation. Consequently, we have a deep understanding on how VR can be applied in rehabilitation. We provide a comprehensive solution that covers the therapists' and patients' needs. Apart from ReHub which is the software solution, we offer a therapist-friendly VR Plug&Play System - a mobile medical cart including all the necessary VR equipment to run ReHub, and a full pack of services (implementation, training the staff, and support) to ensure an optimal usage of the system. Moreover, ReHub has special a feature - Patient Adaptation Technique, which makes the VR training environment adaptable to patient need (if the patient is limited in using certain parts of their body, the system will adapt to their needs, creating an individual difficulty level).

How does your product benefit patients and therapists?

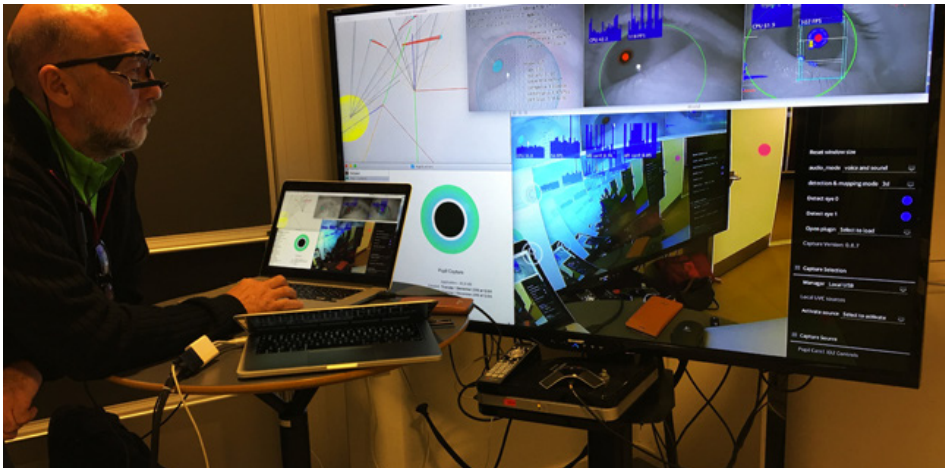
Rehub is improving the rehabilitation outcomes by improving the patients'

physical condition, increasing patients' motivation, therefore compliance to training and reducing the workload of therapists. Our tests indicated a 14,7% improvement in fine motor skills for patients who used our system compared to conventional rehabilitation. We assist therapists in their daily work by tracking patients' performance from one session to another and registering documentation that can be easily attached to the Patient Journal System.

How can one obtain your product?

To purchase our solution please visit our website and contact us or write directly to the contact person. The price varies as our customers have different needs. A monthly license to ReHub with all services included (implementation, training the staff, and support) starts at 7000 DKK.

WHAT IS MEDIALOLOGY?



The author and his new project, the Xlab

The author recently returned from a Dubai design week conference and showcase including 'Belief in AI' where speakers were highlighting how companies around the world are increasingly employing artists to gain a creative edge over competition alongside also seeking 'soft-professional skills' competence employees to supplement their traditional 'hard-skills' workforce of programmers, administrators, sales etc., – however, Middle East recruitment agencies state this is increasingly harder to find¹. The Medialogy education in Aalborg University recognized the need for aligned 'hard' and 'soft' graduate student profiles from its start when established in the city of Esbjerg in South West Denmark in 2002. The academic 'sell' was built upon a foundation where creativity was paired with technology under an engineering institute such that soft and hard skills were educated and where a distinct focus was on

student projects collaborating with external industry partners. This was not just for Bsc but also Msc and PhD. Medialogy students were educated to be able to design, build and test their prototypes fully aware of human end-user needs. Thus, students' academic work is conducted in their group rooms reflecting cooperation throughout their investigations with external partners or they can elect to undertake intern semesters where they are situated at a company again with a focus on gaining both hard and soft skills and competences to complement their knowledge gains.

The International Conference on Disability, Virtual Reality & Associated Technologies (ICDVRAT) 2006 was hosted and chaired by the author under Aalborg University Esbjerg at the nearby venue The Esbjerg Performing Arts Centre (Danish: Musikhuset Esbjerg). Co-located and supporting was the inaugural ArtAbilitation

event, which was conceived by the author. The superb venue featured foyer exhibitions by industry leaders working within Virtual Reality, Human Behavior, healthcare, and related fields, showcasing alongside Medialogy students presenting their Augmented Reality and Virtual Reality projects. These students developed their craft and prototypes in the SensoramaLab complex, which was featured in the conference for delegates to experience and interact within.

ISVR newsletter 7 from April 2016 featured the SensoramaLab, Virtual Reality, Augmented Reality, Interaction Design, Game Creation, and Human Behavior lab from Aalborg University Esbjerg, Denmark. The lab complex was built as part of the Medialogy development plan that also included a green screen suite and usability mobile lab set up. The complex opened around 2004/5 and the lead team consisted of Assistant Professor Dr Eva Brooks (then Petersson) PhD from Sweden, Assistant Professor Dr Bruno Herbelin PhD from France, and Assistant Professor Dr Jan Cigar from Slovenia. Dr Petersson came from a previous professor leadership role in Halmstad University whilst Herbelin and Cigar came as post-docs graduating from Daniel Thalmann's lab in EPFL – École polytechnique fédérale de Lausanne, Switzerland. SensoramaLab's leadership profile was complementary with both the hard and soft represented.

Successful Medialogy student spinout companies evolved from the Medialogy education and exposure to the SensoramaLab complex. Initially this



The author, Associate Professor Dr Anthony Lewis Brooks (aka Tony) PhD is the sole remaining employee from the founding team that established the Medialogy education in Denmark at Aalborg University Esbjerg (AAUE) in 2002 having consulted on its start-up two years prior. He has been in leadership team since start up and heavily involved in initial staffing as well as national and international student recruitment. Medialogy developed to become the largest student intake in all three campuses of Aalborg University. He designed, funded, established, manned, and directed the SensoramaLab complex during its existence. SensoramaLab/Medialogy/AAUE was host to The 6th International Conference on Disability, Virtual Reality & Associated Technologies (ICDVRAT) 2006; ArtAbilitation 2006, 2007, 2011; IEEE/IJART Advances in Artificial Reality and Tele-Existence, 17th International Conference on Artificial Reality and Telexistence, ICAT 2007; The European Alliance for Innovation international conference Art & Technology 2011, 2016; The European Alliance for Innovation international conference Design, Learning & Innovation 2016. The SensoramaLab complex was closed in 2011 and Medialogy education closes in June 2019. Any further international proposals for consortia partnering will come under Aalborg University in the Aalborg city campuses where the author still educates in Medialogy and additionally in the Arts & Technology education befitting his profile and PhD in art, design, media and culture.

(continued from page 6)

was through the on-campus incubator to support business development – notables include the award winning Intertisement Augmented Reality company (<http://intertisement.com>), the award winning Virtual Lab company (<http://www.vlab.dk>), and the most recent award winning company VR-Rehab (<https://vr-rehab.dk>). The latter of these, VR-Rehab, focuses on Gamification with a scientific approach in healthcare and rehabilitation. VR-Rehab is presented in this issue. The leadership includes three Medialogy Msc students as CEO, CDO, and CTO from Denmark and Romania: Noteable is that both hard and soft skills and competencies are represented giving

maximum potential for success. One of their early student projects that led to the establishment of the company was presented at ICDVRAT 2014 when held in Gothenburg Sweden. Awards include 'SiemensPrize'; 'Women in Tech DK'; 'Founder of the Month'; Innovation Prize,and more. Amongst the fifteen scientific publications listed at their site include World Congress of the International Society of Physical and Rehabilitation Medicine; Clinical Virtual Reality: Emerging Opportunities for Psychiatry; NeuroRehabilitation Journal.

In conclusion it is reflected that, whilst the Medialogy education in Esbjerg has suffered in the same way that the

SensoramaLab complex did in that both have been closed, it is very satisfying to know that the contribution from the original research that led to the lab and education also led to successful spinouts.

¹https://www.youtube.com/watch?time_continue=113&v=defEZdWhowk

RECENT BOOKS ON VIRTUAL REHABILITATION

VIRTUAL REALITY AND THE CRIMINAL JUSTICE SYSTEM

EXPLORING THE POSSIBILITIES
FOR CORRECTIONAL REHABILITATION



BOBBIE TICKNOR

Virtual Reality and the criminal justice system by Bobbie Ticknor

Lexington Books (February 19, 2018)

Prison reform and recidivism reduction are important topics trending in the US in recent months. Virtual reality is a family of technologies that could be utilized efficiently in prison communities, helping practitioners and inmates overcome key logistical and access related challenges. The author of this book, an active scientist in the field of technology as it relates to the criminal justice system in the US, presents a compelling narrative and roadmap describing possible applications of virtual environments in the field of corrections.

"The technology for creating compelling and emotionally evocative virtual reality experiences that can now be delivered using low-cost consumer equipment has arrived! The growing maturity and availability of VR technology has served to spawn creative explorations into its use for addressing real human problems that go well beyond VR's popular application in gaming and entertainment. Criminal justice and correctional rehabilitation can now be added to the list along with other pro-social VR efforts in mental health, physical medicine, education, art, and journalism. Ticknor's overview of how VR can be applied to the very real problem of correctional rehabilitation concisely details a relatively unexplored area where VR makes sense and could have a tangible and meaningful impact on the lives of many. The book provides a basic roadmap for exciting things to come in the field of corrections and will certainly ignite thinking on how VR could be used to take on this important societal challenge."

Skip Rizzo (University of Southern California)



The website at <http://www.isvr.org> acts as a portal for information about the society. We are keen to enhance the community aspects of the site as well as 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 webdec@isvr.org 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, student or clinician) entitles the member to receive reduced registrations at ISVR sponsored conferences 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 1197 members.

Call for Contributed Articles

- If you are a technology expert in virtual rehabilitation or you have experience in the clinical use of virtual rehabilitation technologies, and would like to be featured in an upcoming ISVR newsletter issue
- If you would like to submit a contributed article relevant to the ISVR community
- If you have any news, summaries of recent conferences or events, announcements, upcoming events or publications

We are looking forward to your contribution! Please contact us at newsletter@isvr.org.



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