International Society for Virtual Rehabilitation

ISVR

NEWSLETTER

NUMBER 13 | JULY 2018

Editorial

July 2018 Newsletter 13

Welcome to the 13th issue of the ISVR newsletter. After 12 editions, Kynan Eng, Belinda Lange and myself are stepping down from the editorial team. As ISVR President, I thank Kynan and Belinda for their great contributions to our Society and I welcome the new editorial team, composed of Iris Brunner and Amir Tal.

In the technical profile of this issue, we highlight the Interaction Lab at the Department of Architecture, Design and Media Technology at Aalborg University in Denmark (Dr. Hendrik Knoche). Their work is focused on human-computer interaction, especially regarding people with cognitive and physical challenges. They introduce us to *VR@SN*, a system that can be used to assess and train people with spatial neglect after stroke.

In the clinical profile, we present *VihTek*, a research and testing center for health technologies in the Danish Capital Region (Tina Myung Birkild Povlsen). Their main task is to identify, evaluate and implement technologies for rehabilitation in collaboration with hospitals, and prepare reports to give recommendations for clinical practice. In this newsletter, the Center reports on their experience with different technologies and patient groups.

I would like to congratulate Dr. Sandeep Subramanian and Dr. Rachel Proffitt, the winners of the Third ISVR Early Career Investigator Awardvand to thank them for their outstanding contributions to virtual rehabilitation field.

Finally, this newsletter provides information on upcoming conferences and ISVR news.

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.

Enjoy the reading, and we hope to see you at the upcoming ICDVRAT conference next September in Nottingham (UK).

Sergi Bermúdez i Badia, ISVR President

IN THIS ISSUE

UPCOMING EVENTS

12th International Conference on Disability Virtual Reality and Associated Technologies, In Collaboration with Interactive Technologies and Games
September 4-6, 2018 - Nottingham, England
http://www.icdvrat.org/

5th International Conference on NeuroRehabilitation (ICNR2018)
October 16-20, 2018 - Pisa, Italy
http://www.icnr2018.org

11th World Stroke Congress
October 17-20, 2018 - Montreal, Canada
http://www.world-stroke.org

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CLINICAL PROFILE

VihTek

Tina Myung Povlsen
VihTek
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Where is your clinic located?

VihTek is a research and test center for health technologies in the Danish Capital Region. We are located at Rigshospitalet Glostrup in Copenhagen.

What patient populations do you serve? How many per year

VihTek serve all the hospitals in the Capital Region.
Our aim is to identify, test and implement technologies that;

1. Enhance rehabilitation.
2. Increase cross-sectoral cooperation
3. Prevent complications.

We facilitate workshops and demonstrations for clinicians by presenting new solutions and technologies. Our services are uniquely tailored for each project and product.
In 2017 we collaborated with 10 hospitals in the Capital Region.

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

We In VihTek we have different VR products:

- 1 virzoom cycle.
- 1 virzoom sensor to a stationary exercise bike.
- Oculus headset with 2 controllers.
- HTC headset with 2 controllers.
- PlayStation headset with 2 controllers.
- 2 Samsung gear headsets and 2 phones.
- 2 gamer computers.

These products are used in our tests in collaboration with the clinics with various patient populations. We conduct user tests and write reports and articles based on our tests.

Test of VR for rehabilitation

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

Studies indicate that motivation is an important factor of computer and virtual reality games in connection with rehabilitation. However, the potential of VR is far from fully explored. There is a great need for systematic data about experiences with VR in rehabilitation.
VihTek see a great potential in using VR to motivate patients to rehabilitation and maintenance training. So far, we experienced that gender, age and technology level did not have any influence on the outcome of VR training, as long as the physiotherapist is confident with the technology. Our hypothesis is that VR can increase motivation for training and thus increase training amount and intensity.
Additionally, VihTek find commercial games interesting due to the availability and price compared to games developed for rehabilitation, thus it is possible for patients to buy this technology for private use.

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

When using Samsung Gear you can't connect the phone with a tablet for the therapist to be able to observe what the patients experience in the googles. Here it is difficult to guide the patient during training.
The hygiene standard is another issue. We have solved this by using a disposable mask and a hair net. However, some patients experience it to be too warm to wear.
Furthermore, no commercial games are developed that are tailored to the specific diagnoses.

Are you involved in clinical research using VR rehab systems?

In collaboration with the physio- and occupational department at Bispebjerg

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Hospital, VihTek are testing cycle training with VR for outpatients with lung diseases. We are using commercial games in the training. The test is designed as a cross-over design, where the patient's cycle's at a normal stationary exercise bike with and without VR googles. The test includes 8 patients. VihTek are co-authoring an article based on a single case study with VR training to a brain injured young girl. VihTek have more tests to come in the future with VR training in various patient populations.

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

We have identified different challenges'; however we highlight four of them:

1. Training with VR often demands a one-to-one session with the therapist. It is not always possible in the Danish healthcare system, where patients often train in group sessions.
2. It is a challenge to define the quality and load of the specific exercises. (Except for training with a stationary bike combined with VR).
3. The VR gear requires familiarity with technology, thus it can be a barrier for the healthcare professional to start training with VR if they are not confident with the technology.
4. How do we follow the development within the technology and VR area? We want to collect data about specific products, however the technologies are constantly in change with improvement of existing products and new products find a way to the market fast. This is a part of what makes VR interesting and motivating, but also a significant challenge if you want to collect data about methodology outcome.

Cycling in a virtual environment

TECHNICAL PROFILE

Interaction Laboratory

Hendrik Knoche
Department of Architecture, Design, and Media Technology (CREATE), Aalborg, Denmark
https://tinyurl.com/AAU-InteractionLab

Where is your lab located?

The Interaction Lab is part of the department of Architecture, Design and Media Technology in the Create building Rendsburggade 14 on Aalborg new harbor front very close to Musikkenshus – Aalborg's new concert hall.

How did it start? How long has it been around

The lab was founded five years ago by researchers with a common interest in the field of human computer interaction (HCI). An interdisciplinary field that investigates how people interact with computers and how to design for such interactions.

Who are the members ?

The lab is headed by Prof. Matthias Rehm and has three more tenured members associate professors Anthony Brooks, Martin Kraus and Hendrik Knoche, and two assistant professors Markus Löchtefeld and Kasper Rodil, as well as four PhDs.

What research interests does your lab have?

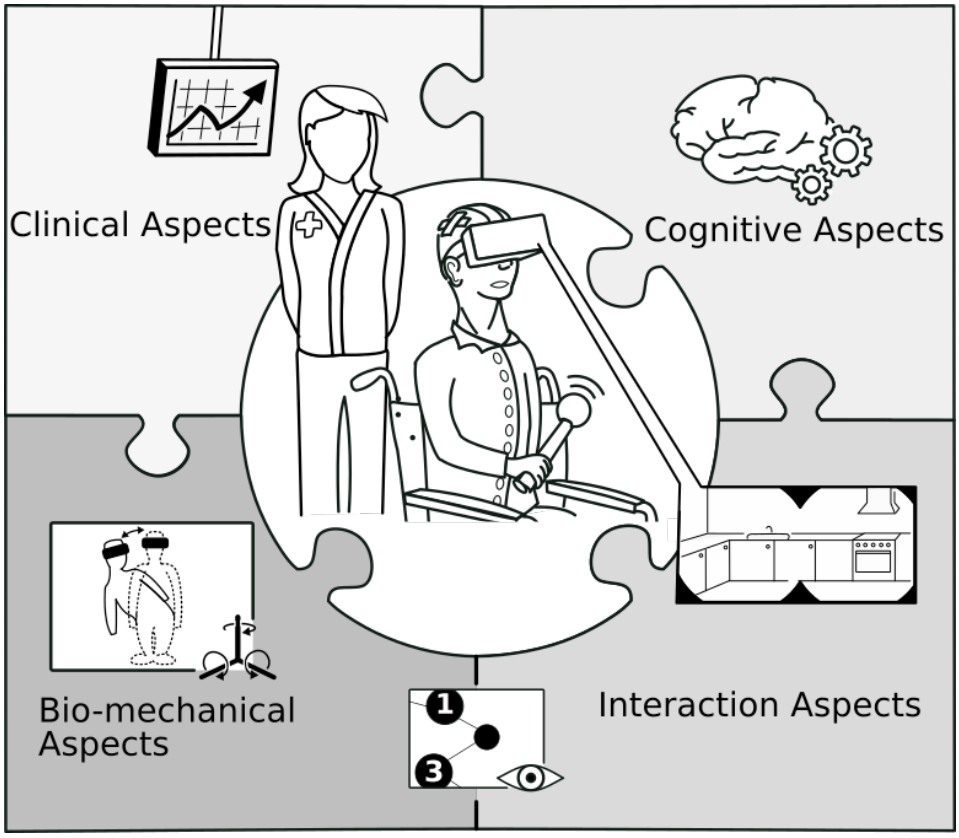
The Interaction Laboratory investigates challenges regarding cognitive abilities, physical abilities, social rules and practices, as well as environmental parameters that impact or determine human machine interactions. In accordance with Aalborg Universities strategy, the team specializes in applied research with relevant regional and national stakeholders in the areas of health, smart learning, and spatial interaction. It has put special focus on disadvantaged users or those special needs often in rehabilitation, and in short- and long-term care and how to design with and for them.

What problem does your system(s) solve?

Spatial Neglect (SN is a reduced or absent attention to one side of the body, space, objects, or even mental imagery. Spatial neglect is routinely assessed using paper-based tests limited by ceiling effects and low ecological validity. Patients with milder symptoms often pass these tests while still exhibiting spatial deficits in everyday activities. The static 2D nature of conventional paper-based assessment does not adequately represent the dynamic 3D nature of spatial difficulties encountered in daily life. Our VR@SN system solves two problems. First, the VR@SN houses assessments for SN in a 3D

Test of spatial neglect

(continued from page 4)



Neglect is a complex impairment

environment, where spatial abilities can be easily evaluated in a wide visual field not only in the horizontal and vertical dimensions, but also the radial (depth) dimension. Second, the VR@SN delivers treatment for individuals with SN after stroke in the form of immersive and engaging training activities, motivating stroke survivors to comply with the treatment regime and complete the treatment course.

What makes it unique?

The VR@SN leverages a tracking system with 6 degrees of freedom and integrates eye-tracking technology in an immersive VR environment. This approach is more sensitive and reliable for the diagnosis and prognosis of spatial neglect than current approaches. Thus, we are confident that the VR@SN will support individualized treatments delivered through immersive VR technology with greater and longer-lasting effects on real-world behavior than current treatment methods that use VR.

How is it better than other existing systems ?

With the VR@SN, we have developed and tested a pilot platform using advanced eye- and head-motion tracking technology to demonstrate that we can seamlessly detect patients' abnormalities and impairment with superior temporal and spatial resolution. However, existing VR approaches for SN have not adopted such advanced techniques.

Tell us about the development process.

We created this system in the spirit of human centered design in close collaboration with the clinical and cognitive rehabilitation professionals from Hammel Neurocenter and Brønderslev's neurorehabilitation center. At Hammel NC, we conducted numerous iterative tests and re-designs of the VR@SN prototypes and evaluated them with patients for accessibility, usability, user experience, patient acceptance and engagement, and ecological feasibility with the clinical settings and its constraints. Both clinical staff and researchers of Hammel NC contributed to design ideas, provided feedback, and shared clinical knowledge during the process.

What level of readiness is the technology now?

The VR@SN System is currently under development. As mentioned, key features are established, but we are still working on specific details to finalize a comprehensive set of diagnostic tasks and training activities. We are working toward a full integration of head, hand, and eye tracking with the system control using a unified operator interface. This user interface will be operated by health care professionals who have limited experience in using VR. The future clinician's interface will allow for the creation of training plans, integrated and on-the-fly eye-tracking calibration, and reviewing patients' performance over time in a visual interface to provide support for patient-clinician interactions. We aim to increase the robustness and usability of (un-)assisted fitting of the head-mounted display (HMD) and trackers to work reliably during use in challenging clinical settings, e.g. bedside assessment, wheelchairs, and patients with paresis. Fellow researchers from the department of health science and technology will address advanced biomechanical analysis of limbs and eye movements and their coordination.

Is it available to the community? How to have access to it?

The system as of yet is not available to the community. However, it is built from commercial off-the-shelf hardware so that it will eventually be scalable and affordable.

REHABILITATION STARTUP

Neuromersiv

Oliver Morton-Evans
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Neuromersiv in action

What product are you offering?

Neuromersiv offers immersive, engaging brain rehabilitation therapy using Virtual Reality for stroke and acquired brain injury survivors. Through a unique methodology based on human learning theory, neuroplasticity and biofeedback, our therapy is demonstrated to provide improved range of motion in on average a third of the time it takes using traditional upper limb rehab therapies.

Our goal is to improve the quality of life of millions by empowering survivors to help them regain their day-to-day independence.

What is unique about your product?

From 2 years of combining Virtual Reality, haptics, Functional Electrical Stimulation and the theories of neuroplasticity and human learning, we have developed a unique methodology for performing rehab. The FES system creates a closed feedback loop and assists the user by sending small electrical pulses to the required muscle groups based on the tasks they are trying to achieve in VR.

By using haptic gloves, Neuromersiv can also fully track the users' fingers, wrist and arm in the VR space which means range of motion improvements can be tracked over time on-the-fly. This does away with the need to use a goniometer which can be a lengthy and often inaccurate process. All of this data is graphically displayed on a clinician dashboard which can be monitored during each session.

How does your product benefit patients and therapists?

Neuromersiv makes therapy fun, engaging and rewarding. Our research suggests that traditional upper limb rehab therapies are boring and repetitive, resulting in poor patient outcomes. Through the release of dopamine due to the truly immersive nature of VR, Neuromersiv can radically improve patient outcomes as patients are motivated to perform and achieve in their therapy.

How can one obtain your product?

We are currently building the beta platform and will be ready for commercial launch in early 2019. If you are interested in being an early tester or for more information, please email Oliver at oliver@neuromersiv.com.

ISVR Society News

The website at http://www.isvr.org acts as 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 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 1148 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.

Join our mailing list: http://isvr.org/join-our-mailing-list/

Third ISVR Early Career Investigator Award

The purpose of this award is to recognize and acknowledge outstanding contributions by early career scientists whose research relates to virtual rehabilitation. The recipient will be awarded a certificate, free registration at an upcoming ICDVRAT or ICVR conference and be asked to present their research as a platform paper at that conference. A runner-up will also be awarded a certificate.

Bios of the winners:

Dr. Sandeep Subramanian is an Assistant Professor at the School of Physical therapy, School of Health Professions, UT Health San Antonio, San Antonio, Texas, USA. He obtained his Bachelors in Physical Therapy from G.S. Medical College and K.E.M Hospital, Mumbai, India. He worked for a year as a physiotherapist in a pediatric setting in India. He completed his MSc (2008) and PhD (2013) in Rehabilitation Sciences at the School of Physical and Occupational Therapy, McGill University under the supervision of Dr. Mindy Levin. He was funded by the Physiotherapy Foundation of Canada for his MSc studies and by the Focus on Stroke initiative (by the Canadian Institutes of Health Research, Heart and Stroke Foundation of Canada and the Canadian Stroke Network) and the Faculty of Medicine, McGill University for his PhD studies. He recently completed a post-doctoral fellowship at the Department of Neurosciences, University of Montreal under the supervision of Dr. Dorothy Barthélemy and Dr. Anatol Feldman, which was funded by the Heart and Stroke Foundation of Canada. His research interests include use of virtual reality for upper limb rehabilitation after stroke, motor control, motor learning, non-invasive brain stimulation and outcome measurement. His research articles have been published in journals like Stroke, Neurorehabilitation and Neural Repair, Journal of Neurophysiology, Experimental Brain Research Journal of NeuroEngineering and Rehabilitation and Restorative Neurology and Neurosciences. He is a member of the editorial board of Restorative Neurology and Neurosciences and is a reviewer for journals including Archives of Physical Medicine and Rehabilitation, Neurorehabilitation and Neural Repair, Journal of Neuroengineering and Rehabilitation, Translational Stroke Research and IEEE Transactions on Neural Systems Rehabilitation Engineering. He is a regular reviewer for the ICDVRAT and ICVR conferences. He previously has been a peer-reviewer for the annual meeting of the Canadian Physiotherapy Association, World Congress in Physical Therapy and the Chartered Society for Physiotherapists (UK). He has been invited to deliver presentations on the use of VR in India and England. In addition, he is member of the education sub-committee of the American Society of Neurorehabilitation. His current research focusses on i) understanding the reasons for non-optimal motor improvement in the upper extremity after traumatic and acquired (e.g. Stroke) brain injury and ii) use of interventions to optimize motor improvement in the upper extremity. He is currently funded through pilot grants from the Center for Biomedical Neurosciences and the School of Health Professions at UT Health San Antonio.

Dr. Rachel Proffitt is Assistant Professor in the Department of Occupational Therapy at the University of Missouri. Her research focuses on developing, testing, and implementing virtual reality-based interventions for adults and older adults with neurological conditions. Dr. Proffitt has extensive experience working in an interdisciplinary setting with computer scientists and engineers and was previously the Director of the Game Based Rehab Lab at the Institute for Creative Technologies at the University of Southern California (USC). She has completed a T32 fellowship as well as a K12 Career Development Award. At Mizzou, Dr. Proffitt is currently funded on a KL2 Career Development Award that is joint with Washington University School of Medicine. She is currently conducting several studies to examine the mechanisms of her VR interventions in order to ultimately determine how these interventions impact motor and cognitive performance of adults with stroke.

Save the Date

ICVR 2019

INTERNATIONAL CONFERENCE ON VIRTUAL REHABILITATION

July 23-25, 2019

Tel Aviv University, Tel Aviv, Israel

www.virtual-rehab.org/2019/

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