

*The 6<sup>th</sup> International Conference on Disability,  
Virtual Reality and Associated Technologies*



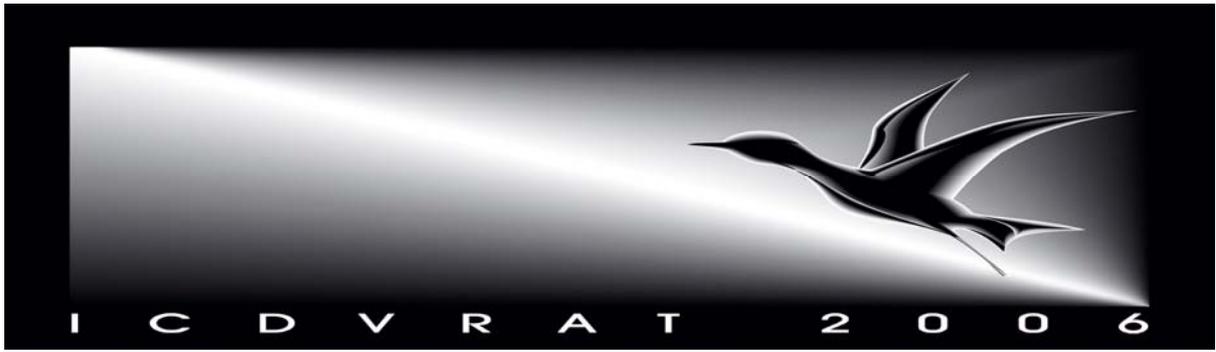
**ArtAbilitation**  
helping through art



*The 1<sup>st</sup> International Conference on  
ArtAbilitation*

**Programme**  
&  
ArtAbilitation Abstracts

*18-20 September 2006  
Musikhuset, Esbjerg, Denmark*



The 6<sup>th</sup> International Conference on  
*Disability, Virtual Reality and Associated Technologies*

*and*



*ArtAbilitation 2006*

*18 to 20 of September, 2006*

*Centre for Performing Arts, Musikhuset Esbjerg  
Esbjerg, Denmark*

*Programme*



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## Conference Sponsors

ICDVRAT 2006 is sponsored by: the University of Reading, UK; SoundScapes, Denmark; and Aalborg University Esbjerg/Esbjerg Technical Institute, Denmark.

The conference is grateful for support from: Dronning Louise, Erhvervsudvikling Vest, Esbjerg Erhvervscenter, Esbjerg Turistkontor, Fiskeri- & Søfartsmuseet, Hotel Ansgar, Hotel Britannia, IBM, KPMG, Martin Professional, Musikhuset Esbjerg, Sony, Svømmestadion Danmark, Thuesen Bødker & Jæger, Tobakken, Vestjysk Marketing w/Boy Boysen, Videncenter Vest

Additional help in publicising the conference has been gratefully received from [vrpsych-l@usc.edu](mailto:vrpsych-l@usc.edu), amongst many others.

## Artwork

Artwork and Conference Layout by *skelp*, adapted from original ideas of Eric Phipps and David Angus (ICDVRAT Logo) and from original clipart from the CorelDraw Clipart Library (ICDVRAT 2006 Graphic). Eric Phipps and David Angus (both of Project DISCOVER) and *skelp* may be contacted through ICDVRAT.



# Conference Locations

The main conference venues are detailed on the map of Esbjerg included with your conference bag. Plans of the conference centre (Musikhuset) are given on the following pages. The main venues are as follows:

## Conference Sessions I to IX

*Esbjerg Performing Arts Centre, Musikhuset.*

*Havnegade 18 – from the city central square, Musikhuset can be seen 300m towards the sea.*

All ICDVRAT conference presentations will take place in the *Lillesal* in Musikhuset – down the stairs from the foyer. ArtAbilitation sessions will take place on the same level in the *Foredragssal*.

## Special Session: Posters, Demonstrations, Exhibits

*Foyer of Musikhuset*

## Pre-Conference (Sunday)

*Svømmestadion Danmark (Swimming & Leisure Centre)*

*Gl. Vardevej 60*

The Svømmestadion lies less than 1km from the centre of Esbjerg (in a north west direction). From the Musikhuset, follow the main road in a westerly direction. On reaching a large roundabout (c. 700m) go north on Gl Vardevej where the Svømmestadion can be found on the left (c. 200m).

## Conference Reception (Monday)

*The Fisheries and Maritime Museum*

Buses will transport delegates to the museum for the reception. In case you miss the bus just ask a taxi driver or catch bus number 3 or 7 and get off at the statue of the 'Four Men and the Sea', the drivers will assist but the statues are hard to miss on your left on the seafront. The museum is across the road from the statue but best is to walk around the road (by the traffic lights) to main entrance.

## Lunches

*Foyer of musikhuset. Vouchers required for all meals and coffees.*

## Conference Banquet

*Café Tonekunsten in the Foyer of Musikhuset.*

After the banquet – an off programme offer to join in at restaurant Dr. Louise for music and dancing – upstairs. This is situated on the city square. Toilet facilities for people with disabilities are available and assistance to the upper level is offered by the host proprietor.

## Accommodation

Tourist board arrange hotels or you can do it yourself direct.

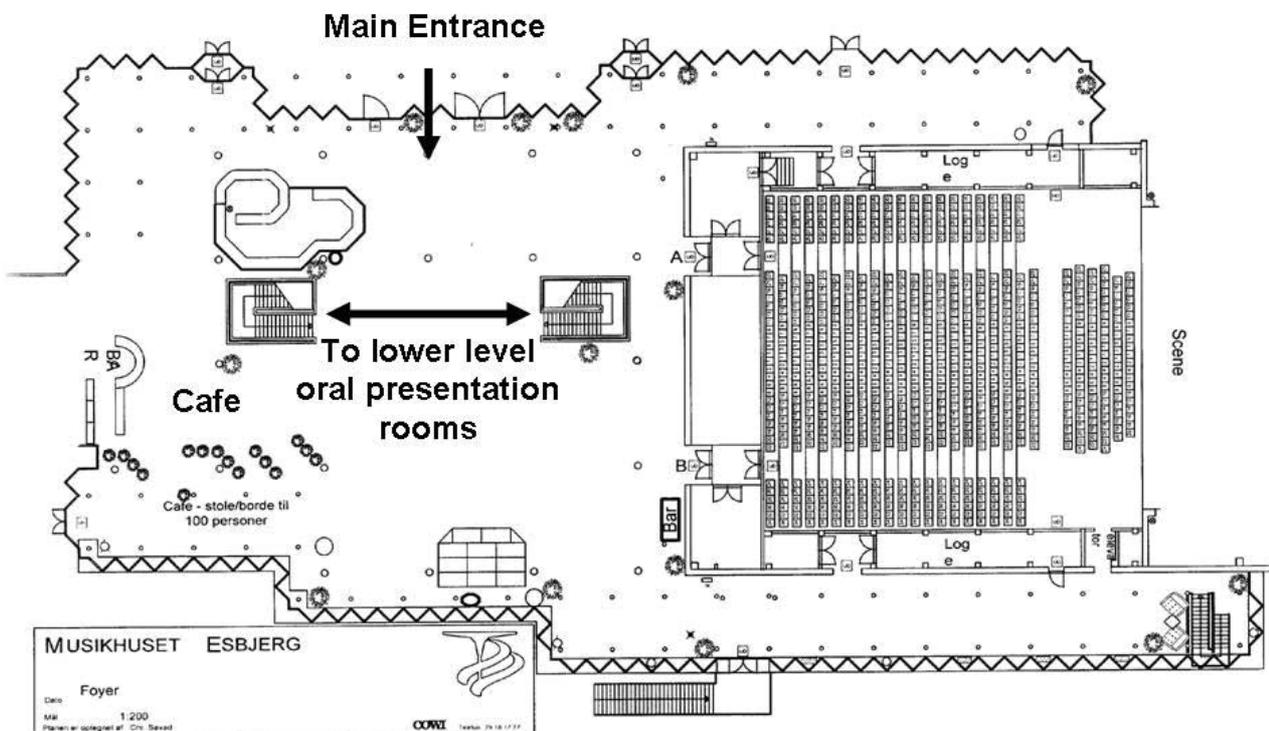
The Local hostel is called "DANHOSTEL Esbjerg" and is located in beautiful surroundings within walking distance of the town and within 100 metres of the swimming stadium, "Svømmestadion Danmark", and the town's other sports facilities.

The hostel is located in the northwest of Esbjerg, 2.5 km (1.5 mile) from the centre and the train station. There's a bus stop within 2 minutes walking from the hostel. Address is - Gammel Vardevej 80, Esbjerg. Telephone (+45) 75 124 258

## Coffee & biscuits/Danish

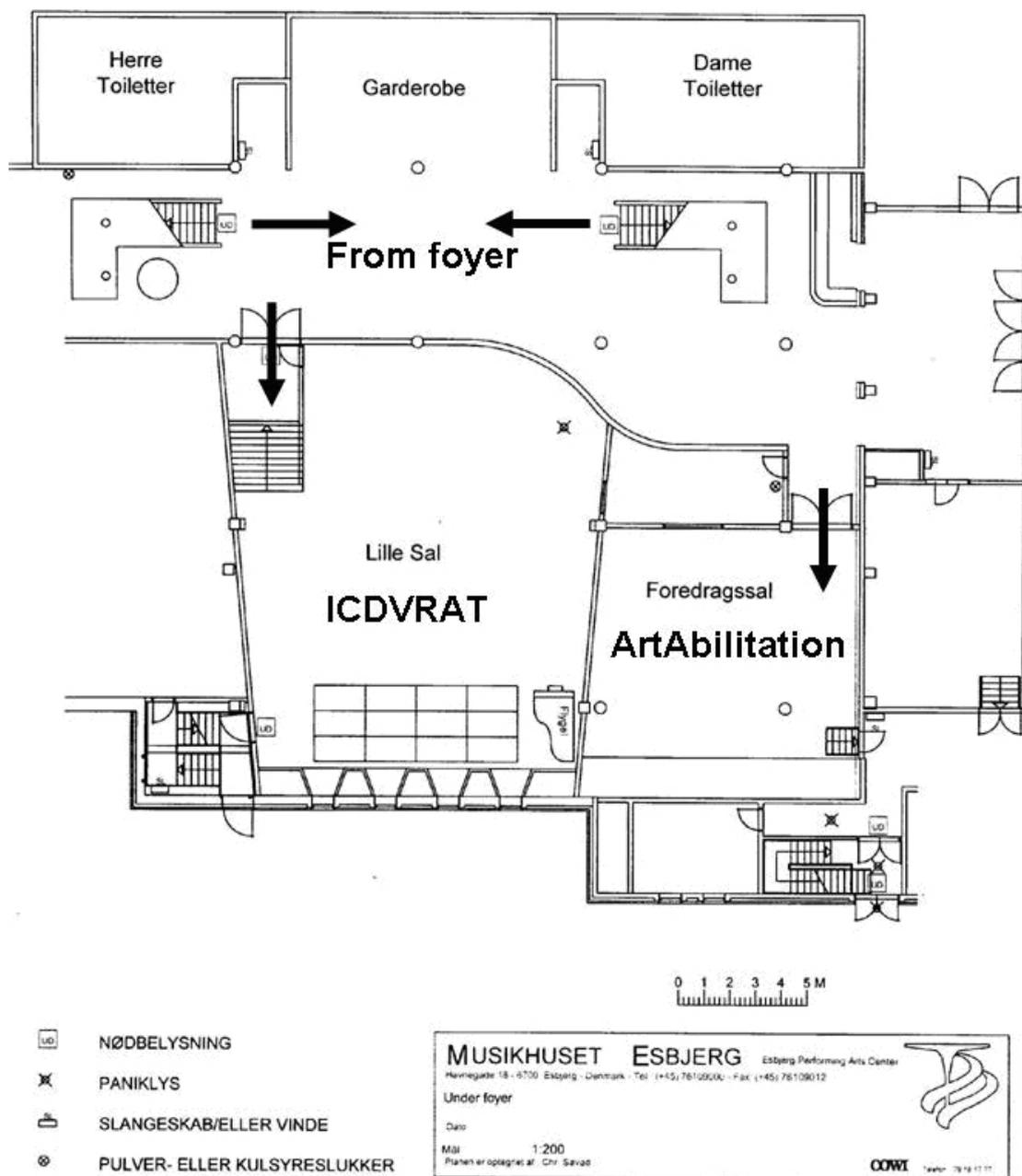
Foyer of Musikhuset. Vouchers required.

## Musikhuset – Ground Floor



## Musikhuset: Conference venue, exhibition and banquet information

# Musikhuset – Conference Level



## Musikhuset: Conference oral presentation rooms



# ICDVRAT & ArtAbilitation at a Glance

## Sunday, 17<sup>th</sup> September

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16:00 – 19:00 Pre-registration open at Svømmestadion Danmark

## Monday, 18<sup>th</sup> September

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8:50 Opening remarks  
9:00 – 11:05 **ICDVRAT I: Social Interaction**  
Coffee  
11:30 – 13:10 **ICDVRAT II: Motion Tracking and 3D Modelling**  
Lunch  
14:30 – 16:35 **ICDVRAT III: Therapy**  
Coffee  
17:15 – 18:45 Visit to the Sensorama VR Lab, Aalborg Universitet Esbjerg  
19:00 – 20:30 Reception (drinks and finger buffet) at the Esbjerg Fisheries and Maritime Museum  
20:30 Free for dinner

## Tuesday, 19<sup>th</sup> September

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9:00 – 11:05 **ICDVRAT IV: Interaction Control**  
Coffee  
11:30 – 13:10 **ICDVRAT V: Rehabilitation and Route Learning**  
**ArtAbilitation I: Playing and Learning**  
Lunch  
14:30 – 16:10 **ICDVRAT VI: Medical Treatment and Home Based Rehabilitation**  
**ArtAbilitation II: Intersensory Interaction**  
Coffee  
16:30 – 18:30 **ICDVRAT/ArtAbilitation** Interactive Demonstration Session  
19:30 – 22:00 Conference Banquet at Café Tonekunsten, Musikhuset

## Wednesday, 20<sup>th</sup> September

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9:00 – 11:05 **ICDVRAT VII: Visual Impairment**  
**ArtAbilitation III: Sound and Vision**  
Coffee  
11:30 – 13:10 **ICDVRAT VIII: Cognitive Skills**  
Lunch  
14:30 – 16:10 **ICDVRAT IX: Stroke Rehabilitation**  
16:10 Closing Remarks followed by Coffee



## ICDVRAT 2006 Conference Sessions ~ *Lillesal*

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**Session 1. Social Interaction** **Session Chair: Tony Brooks**  
**Monday 09:00 – 11:05**

- 3 *A decade of research and development in disability and virtual reality and associated technologies: promise or practice*, **S V G Cobb** and **P M Sharkey**, University of Nottingham/University of Reading, UK
- 19 *Exploration of social rule violation in patients with focal prefrontal neurosurgical lesions*, **R G Morris**, **E Pullen**, **S Kerr**, **P R Bullock** and **R P Selway**, Institute of Psychiatry, London/University of Nottingham/King's College Hospital, London, UK
- 27 *Exploring interpersonal dynamics between adults and motor disabled children within aesthetic resonant environments*, **P Lopes-dos-Santos**, **L M Teixeira**, **S Silva**, **M Azeredo** and **M Barbosa**, University of Porto/Portuguese Catholic University, PORTUGAL
- 35 *Challenges in designing virtual environments training social skills for children with autism*, **U Andersson**, **P Josefsson** and **L Pareto**, University West, SWEDEN
- 43 *Virtual social environment for preschoolers with autism – preliminary data*, **C Y Trepagnier**, **M M Sebrechts**, **A Finkelmeyer**, **J Woodford** and **W Stewart Jr**, The Catholic University of America, Washington, DC, USA

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**Session 2. Motion Tracking and 3D Modelling** **Session Chair: Cecilia Sik Lányi**  
**Monday 11:30 – 13:10**

- 53 *Development of vision based meeting support system for hearing impaired*, **R Shikata**, **T Kuroda**, **Y Tabata**, **Y Manabe** and **K Chihara**, Kyoto University Hospital/Kyoto College of Medical Technology/Nara Institute of Science and Technology, JAPAN
- 59 *Perceptive 3-D interface via stereo observation*, **D Padbury**, **R J McCrindle** and **H Wei**, University of Reading, UK
- 67 *Evaluation of a computer aided 3D lip sync instructional model using virtual reality objects*, **A Rathinavelu**, **H Thiagarajan** and **S R Savithri**, Dr Mahalingam College of Engineering and Technology/National Institute of Technology/All India Institute of Speech and Hearing, INDIA
- 75 *Constructing new coordinate system suitable for sign animation*, **T Kuroda**, **K Okamoto**, **T Takemura**, **K Nagase** and **H Yoshihara**, Kyoto University Hospital/ Kyoto University, JAPAN

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**Session 3. Therapy** **Session Chair: Noomi Katz**  
**Monday 14:30 – 16:35**

- 83 *Technological challenges and the Delft virtual reality exposure system*, **C A P G van der Mast**, Delft University of Technology, THE NETHERLANDS
- 91 *Evaluation of virtual reality therapy in augmenting the physical and cognitive rehabilitation of war veterans*, **B K Wiederhold** and **M D Wiederhold**, Interactive Media Institute/Virtual Reality Medical Center, San Diego, CA, USA
- 97 *Do we need high-scale flexibility in virtual therapies?*, **Z Geiszt**, **M E Kamson**, **C Sik Lányi** and **J A Stark**, University of Pannonia, HUNGARY/Austrian Academy of Sciences, AUSTRIA
- 105 *Use of virtual reality as therapeutic tool for behavioural exposure in the ambit of social anxiety disorder treatment*, **H Grillon**, **F Riquier**, **B Herbelin** and **D Thalmann**, EPFL, Lausanne, SWITZERLAND/Aalborg University Esbjerg, DENMARK
- 113 *User-centered design driven development of a virtual reality therapy application for Iraq war combat-related post traumatic stress disorder*, **A A Rizzo**, **K Graap**, **J Pair**, **G Reger**, **A Treskunov** and **T Parsons**, University of Southern California/ Virtually Better, Inc., Decatur, Georgia/U.S. Army, Fort Lewis, Tacoma, Washington, USA

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**Session 4. Interaction Control** **Session Chair: Bruno Herbelin**  
**Tuesday 09:00 – 11:05**

- 125 *Designing a device to navigate in virtual environments for use by people with intellectual disabilities*, **P J Standen, D J Brown, N Anderton** and **S Battersby**, University of Nottingham/Nottingham Trent University, UK
- 133 *Tactile information transmission by apparent movement phenomenon using shape-memory alloy device*, **Y Mizukami** and **H Sawada**, Kagawa University, JAPAN
- 141 *Statistical estimation of user's intentions from motion impaired cursor use data*, **P Langdon, S Godsill** and **P J Clarkson**, University of Cambridge, UK
- 147 *Hands-free man-machine interface device using tooth-touch sound for disabled persons*, **K Kuzume** and **T Morimoto**, Yuge National College of Technology, JAPAN
- 153 *Tongue-computer interface for disabled people*, **L N S Andreassen Struijk**, Aalborg University, DENMARK

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**Session 5. Rehabilitation and Route Learning** **Session Chair: Charles van der Mast**  
**Tuesday 11:30 – 13:10**

- 161 *Combining interactive multimedia and virtual reality to rehabilitate agency in schizophrenia*, **E A Lallart, S C Machefaux** and **R Jouvent**, Hôpital de la Salpêtrière, Paris, FRANCE
- 167 *Investigating the efficacy of a virtual mirror box in treating phantom limb pain in a sample of chronic sufferers*, **C D Murray, E Patchick, S Pettifer, T Howard** and **F Caillette**, University of Manchester, UK
- 175 *Use of a virtual-reality town for examining route-memory, and techniques for its rehabilitation in people with acquired brain injury*, **J Lloyd, T E Powell, J Smith** and **N V Persaud**, Birmingham University, UK
- 183 *Assisting the mobilization through subway networks by users with visual disabilities*, **J H Sánchez** and **M A Sáenz**, University of Chile, Santiago, CHILE

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**Session 6. Medical Treatment and Home Based Rehabilitation** **Session Chair: Pat Langdon**  
**Tuesday 14:30 – 16:10**

- 193 *Using virtual reality for medical diagnosis, training and education*, **A Al-khalifah, R J McCrindle, P M Sharkey** and **V A Alexandrov**, University of Reading, UK
- 201 *Virtual reality for interactive binocular treatment of amblyopia*, **P E Waddingham, S V Cobb, R M Eastgate** and **R M Gregson**, University of Nottingham, UK
- 209 *TheraGame – a home based VR rehabilitation system*, **R Kizony, P L Weiss, M Shahar** and **D Rand**, University of Haifa, ISRAEL
- 215 *SMART project: application of emerging information and communication technology to home-based rehabilitation for stroke patients*, **H Zheng, R Davies, H Zhou, J Hammerton, S J Mawson, P M Ware, N D Black, C Eccleston, H Hu, T Stone, G A Mountain** and **N D Harris**, University of Ulster/University of Essex/Sheffield Hallam University/University of Bath, UK

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**Special Session. Interactive Demonstration, Posters and Exhibits**  
**Tuesday 16:30 – 18:30**

**Exhibition spaces will be available for both conferences during Tuesday and Wednesday from 10:00 to 18:00.**

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**Session 7. Visual Impairment** **Session Chair: Ali Al-khalifah**  
**Wednesday 09:00 – 11:05**

- 223 *Non-visual feedback for pen-based interaction with digital graphs*, **S A Wall** and **S A Brewster**, University of Glasgow, UK
- 231 *Developing an ENABLED adaptive architecture to enhance internet accessibility for visually impaired people*, **C C Tan**, **W Yu** and **G McAllister**, Queen's University Belfast, UK
- 239 *Exploratory strategies and procedures to obtain non-visual overviews using TableVis*, **J Kildal** and **S A Brewster**, University of Glasgow, UK
- 247 *Understanding users with reading disabilities or reduced vision: towards a universal design of an auditory, location-aware museum guide*, **L Pareto** and **U Lundh Snis**, University West, Uddevalla, SWEDEN
- 255 *Preliminary work for vocal and haptic navigation software for blind sailors*, **M Simonnet**, **J-Y Guinard** and **J Tisseau**, European Center for Virtual Reality, École Nationale D'Ingénieurs de Brest, FRANCE

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**Session 8. Cognitive Skills** **Session Chair: Eva Petersson**  
**Wednesday 11:30 – 13:10**

- 265 *Visual spatial search task (VISSTA): a computerized assessment and training program*, **A Bar-Haim Erez**, **R Kizony**, **M Shahar** and **N Katz**, Hebrew University & Hadassah, Jerusalem/University of Haifa, ISRAEL
- 271 *Analysing the navigation of mentally impaired children in virtual environments*, **C Sik Lányi**, **R Mátrai** and **I Tarjányi**, University of Pannonia, HUNGARY
- 277 *Tangible user interfaces: tools to examine, assess and treat dynamic constructional processes in children with developmental coordination disorders*, **S Jacoby**, **N Josman**, **D Jacoby**, **M Koike**, **Y Itoh**, **N Kawai**, **Y Kitamura**, **E Sharlin** and **P L Weiss**, University of Haifa, ISRAEL/Osaka University, JAPAN/University of Calgary, CANADA
- 285 *An evaluation of the use of a switch controlled computer game in improving the choice reaction time of adults with intellectual disabilities*, **P J Standen**, **R Karsandas**, **N Anderton**, **S Battersby** and **D J Brown**, University of Nottingham/Nottingham Trent University, UK

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**Session 9. Stroke Rehabilitation** **Session Chair: Sue Cobb**  
**Wednesday 14:30 – 16:10**

- 295 *Brain-computer music interface for generative music*, **E R Miranda**, University of Plymouth, UK
- 303 *Investigating the use of force feedback joysticks for low cost robot-mediated therapy*, **H Sugarman**, **E Dayan**, **A Lauden**, **A Weisel-Eichler** and **J Tiran**, Ono Academic College/Hadassah College Jerusalem/Ben-Gurion University of the Negev, ISRAEL
- 309 *The design of a haptic exercise for post-stroke arm rehabilitation*, **E Lövquist** and **U Dreifaldt**, University of Limerick, IRELAND
- 317 *Investigating the impact of method of immersion on the naturalness of balance and reach activities*, **I Sander**, **D J Roberts**, **C Smith**, **O Otto** and **R Wolff**, University of Salford, UK









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*Abstracts*

(Full Papers are available on the accompanying CDROM)



Session 1. Playing and Learning *Tuesday 11.40-13.00*

**Interactive flashlights in special needs education**

S Cobb<sup>1</sup>, A Mallet<sup>2</sup>, T Pridmore<sup>3</sup> and S Benford<sup>3</sup>

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<sup>2</sup>The Shepherd School, Nottingham, UK

<sup>3</sup>Mixed Reality Lab, University of Nottingham, Nottingham, UK

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**ABSTRACT**

Flashlight torches are cheap, robust, familiar and fun and so make interesting devices upon which to base interaction technologies. Computer vision software has been developed that can recognise and distinguish between different flashlight beams and these can be used to activate digital media including audio, video or special effects. The technology appears to 'magically bring to life' objects and areas of the environment merely by shining a torch on them and has been used to successfully to enhance visitor attractions such as museum exhibits and displays. This paper considers the potential for using this technology in special needs education, providing a means for children to explore their immediate environment and discover something new. Potential applications for supporting learning are proposed and a feasibility study is presented. Three case examples were conducted to assess the practicalities of configuring interactive learning experiences within the school environment and pupil's responses to the technology.

*Keywords:* flashlights, multimedia interaction device, learning disabilities, interactive learning space

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## **Tink Tank – an interactive space to make exercise fun for children with various abilities**

T M Kurien

National Institute of Design, India

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### **ABSTRACT**

The children in SETU have been enjoying Tink Tank for the last eight months. Every Monday in SETU is celebrated as “Tink Tank” day. Tink Tank is a universal concept aimed to make certain exercises fun for children with various abilities. I have been inspired by their present toys and developed a new space to make their exercises more interactive and fun. The tank has four different environments (water, jungle, galaxy and springtime). Each environment is associated with an exercise. The exercises include (blowing, grip, hand eye coordination, fine and gross motor coordination and hand exercises). The exercises provide auditory, tactile and visual stimulation. The more they exercise the brighter the light becomes, the movement becomes faster and the music becomes louder. The table of the tank teaches colour, shape, numbers, alphabet and expressions.

*Keywords:* interactive play therapy, exercise stimulation, multisensory play, developmental toys, entertainment edutainment, design for disability.

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## **Explorascope: an interactive, adaptive educational toy to stimulate the language and communicative skills of multiple-handicapped children**

C. Hummels<sup>1</sup>, A. van der Helm<sup>1</sup>, B. Hengeveld<sup>1</sup>, R. Luxen<sup>1</sup>, R. Voort<sup>2</sup>, H. van Balkom<sup>2</sup> and J. de Moor<sup>3</sup>

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### **ABSTRACT**

Very young non- or hardly speaking children with severe disabilities need active guidance to stimulate interaction with their environment in order to develop their communicative and linguistic skills. Augmentative and Alternative Communication (AAC) systems can help this process, provided that they are tuned to this specific user group. LinguaBytes is a research programme, which aims at developing an interactive and adaptive educational toy that stimulates the language and communicative skills of multiple-handicapped children with a developmental age between 1 – 4 years. In this article we show which guidelines we consider essential for developing this tool. We have developed several concepts based on these guidelines, of which we elucidate one called Explorascope (E-scope). E-scope consists of a tangible toy-like interface that is adaptable to an individual child with respect to his or her cognitive, linguistic, emotional and perceptual-motor skills. A user test with the first version of E-scope shows that adaptive, toy-like educational tools are promising and useful for this user group.

*Keywords:* tangible interaction, computer assisted learning, toy design, adaptability, multi-handicapped children

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## Interactivity in work with disabled

S Hasselblad<sup>1</sup>, E Petersson<sup>2</sup> and T Brooks<sup>2</sup>

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<sup>2</sup>Aalborg University Esbjerg, Denmark

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### ABSTRACT

A case study is presented where exploration, play and empowerment in interactive therapy sessions with audiovisual stimuli resulted in achievement, self-esteem and a shared pride for a young adult with profound and multiple learning disabilities (PMLD). Communicative and developmental attributes are central to the work and related to activity theories. Exhibited curiosity and novelty were observed as the user indicated awareness of potential opportunities of own ability and capacity through the interactive environment. Participative involvement methodology resulted in a shared viewing of what was created with the mother. Findings suggest at the significance of realising such 'non-material therapy' in the form of tangible artefacts that can be representational as a sense of achievement for the user.

*Keywords:* Curiosity, achievement, novelty, concentration self-expression, cause and effect, PMLD therapy.

Session 2. Intersensory interaction *Tuesday 14.30-16.05*

**E-skin: research into wearable interfaces, cross-modal perception and communication for the visually impaired on the mediated stage**

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**ABSTRACT**

Today our cultural events are dominated by visual information based on sight and sound, but hardly at all on the combined senses of touch and sound. Visually impaired users, lacking sight are not often able to engage in cultural events. Compensated audio-description or talking books are standard products that visually impaired people can buy to imagine feature film stories or decide what is happening on the stage. Very little theatre, dance or art events exist in which these people can actually participate. Interfaces are not often designed which promote communication between impaired actors, nor allow them to navigate and control audio-visual information on the mediated or digital stage. As neuroscientists suggest, the unique cross-modal potentials of human sensory perception could be augmented by electronic devices, which in turn might communicate with sighted audiences. Our research group is interested to address these problems by constructing ergonomic HCI (Human Computer Interfaces) that can explore the above problems including research into orientation, cognition mapping and external audio-visual device control. Consequently, we are implementing our discoveries in artificial systems, which can interact intelligently with people on the digitally simulated stage.

*Keywords:* Skin perception, embodiment, visually impaired users, cross-modal interaction, cognitive mapping, art rehabilitation, ergonomic design, wearable computing, mediated stages (digital audio-visual control)

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## Use of the 'Phantom' as a basis for a new form of art therapy in schizophrenia

S Machefaux, E Lallart, and R Jouvent

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### ABSTRACT

Art therapy is commonly used as an adjuvant treatment for schizophrenic patients. Few results of its efficiency are available, and the mechanisms of its efficiency remain still unknown. Art therapy, whatsoever the conception we have about it, implicates the subject in a first person perspective, and thus arouses the perception of himself as an agent: his agency. Precisely, this sense of agency is altered in schizophrenia, and this impairment is proposed by many authors to be the essential etiopathogenic mechanism of schizophrenia. Action-monitoring is known as a basis of the sense of agency; inasmuch as it involves the comparison between the intention and the result of the action (the sensory feedback). In this perspective, we conceived a cognitive paradigm evaluating action-monitoring and thus being an indicator of a component of the sense of agency. We used a virtual reality tool: the 'Phantom', which allows a manipulation of the sensory feedbacks. Finally, we put forward the training to those sensory-motor tasks associated to the manipulation of the feedbacks, as a treatment of agency's impairment. Thus, we propose in this paper a new form of art therapy, based on sensory integration and action monitoring. Indeed, the 'Phantom' can be customized for art therapy applications as sculpting, painting... and allows the manipulation of action monitoring, which arouses the sense of agency.

*Keywords:* schizophrenia, agency, self-monitoring, virtual reality, art therapy.

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## Innovative implementation in socket design: digital models to customize the product

C Umberto<sup>1</sup>, B Massimiliano<sup>1</sup>, B Daniele<sup>1</sup>, C Giorgio<sup>1</sup>,  
C Costantino<sup>2</sup> and M Grazia<sup>1</sup>

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### ABSTRACT

The paper presents an innovative approach based on digital data and computer tools to optimize lower limb socket prosthesis design. The kernel of the approach is a stump's detailed geometric model, with external surface and inner bones. To obtain this model, we integrated RE laser scanning and two medical imaging technologies, Computer Tomography (CT) and Magnetic Resonance Imaging (MRI). The model obtained can not be directly used to build the socket by using Rapid Manufacturing technologies. We demonstrate this assertion by comparing digital model of the limb with the positive plaster cast acquired by an orthopaedic technician during the traditional manual manufacturing process. The comparison evidences some differences concentrated on critical zones, whose deformations strictly depend on technician's manipulation. The analyses of the causes of the mentioned differences can furnish guidelines for physics-based simulations able to reproduce effects obtained by the technician.

*Keywords:* lower limb prosthesis design, custom socket, 3D digital modelling, reverse engineering.

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## Facilitating the experience of agency through an intersensory interactive environment

L van Leeuwen and P Ellis

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### ABSTRACT

The project presented provided a group of elderly participants in sheltered living conditions with an intersensory environment in which participants create expressively, by the use of their voice or movements, events which are specified auditory, visual and/or tactile. Being part of long-term research the *iMuse* project explores the effect of additional visual feedback for this specific client group. Through interviews and video-based behavioural observation an account is given of the change in experienced control during *iMuse* sessions with and without visual feedback. The effects in terms of experience and observed behaviour are evaluated in relation to specific impairments as well as individual aesthetic preferences.

*Keywords:* wellbeing in elderly, person-centred intervention, inter-sensory therapy, vibroacoustic sound therapy

Session 3. Sound and Vision *Wednesday 09.00-11.05*

**Picturing sound – an overview of its efficacy**

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<sup>2</sup>Aalborg University Esbjerg, Denmark

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**ABSTRACT**

This paper presents three case studies selected from a sample of teenage children (n = 11) having severe disabilities. Personalised audiovisual environments are created with a targeted goal to encourage interaction, creativity and artistic expression from the teenagers. The feedback stimuli is directly linked to the child's gesticulations for a sense of associated control to be available for recognition. Non-intrusive sourcing of gesture is through camera data mapped to computer vision algorithms. Intervention strategies from staff and helpers within such user-centred environments are questioned. Results point to the positive benefits for these children such as increased eye-to-hand coordination, concentration duration, and improved communication. These findings corroborate with other research in being indicative of the potentials in utilisation such interactive multi-sensory environments in special schools and institutes as a supplemental tool for traditional methods.

*Keywords:* Interaction, Communication, Empowerment, Therapy, Contingency, Awareness

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## **Real-time composition of image and sound in the (re)habilitation of children with special needs: a case study of a child with cerebral palsy**

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### **ABSTRACT**

This paper presents a single case-study of a child with cerebral palsy conducted within the framework of a research project examining the potential benefits of real time interactive image and music composition on the (re)habilitation of children with special needs. An interface was designed to simultaneously present audio and visual feedback stimuli. The child had low mobility of upper limbs, was in a wheelchair and had a short attention span. Sessions took place over a six month period. The first thirteen sessions were analysed. Quality of movement control improved across sessions as well as the quality of the sound produced, revealing growing intentionality on music production. Independent assessments made by the multidisciplinary team of therapists who were delivering rehabilitation services to the child revealed gains in most behavioural skills.

*Keywords:* aesthetic resonance, cerebral palsy, music therapy, multi-sensory environments, movement rehabilitation

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## MusiCam – an instrument to demonstrate chromaphonic synesthesia

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### ABSTRACT

Inspired by a type of synesthesia where colour typically induces musical notes the MusiCam project investigates this unusual condition, particularly the transition from colour to sound. MusiCam explores the potential benefits of this idiosyncrasy as a mode of Human Computer Interaction (HCI), providing a host of meaningful applications spanning control, communication and composition. Colour data is interpreted by means of an off-the-shelf webcam, and music is generated in real-time through regular speakers. By making colour based gestures users can actively control the parameters of sounds, compose melodies and motifs or mix multiple tracks on the fly. The system shows great potential as an interactive medium and as a musical controller. The trials conducted to date have produced encouraging results, and only hint at the new possibilities achievable by such a device.

*Keywords:* colour organ, audio synthesis, musical controller, synesthesia, HCI

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## Unintentional therapy, unexpected results: my artistic life to this point

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(Western Newfoundland, geriatrics division), Canada

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### ABSTRACT

This autobiographical paper explores the varied and intricate relationships between the creation of visual art (through painting, drawing and sculpting) and the improvement of cognitive functions. It expresses the point of view of the “patient” as this author shares her own personal experience with using art elements (colour, line and shape) as a neurological stimulus. These creative and expressive therapies (though unintentional, in this case) were instrumental in restoring her cognitive abilities after surviving a massive childhood stroke. She goes on to relate how she applies this learning to working with children, adults and others with varying degrees of cognitive/neurological dysfunction today.

*Keywords:* sensory perception, neural pathways, visual stimuli, motor co-ordination, foundational elements

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## Flying cities: building a 3D world from vocal input

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### ABSTRACT

The Flying Cities artistic installation brings to life imaginary cities made from the speech input of visitors. In this article we describe the original interactive process generating real time 3D graphics from spectators' vocal inputs. This example of cross-modal interaction has the nice property of providing a tangible correspondence between the two spaces. This interaction mean has proved to suit the artistic expression well but it also aims at providing anyone with a pleasant and stimulating feedback from speech activity, a new medium for creativity and a way to visually perceive a vocal performance. As the feedback we have received when presenting Flying Cities was very positive, our objective now is to cross the bridge between art and the potential applications to the rehabilitation of people with reduced mobility or for the treatment of language impairments.

*Keywords:* speech processing, interactive art, artificial reality, cross-modal, rehabilitation.



# ICDVRAT & ArtAbilitation at a Glance

## Sunday, 17<sup>th</sup> September

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16:00 – 19:00 Pre-registration open at Esbjerg Svømmestadion

## Monday, 18<sup>th</sup> September

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8:50 Opening remarks

9:00 – 11:05 **ICDVRAT I: Social Interaction**

Coffee

11:30 – 13:10 **ICDVRAT II: Motion Tracking and 3D Modelling**

Lunch

14:30 – 16:35 **ICDVRAT III: Therapy**

Coffee

17:15 – 18:45 Visit to the Sensorama VR Lab, Aalborg Universitet Esbjerg

19:00 – 20:30 Reception (drinks and finger buffet) at the Esbjerg Fisheries and Maritime Museum

20:30 Free for dinner

## Tuesday, 19<sup>th</sup> September

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9:00 – 11:05 **ICDVRAT IV: Interaction Control**

Coffee

11:30 – 13:10 **ICDVRAT V: Rehabilitation and Route Learning**

**ArtAbilitation I: Playing and Learning**

Lunch

14:30 – 16:10 **ICDVRAT VI: Medical Treatment and Home Based Rehabilitation**

**ArtAbilitation II: Intersensory Interaction**

Coffee

16:30 – 18:30 **ICDVRAT/ArtAbilitation** Interactive Demonstration Session

19:30 – 22:00 Conference Banquet at Café Tonekunsten, Musikhuset

## Wednesday, 20<sup>th</sup> September

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9:00 – 11:05 **ICDVRAT VII: Visual Impairment**

**ArtAbilitation III: Sound and Vision**

Coffee

11:30 – 13:10 **ICDVRAT VIII: Cognitive Skills**

Lunch

14:30 – 16:10 **ICDVRAT IX: Stroke Rehabilitation**

16:10 Closing Remarks followed by Coffee



The University of Reading

