**3rd International Convention on Rehabilitation Engineering & Assistive Technology**
**22 – 26 April, 2009**
**"Accessible Tourism"**
**Singapore Management University, School of Accountancy, Singapore**

# Programme at a Glance

**Legend:**
**HW***X* – Half day workshop **QW***X* – Quarter day workshop **F***X* – Forum
**Seminar Rooms:** 2.1, 2.2, 2.3 & 2.5 (Level 2); 3.1, 3.2 & 3.3 (Level 3)
*Please note that the programme is subject to changes without any prior notification.*

| **Pre-Conference**<br>**22 April 2009 (WEDNESDAY)** | |
|---|---|
| **Time** | **School of Accountancy Basement 1** |
| **2:00PM – 5:30PM** | Registration |

| **Exhibition**<br>**23 April 2009 (WEDNESDAY) to 25 April 2009 (FRIDAY)** | |
|---|---|
| **Time** | **School of Accountancy Basement 1** |
| **10:00AM – 5:30PM** | Rehabilitation Engineering (RE) and Assistive Technology (AT) Exhibition<br>Open to Public |

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| **Day 1**<br>**23 April 2009 (THURSDAY – AM Session)** | | | | |
|---|---|---|---|---|
| **Time** | **Room 3.1** | **Room 3.2** | **Room 3.3** | **Room 3.4** |
| **8:00AM – 8:30AM** | Registration<br>(Basement 1 Exhibition Area) | | | |
| **8:30AM – 10:30AM** | Paper Presentation<br>A1<br>*Mobility Aids & Seating* | Paper Presentation<br>B1<br>*Rehabilitation Technology* | Paper Presentation<br>C1<br>*Special Education and Augmentative & Alternative Communications* | Student Design Challenge |
| **10:30AM – 11:00AM** | Tea Reception<br>(Basement 1 Exhibition Area) | | | |
| **11:00AM – 12:30PM** | Paper Presentation<br>A2<br>*Silver Industry Technology* | Paper Presentation<br>B2<br>*Rehabilitation Technology* | Paper Presentation<br>C2<br>*Assistive Technology and Society* | Student Design Challenge |
| **12:30PM – 1:30PM** | Lunch | | | Prototype Judging |

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| **Day 1**<br>**23 April 2009 (THURSDAY – PM Session)** | |
|---|---|
| **Time** | **Ngee Ann Kongsi Auditorium** |
| **1:20PM – 1:45PM** | ***i*-CREAT*e* 2009** Opening Ceremony |
| **1:45PM – 2:15PM** | Plenary 1<br>Mr Kua Cheng Hock on "*Towards More Rewarding and Accessible Tourism — Experiences and Expectations Of a Blind Traveller*" |
| **2:15PM – 2:45PM** | Plenary 2<br>Prof. Etienne Burdet on "*Human Centered Rehabilitation Robotics*" |
| **2:45PM – 3:15PM** | Plenary 3<br>Dr. Kong Keng He on "*The Role of Technology in Rehabilitation — Perspective from a Rehabilitation Physician*" |
| **2:30PM** | Arrival of Guests of Honor<br>Her Royal Highness Princess Maha Chakri Sirindhorn, Kingdom of Thailand<br>Dr Vivian Balakrishnan, Minister for Community Development, Youth and Sports, Singapore |
| **3:15PM – 3:45PM** | Tea Reception<br>(L2 Foyer) |
| **4.00PM – 4:30PM** | Plenary 4<br>Dr Therdchai Jivacate on "*The Prostheses Foundation of H.R.H. the Princess Mother*" |
| **4:30PM – 5:00PM** | Plenary 5<br>Dr Gery Colombo on "*Advanced Neurorehabilitation Technology*" |
| **5:00PM** | End of ***i*-CREAT*e* 2009** Day 1 Conference |
| **6:00PM – 10:00PM** | ***i*-CREAT*e* 2009** GALA DINNER at Grand Park, City Hall<br>Registration & Cocktail reception at 6.00pm<br>All guests to be seated at 6.30pm<br>Guests of Honor<br>Her Royal Highness Princess Maha Chakri Sirindhorn, Kingdom of Thailand<br>Dr Vivian Balakrishnan, Minister for Community Development, Youth and Sports, Singapore |

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<table>
<tr><th colspan="6">Day 2<br>24 April 2009 (FRIDAY – AM SESSION)</th></tr>
<tr><th>Time</th><th>Room 2.1</th><th>Room 2.2</th><th>Room 2.3</th><th>Room 2.5</th><th>Ngee Ann Kongsi Auditorium</th></tr>
<tr><td>8:30AM – 9:30AM</td><td rowspan="2">HW1<br>Assistive Technology<br>by<br>Augmentative and Alternative Communication Institute (AACI), USA</td><td rowspan="2">HW2<br>Special Education<br>by<br>National Institute of Education, SINGAPORE</td><td rowspan="2"></td><td rowspan="2">HW3<br>Workshop for Visually Impaired<br>by<br>ViewPlus Technologies, AUSTRALIA</td><td></td></tr>
<tr><td>9:30AM – 10:00AM</td><td rowspan="2">F1<br>Disability & Employment Forum<br>(in conjunction with ICAT2009)</td></tr>
<tr><td>10:00AM – 10:30AM</td><td colspan="4">Tea Reception<br>(Basement 1 Exhibition Area)</td></tr>
<tr><td>10:30AM – 12:30PM</td><td>HW1<br>Assistive Technology<br>by<br>Augmentative and Alternative Communication Institute (AACI), USA</td><td>HW2<br>Special Education<br>by<br>National Institute of Education, SINGAPORE</td><td>QW1<br>Workshop on Special Seating<br>by<br>Spastic Children's Association of Singapore, SINGAPORE</td><td>HW3<br>Workshop for Visually Impaired<br>by<br>ViewPlus Technologies, AUSTRALIA</td><td></td></tr>
<tr><td>12:30PM – 1:30PM</td><td colspan="5">Lunch</td></tr>
</table>

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| **Day 2**<br>**24 April 2009 (FRIDAY – PM Session)** | | | | | |
|---|---|---|---|---|---|
| **Time** | **Room 2.1** | **Room 2.2** | **Room 2.3** | **Room 2.5** | **Ngee Ann Kongsi Auditorium** |
| **1:30PM – 3:30PM** | QW2<br>*Augmentative and Alternative Communication (AAC) Systems in the Classroom*<br>by<br>Augmentative and Alternative Communication Institute (AACI), USA | | HW4<br>*Workshop on Motion Capture*<br>by<br>Nanyang Polytechnic, SINGAPORE | QW3<br>*Workshop on Power Mobility & Seating*<br>by<br>Tan Tock Seng Hospital, SINGAPORE & Otto Bock, HONG KONG | |
| **3:30PM – 4:00PM** | Tea Reception<br>(Basement 1 Exhibition Area) | | | | |
| **4:00PM – 5:30PM** | F2<br>*Assistive Technology (AT) in Classroom Forum* | | HW4<br>*Workshop on Motion Capture*<br>by<br>Nanyang Polytechnic, SINGAPORE | QW4<br>*Workshop on Prosthesis & Orthosis*<br>by<br>Tan Tock Seng Hospital, SINGAPORE & Otto Bock, SINGAPORE | |
| **6:00PM – 9:00PM** | Night Program<br>(Optional tours available at Asia Travel Group) | | | | |

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| **Day 3**<br>**25 April 2009 (SATURDAY – AM SESSION)** | | | | | |
|---|---|---|---|---|---|
| **Time** | **Room 2.1** | **Room 2.2** | **Room 2.3** | **Ngee Ann Kongsi Auditorium** | **Lee Kong Chian School of Business Room 1.2** |
| **8:30AM – 10:00AM** | HW5<br>*Workshop on Advanced Augmentative & Alternative Communications (AAC) Intervention*<br>by<br>Augmentative and Alternative Communication Institute (AACI), USA | HW6<br>*Workshop on Neuro Rehabilitation*<br>by<br>Tan Tock Seng Hospital, SINGAPORE | | | |
| **10:00AM – 10:30AM** | Tea Reception (Basement 1 Exhibition Area) | | | | |
| **10:30AM – 12:30PM** | HW5<br>*Workshop on Advanced Augmentative & Alternative Communications (AAC) Intervention*<br>by<br>Augmentative and Alternative Communication Institute (AACI), USA | HW6<br>*Workshop on Neuro Rehabilitation*<br>by<br>Tan Tock Seng Hospital, SINGAPORE | | | |
| **12:30 – 1:30PM** | Lunch | | | | |

**3rd International Convention on Rehabilitation Engineering & Assistive Technology**
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| **Day 3**<br>**25 April 2009 (SATURDAY – PM Session)** | | | | | |
|---|---|---|---|---|---|
| **Time** | **Room 2.1** | **Room 2.2** | **Room 2.3** | **Ngee Ann Kongsi Auditorium** | **Lee Kong Chian School of Business Room 1.2** |
| **1:30PM – 3:30PM** | | QW5<br>*Workshop on Gym for Elderly*<br>by<br>Dynaforce, SINGAPORE | | F3<br>*Assistive & Rehabilitation Technology Alliance Forum* | |
| **3:30PM – 4:00PM** | Tea Reception<br>(Basement 1 Exhibition Area) | | | | *Meeting on Commercialization*<br>by<br>Fellowship of Inventors |
| **4:00PM – 6:00PM** | | | | | |

| **Post-Conference**<br>**26 April 2009 (SUNDAY)** | |
|---|---|
| **10:00AM – 5:00PM** | Social Program<br>(Optional tours available at Asia Travel Group) |

# Paper Presentation

**Paper Session A1 – Mobility Aids & Seating**
**Rm 3.1**
**Day 1 – 23 April 2009 (THURSDAY)**
**8:30AM – 10:30AM**

| Session | Description |
|---|---|
| 8:30AM – 8:45AM | **A1-1**<br>**SmartGuide System to Assist Visually Impaired People in a University Environment**<br>*Zhi Heng Tee, Li-Minn Ang, Kah Phooi Seng, Jia Hao Kong, Ricky Lo, Ming Yeang Khor*<br>*University of Nottingham, Malaysia*<br><br>Abstract<br>This paper presents a caregiver monitoring system for assisting visually impaired people. The objective of this system is to assist blind and low vision people to walk around independently and safely in a university environment by providing speech guidance on their current location and navigation information on how to move to a particular location. |
| 8:45AM – 9:00AM | **A1-2**<br>**Design and Development of a Navigation Assistance System for the Visually Impaired**<br>*J. Zhang, S. K. Ong, Y. C. Nee*<br>*National University of Singapore, Singapore*<br><br>Abstract<br>In this paper, the design of a navigation assistance system for the visually impaired is discussed, and the development of such a prototype system is presented. The motivation of this research is to develop a navigation system without the necessity of continuous user localization. Navigational information is only provided when necessary at decision-making locations. Absolute spatial information is stored for these locations, and ZigBee technology is applied for wireless data communication between the location node and the user module. Infrared, computer vision, and inertial technologies are applied in the system to transform the absolute spatial information into user-centric destination orientation data. |

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| 9:00AM – 9:15AM | **A1-3**<br>**Adapting Motorbikes for Independent Use by People with Disability**<br>*Jesse Owens*<br>*University of Alaska Anchorage, USA*<br><br>Abstract<br>In much of the world motorbikes are the dominant means of transportation. In the developing world motorbikes are often the only form of motorized transportation affordable to the majority of the population. Unfortunately this method of transportation has not been widely exploited anywhere in the world for use by people with severe mobility impairments, especially those who must use wheelchairs. To provide affordable transport for a wide range of mobility-impaired people I have developed an inexpensive sidecar adaptation for motorbikes, capable of transporting a wheelchair user (Figure 1). This adaptation is referred to as the SideScooter. The SideScooter can be operated independently with hand controls from the sidecar or from the motorbike seat, depending on the needs of the operator. Given the vast number of motorbikes in the world and the scarcity of independent transportation for wheelchair users this device has the potential to improve the quality of life for many disabled people in developing as well as the more affluent regions of the world. |
| 9:15AM – 9:30AM | **A1-4**<br>**Low-cost Stereo Vision System for Supporting the Visually Impaired's Walk**<br>*Thanathip Limna, Pichaya Tandayya, Nikom Suvanvorn*<br>*Prince of Songkla University, Thailand*<br><br>Abstract<br>This paper presents an obstacle detection system for the visually impaired to use with a walking stick. The system in this work can find obstacles applying the depth discontinuities Pixel-to-Pixel (P2P) stereo algorithm which is one of the Intensity-based Stereo Matching (ISM) techniques in stereo vision that can find objects with featureless surface such as whiteboard, door, etc. However, the ISM technique is time consuming and not fast enough for real-time usage. Applying parallel computing using Message Passing Interface (MPI) helps reduce the computing time and enable real-time usage. In this work, we estimate the distance between objects and the visually impaired by applying the V-disparity. Our system can accurately detect objects within the range of 5 meters using 12-centimeter based-line low-cost webcams. |

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| 9:30AM – 9:45AM | **A1-5**<br>**A Novel Design and Development on Bioimpedance-Based Wheelchair Control**<br>*Yunfei Huang, Pornchai Phukpattaranont, Booncharoen Wongkittisuksa, Sawit Tanthanuch*<br>*Prince of Songkla University, Thailand*<br><br>Abstract<br>This article presents a novel design and development on bioimpedance-based wheelchair control for the disabled people and the elderly. We use three electrodes to measure two channels of bioimpedance from the trapezius muscle. Bioimpedance changes when there is a movement in the segment of trapezius muscle. We can classify six types of motions resulting in six operation capabilities for wheelchair control based on six types of shoulder movements, i.e. left shoulder up, right shoulder up, and both shoulder up for short time and long time. Our system is composed of the modified Howland current bridge circuit, which supplies the 0.5 mA ac current to the measurement system at the frequency of 50 kHz. NI PCI-6250 DAQ board was adopted to collect the data and Labview 8.2 was used to implement the signal processing and control system. Algorithms applied in the system are an automatic threshold value adjustment, which adapt its value to the measured signal. Pump value detection is used to detect the unexpected large change of the signal to avoid the wrong operation. Results indicate that the change of signal according to the shoulder movement is very stable. Moreover, we can use the shoulder movement to control LED on Labview 8.2 with an accuracy of 100%. |
| 9:45AM – 10:00AM | **A1-6**<br>**Electric Motor Based Head Controller for Power Wheelchairs with Joy Stick Input**<br>*Prapon Jitkreeyarn, Niyom Nulek, Kanokvate Tungpimolrut, Nattapon Chayopitak*<br>*National Electronics and Computer Technology Center, Thailand*<br><br>Abstract<br>In this paper, a design of a head controller and an adapting unit for interfacing with a power wheelchair is presented. The proposed controller is based on a servo mechanism of stepper motors, which provide motion in the x- and y-axis to actuate a modified joystick-controlled power wheelchair. The technical design aspects of the proposed head controller, adapting unit as well as the microcontroller implementation are discussed. |

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| 10:00AM – 10:15AM | **A1-7**<br>**Performance Evaluation Method of Alternating Pressure Air Mattresses Using FSA Pressure Mapping System**<br>*Pasu Sirisalee, Danu Prommin, Pataravit Rukskul*<br>*National Metal and Materials Technology Center, Thailand*<br><br>Abstract<br>Pressure ulcers are among the most common complication found in bed-ridden patients. In Thailand, Alternating Pressure Air Mattresses (APAMs) have been used both in hospitals and home settings to prevent pressure ulcers. Various types of APAMs are commercially available at a variety of prices and features. The performance of these APAMs is still questionable to the users. Pressure Relief Index (PRI) is a promising indicator that can be used to compare the performance of APAMs. This paper presents a simple procedure to evaluate the performance of APAMs based on the concept of PRI by using FSA pressure mapping system. This procedure can be used to relatively compare the performance of APAMs and assist the users in justifying the cost-effectiveness of APAMs. |
| 10:15AM – 10:30AM | **A1-8**<br>**Development Issues of Seating Systems and A proposed Framework for a Therapeutic Seat**<br>*Yaqun Wu, Yoke San Wong, Han Tong Loh*<br>*National University of Singapore. Singapore*<br><br>Abstract<br>Prolonged sitting duration can have an adverse effect on elderly people, especially those with limited mobility and sensation. It usually results in many medical problems and complexities. Pressure ulcers have got most concerned as its prevalence, harm and high cost for treatment. Various seating systems have been developed to enhance functional ability, provide protection from tissue breakdown (pressure ulcers) and relieve the concentrated interface pressure for these patients. Air inflated cushion has been evaluated and verified to be efficient in pressure management and is adaptive for other functional extensions. Some key issues in developing effective air-inflated cushions are identified in this paper, including the interface pressure, sitting conditions discrimination, inflation pressure, alternating pressure and some other problems. In addition, efforts made in these aspects and some novel achievements are summarized. Furthermore, the framework of a Computer Controlled Adjustable Seat System (CCASS) is proposed for the study on therapeutic air inflated cushion development. Specifically the CCASS adopts a multiple air cell structure with sensing system and can serve as a research tool to identify the various seating factors for the design of a therapeutic seat. The general design and development process of an intelligent air cushion will also be briefly introduced, and the main design idea was validated |

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| | with prototype testing. |

**Paper Session A2 – Silver Industry Technology**
**Rm 3.1**
**Day 1 – 23 April 2009 (THURSDAY)**
**11:00AM – 12:30PM**

| Session | Description |
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| 11:30AM – 11:45AM | **A2-1**<br>**Fall Detection and Activity Monitoring System using Dynamic Time Warping for Elderly and Disabled People**<br>*Sasiwan Paiyarom, Poj Tangamchit, Rachoporn Keinprasit*, Prakasith Kayasith**<br>*King Mongkut's University of Technology Thonburi, Thailand*<br>**National Electronics and Computer Technology Center (NECTEC), Thailand*<br><br>Abstract<br>We present a new system that both tracks human movements and detects falling in elderly and disable people. We applied Dynamic Time Warping(DTW) to recognize human activities of daily living. Seven different movements, stand, sitt, walk, run, stand-to-sit, sit-to-stand and lyings were considered and were kept to reference databases signals. Our system consists of two parts: transmitter and receiver. A transmitter part is the device mounted at the user's waist within a pager case measuring 90x40x20 mm. A sensor used in this device is a 3-axial accelerometer (Hitachi H48C). The signals from the accelerometer are transmitted wirelessly to a personal computer in receiver part using Zigbee Pro 2.4GHz. A personal computer only requires MATLAB7 program to recognize our system. DTW is used to match the signals from different behaviors in online with the databases. DTW will find a minimal path between two time series: the test signal and the reference database signal. This minimal value can classify a kind of activity of that test signal. In addition, we use the thresholds with repeated lying after the test signal amplitude is over thresholds to detect falling. Thresholds are from the minimal and maximal value in each axis of acceleration in reference databases. The experiment shows 98.6 percent accuracy in recognizing these behaviors and fall detection. |
| 11:15AM – 11:30AM | **A2-2**<br>**An Exploratory Study on Senior Citizens' Perceptions of the Nintendo Wii: A Case of Singapore**<br>*Yin-Leng Theng*<br>*Nanyang Technological University, Singapore*<br><br>Abstract<br>Recent developments in digitally mediated games such as the Nintendo Wii aim to encourage exercise. This paper focuses on assessing the |

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| | efficacy of the Nintendo Wii, popular in the United States and Japan, in promoting regular exercise among senior citizens in Singapore (aged 65 years and above). Adapting from the Technology Acceptance Model (TAM), this exploratory study examines senior citizens' perceptions of the Nintendo Wii. Twenty-eight participants took part in this pilot study conducted at a senior citizens centre in Singapore. Data collection was carried out via a self-reported questionnaire and video observation. Findings indicate that senior citizens perceived the Nitindo Wii usable with realistic depictions of games and had positive engagement with the Wii games. However, contrary to prior belief, findings did not show that perceived usefulness has a significant influence on senior citizens' intention to use the Wii for improving social interaction, health and exercise. The paper concludes with a discussion on the design and impact of digitally mediated games for elderly users. |
| 11:30AM – 11:45AM | **A2-3**<br>**Evaluation of Fall Detection for the Elderly on a Variety of Subject Groups**<br>*Patimakorn Jantaraprim, Pornchai Phukpattaranont, Chusak Limsakul, Booncharoen Wongkittisuksa*<br>*Prince of Songkla University, Thailand*<br><br>Abstract<br>Falls in the elderly are a major problem for today's society. If the elderly could get help immediately after the fall, the severity of the injury could be reduced. Also, it results in decreasing the rate of death and the medical cost. This paper presents a fall detection algorithm based on the threshold value of the maximum peak resultant acceleration to classify falls and Activity of Daily Live (ADL). Two types of the experiments were investigated. Type A) ten young subjects performed both falls and ADL. Type B) ten young subjects performed falls whereas ten elderly subjects performed ADL. In the experiment, tri-axial accelerometer was mounted on the trunk. There were four categories of falls: forward fall, backward fall, left and right side fall and six categories of ADL: sit-stand, stand-sit, sit-lie, lie-sit, bend down, and walking 2 m. For the threshold of the maximum peak resultant acceleration at 1.9g, falls could be distinguished from ADL with 100% sensitivity in both Type A and B while specificity for Type A and B were 96.11% and 98.33%, respectively. Results indicate that the trend in classification of fall from ADL in the elderly could gain the increase in error. Therefore, more sophisticated algorithms for the classification of fall from ADL in the elderly are needed to improve performance of detection. |

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| 11:45AM – 12:00PM | **A2-4**<br>**Adult Children's Perceptions of Intelligent Home Systems in the Care of Elderly Parents**<br>*Joseph Coughlin, Lisa D'Ambrosio, Bryan Reimer, Jasmin Lau**<br>*Massachusetts Institute of Technology AgeLab, USA*<br>**Singapore Ministry of Manpower, Singapore*<br><br>Abstract<br>Smart home technologies and services are widely researched and being commercialized for use in the homes of older adults throughout the world. However, widespread adoption by older adults of even the most affordable and simple systems has been mixed. While older adults may be the "users" of such technologies, we seek to understand the perceptions held by key "influencers" in the buy and use decisions – the adult child. We present an exploratory study based upon a convenience sample of adult children most likely to embrace intelligent home systems and services. Survey respondents are highly educated technology savvy, middle to high-income adult children ages 35 and older. This group represents possible "lead adopters" that might advance the commercialization of these potentially useful technologies. Findings suggest that trust in the accuracy of the system, privacy concerns and willingness to intervene in a parent's home may present challenges to adoption even among tech-savvy adult children. |
| 12:00PM – 12:15PM | **A2-5**<br>**The Gator Tech Smart House: Enabling Technologies and Lessons Learned**<br>*Sumi Helal, Chao Chen*<br>*University of Florida, USA*<br><br>Abstract<br>In this paper, we describe the Gator Tech Smart House (GTSH), an assistive environment for independence and wellbeing, with focus on the elderly population. We give a quick overview of the GTSH and its services before presenting our experience and some of the lessons we learnt in this real world deployment project. We present the Atlas architecture – a key enabling technology for the automatic integration of devices and sensors and show how can Atlas be used to develop smart environments without requiring a team of engineers or system integrators. Finally, we discuss ongoing related Atlas developments. |

**Paper Session B1 – Rehabilitation Technology**
**Rm 3.2**
**Day 1 – 23 April 2009 (THURSDAY)**
**8:30AM – 10:30AM**

| Session | Description |
|---|---|
| 8:30AM – 8:45AM | **B1-1**<br>**An Affordable, Computerized, Table-based Exercise System for Stroke Survivors**<br>*Marcus King, Leigh Hale*, Anna Pekkari**, Martin Persson***<br>*Industrial Research Ltd, New Zealand*<br>**University of Otago, New Zealand*<br>***Uemå University, Sweden*<br><br>Abstract<br>Loss of hand function as a result of upper limb paresis after a stroke leads to a loss of independence and the strength of the paretic upper limb is strongly related to measures of activity. Robotic-assisted therapy with virtual reality, leads to improvements in motor function, but, there is a need to improve the cost-to-benefit ratio of these therapies. This case series study investigated an augmented reality computer game which provided a rewarded, goal-directed task to upper limb rehabilitation via a reaching task motivated by a computer game. A device was developed to increase the exercise effort for the table-based therapy. Of the 4 participants in the case study, 2 showed improvement in ability to play the game and in arm function. Participants felt that the system provided a worthwhile exercise that they would carry out in a home rehabilitation setting. |
| 8:45AM – 9:00AM | **B1-2**<br>**Computer Vision Technologies for Monitoring System in Tele-Physiotherapy**<br>*Panachit Kittipanya-ngam, Xinguo Yu, How Lung Eng*<br>*Institute for Infocomm Research, Singapore*<br><br>Abstract<br>Physiotherapay exercise is a vital medical treatment process as it helps bringing a normal life back to patients. However due to the requirements of time spent and interactions with medical specialists such as doctors, therapists, and nurses, patients have to deal with some difficulties such as time and cost of travelling, waiting for availability of specialists and ineffective personal exercises. These difficulties could cause worse on those patients living in the areas distant from medical centres or lacking of medical staffs and experts. Therefore the concept of tele-physiotherapy was created to improve the quality of physiotherapy services. The objective of tele-physiotherapy is to allow patients and medical experts |

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| | carrying on their sessions through telecommunication networks as if they are in the same place. Computer vision technologies, then, can be useful and helpful in monitoring process of system because the quality assessments of physiotherapy exercise are mainly based on vision. This article is discussing the feasibility of applying computer vision technolgies in tele-physiotherapy while showing an example of using computer vision in fall detection. The study shows that computer vision has some potential in enhancing and improving the telephysiotherapy system but the study of some considerations is needed before implementing. |
| 9:00AM – 9:15AM | **B1-3**<br>**Design of a Myoelectric Glove for Upper Limb Stroke Rehabilitation**<br>*Sangit Sasidhar, Sanjib Kumar Panda, Jianxin Xu*<br>*National University of Singapore, Singapore*<br><br>Abstract<br>Physiotherapy is an inherent component of stroke rehabilitation. It is important for the patient to be self motivated in physiotherapy sessions for a better and faster recovery. This paper presents a simple design of an orthotic glove which will be controlled by the myoelectric signals of the stroke patient. A real time control scheme using a linear discriminant classifier is used to process and classify the myoelectric signals acquired from different muscle groups. These control signals are used to actuate servo motors to facilitate elbow movement. A position and velocity sensor ensures that there are no sudden movements or jerks in the movement path of the orthotic glove. |
| 9:15AM – 9:30AM | **B1-4**<br>**A Method for Measuring Human Arm's Mechanical Impedance for Assessment of Motor Rehabilitation**<br>*Hossein Mousavi Hondori, Shih Fu Ling*<br>*Nanyang Technological University, Singapore*<br><br>Abstract<br>This research work aims to develop a new tool for assessment of human motor function with a focus on the upper limb. For that purpose, Simultaneous Sensing cum Actuating technology (SSA) will be used for measuring force, velocity, and especially mechanical impedance of the limb. Impedance measured at the hand point while the upper limb performing a motion task is a quality indicator of the limb's motor function. Conventional method of measuring mechanical impedance which requires a force and a motion sensor mounting on fixed base points is not applicable here. This method overcomes the difficulty. Here an electrical motor is used as sensor-actuator which carries a mechanical load (here human's limb); the motor plays the role of a sensor as well, so we calibrate the "transduction matrix" of the motor and will measure the |

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| | mechanical impedance of the load through measuring the electrical impedance of the electrical motor. In this paper we explain how the appropriate apparatus was designed and tailored for this application and how the method was validated. At the end experimental result of measuring mechanical impedance of a human subject is presented. |
| 9:30AM – 9:45AM | **B1-5**<br>**Improving Performance of Asynchronous BCI by Using a Collection of Overlapping Sub Window Models**<br>*Nakarin Suppakun, Songrit Maneewongvatana*<br>*King Mongkut's University of Technology Thonburi, Thailand*<br><br>Abstract<br>Asynchronous Brain Computer Interface (BCI) has become an interesting topic in the present days because it provides the simulation of realistic usage of BCI. For asynchronous BCI, the computer has to discriminate not only differences among various imaginary tasks but also detect of relax period. Since the training phase for building a classification model is still synchronous (cuebased), the main challenge is to classify the EEG signal continuously with good accuracy on asynchronous (uncue-based). This paper addresses on achieving to better performance by using a collection of overlapping sub windows models. A model is referred to a primitive classification model which consists of common spatial patterns (CSP) with linear discriminant analysis (LDA). Each primitive model was trained with the corresponding sub window indexes. We had 3 collections of models: task1 vs. task2, task1 vs. relax, and task2 vs. relax. These binary classification results were then fused together with Mahalanobis distance to gain better performance. The results were measured by mean square error (MSE), and their performance is better compared to the primitive model. Furthermore, the results on the test set were achieved comparable to the 3 leading scores of BCI Competition IV dataset 1. |
| 9:45AM – 10:00AM | **B1-6**<br>**Exercises for Rehabilitation and Assessment of Hand Motor Function with the Haptic Knob**<br>*Olivier Lambercy, Ludovic Dovat, Teo Chee Leong, Hong Yun*, Seng Kwee Wee*, Christopher Kuah, Karen Chua*, Roger Gassert**, Theodore Milner***, Etienne Burdet*****<br>*National University of Singapore, Singapore*<br>**Tan Tock Seng Hospital, Singapore*<br>***ETH Zurich, Switzerland*<br>**** McGill University, Canada*<br>*****Imperial College, London, United Kingdom*<br><br>Abstract<br>This paper investigates robot-assisted rehabilitation and assessment of hand function after stroke using the Haptic Knob, a 2 degrees-of-freedom |

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| | end-effector based robotic device to train grasping and wrist pronation/supination.<br><br>Nine chronic stroke subjects trained over a period of 6 weeks, with 3 one-hour sessions of robot-assisted therapy per week, consisting in two exercises requiring active participation promoted by therapeutic games. Behavioral data collected by the Haptic Knob were analyzed to evaluate motion control, smoothness and precision over the therapy. Subjects progressively improved their performances in the proposed functional exercises, suggesting improvement in hand motor function. This was confirmed by results of standard clinical assessment as subjects improved a mean of 4.3 points in the Fugl-Meyer assessment scale, accompanied by a decrease in spasticity. These results illustrate the positive effect of therapy with the Haptic Knob and the possibility to use it as an assessment tool to evaluate and monitor hand motor function during rehabilitation therapy. |
| 10:00AM – 10:15AM | **B1-7**<br>**Interactive Robot-Assisted Training System using continuous EMG signals for Stroke Rehabilitation**<br>*Raymond K. Y. Tong, Wallace W. F. Leung, X. L. Hu, R. Song*<br>*The Hong Kong Polytechnic University, Hong Kong*<br><br>Abstract<br>Active initiation and participation in the rehabilitation is a key of success for stroke rehabilitation. To patients with stroke, the interactive robotic system would motivate them to actively interact with the system during the task-related training regime. The system used muscle activation from affected limbs as control signal. The system was designed to train the wrist, elbow, knee and ankle joints in vertical and horizontal positions. Results from wrist and elbow training on persons after stroke had shown improvement in reduced spasticity on the joint, better coordination on the wrist and elbow joints. |
| 10:15AM – 10:30AM | **B1-8**<br>**Leveraging Retained Physical Capabilities to Support Persons with Severe Motor Impairments**<br>*Torsten Felzer, Rainer Nordmann*<br>*Darmstadt University of Technology, Germany*<br><br>Abstract<br>This paper deals with two novel applications of an alternative method of interacting with a computer which enables persons with very severe motor impairments to leverage retained capabilities in order to independently control certain parts of their daily lives. The input strategy is based on tiny intentional contractions of a single muscle of choice (requiring a minimum of physical contribution only) which are used as "selection |

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| | marker" in the context of *scanning*. The first application turns the PC into a *Universal Remote Control* (URC), while the second one is a *Text-To-Speech* (TTS) module. A simple experiment requesting the speed of the scanning scheme shows that the theoretical concept really works and that it therefore has the potential of being of great help for its target population. |
| — | **B1-9**<br>**Analysis and Comparison of Intelligent Control Methods for Computer-controlled Artificial Leg**<br>*Hong-liu Yu, Xing-san Qian, Ling Shen*<br>*University of Shanghai for Science and Technology, China*<br><br>Abstract<br>The computer-controlled artificial legs, most of which are above-knee prostheses (AKP) can better adapt to the human gait and walking modes, automatically distinguishing terrain and coordinate the symmetry of gait. Due to the complexity and non-linearity of AKP control, it is required to design a kind of controller being intelligent enough for it. Research and product development of computer-controlled AKP is comprehensively discussed in the paper. The expert controller based on finite-state machine method and BP neural network controllers based on PD supervision are especially analyzed. The major intelligent control methods applied for existing AKP products are also compared with each other here. The development of intelligent control technology in the future is pointed out. |

**Paper Session B2 – Rehabilitation Technology**
**Rm 3.2**
**Day 1 – 23 April 2009 (THURSDAY)**
**11:00AM – 12:30PM**

| Session | Description |
|---|---|
| 11:30AM – 11:45AM | **B2-1**<br>**Hand Rehabilitation based on Augmented Reality**<br>*Y. Shen, S. K. Ong, A. Y. C. Nee*<br>*National University of Singapore*<br><br>Abstract<br>This paper presents an augmented reality based system for hand rehabilitation. In this system, digital data gloves are used to detect the movements of the patients' hands and collect the physical information from the patients. Using augmented reality technology, a highly controllable environment with tasks of different levels of difficulty is provided to the patients for them to perform the rehabilitation exercises gradually. The targets of the exercises can be adjusted dynamically with respect to the physical conditions and progress of the patients. Multimodal feedbacks are provided to facilitate and encourage the patients during the rehabilitation sessions. |
| 11:15AM – 11:30AM | **B2-2**<br>**Interactive Rehabilitation**<br>*Lu Dong, Mui Suan Tan, Wei Tech Ang*, Chee Kiat Ng***<br>*Hwa Chong Institution, Singapore*<br>**Nanyang Technological University, Singapore*<br>***Lab Rehab Pte Ltd, Singapore*<br><br>Abstract<br>In the detection of ankle injuries, the Cumberland Ankle Instability Tool (CAIT) has been widely used. However, despite its validity and reliability as acclaimed by some therapists, certain inadequacies are still present due to the differences in judgements made by the physiotherapists and human subjects. This project investigates the possible use of the Pro.BalanceTM as a tool to detect potential ankle injuries. Preliminary results have shown that the CAIT score and the Overall Performance Index obtained from Pro.BalanceTM are correlated. Balancing tests should be done on difficulty levels 2 and 3 so as to achieve a more reliable and accurate diagnosis. Future work includes having a larger sample size to further verify the results. |

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| 11:30AM – 11:45AM | **B2-3**<br>**Detailed Spine Modeling with LifeMOD**<br>*Shih Kwang Tay, Ian Gibson, Bhat Nikhil Jagdish*<br>*National University of Singapore, Singapore*<br><br>Abstract<br>Patients sitting in a wheelchair may spend hours in a relatively fixed position, with their lower back forced away from its natural lordotic curvature. This prolonged sitting was reported to be linked with low back problems. The aim of this study was to develop a design system that can simulate the kinematics behavior of musculoskeletal forms and generate a human-wheelchair interface to provide accurate means of designing effective seating solutions for wheelchair users preventing long-term spinal deformities. This virtual simulation platform aims to aid clinicians in their analysis to ensure higher degree of accuracy and consistency in the prescriptions.<br><br>LifeMODTM was used as the base simulation software package to build a detailed spine multi-body model. The presented model can be applied to understand the complex spine biomechanics and clinically important analysis such as contact forces between each vertebrae and wheelchair model, load acting on the intervertebral disc joints, corresponding angles between vertebrae in the seated position and tension in the spine muscles. These results aid clinicians to develop mechanical design of back support, such as placing conventional pillows and towels at appropriate positions which can be an effective and convenient alternative to expensive special seating. |
| 11:45AM – 12:00PM | **B2-4**<br>**Evaluation on the Methods to Identify Muscle Fatigue Changes after Focal Cortical Ischemia in Rats**<br>*Wei Rong, Le Li, Zheng Ke, Xiaoling Hu, Kai Yu Tong*<br>*The Hong Kong Polytechnic University, Hong Kong*<br><br>Abstract<br>The extent of the restoration of limb functions after stroke is highly associated with the time of rehabilitation intervention and the corresponding workload prescription. Physical practice of the affected limbs in the relatively early stages after stroke (i.e. acute and subacute stages) could achieve a more significant motor functional recovery than the post-stroke training introduced in the later stage (i.e. chronic stage); However, the recovering brain would face more risks of further damage in response to over-exercise during the early stages than in the chronic period. In this study we have developed a platform to investigate fatigue change after stroke in rat. Results on 10 stroke rats showed decreases in mean power frequency (MPF) after the stroke surgery and larger co-contraction in the EMG signals, which were related to fatigue changes. The understanding on fatigue could help to generate suitable workload |

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| | prescription for post-stroke rehabilitation, which will lead to an optimal functional and physiological recovery. |
| 12:00PM – 12:15PM | **B2-5**<br>**Spatial Filtering and Single-Trial Classification of EEG during Vowel Speech Imagery**<br>*Charles DaSalla, Hiroyuki Kambara, Makoto Sato, Makoto Sato, Yasuharu Koike*<br>*Tokyo Institute of Technology, Japan*<br><br>Abstract<br>With the purpose of providing assistive technology for the communication impaired, we propose a control algorithm for speech prostheses using vowel speech imagery. Electroencephalography was recorded in three healthy subjects during the performance of three tasks, imaginary speech of the English vowels /a/ and /u/, and a no action state as control. Speech related potentials were visualized by grand averaging in the time domain. Feature data was obtained by filtering the time series data using optimal spatial filters designed through the common spatial patterns method. The resultant feature vectors were classified using a nonlinear support vector machine. Overall classification accuracies ranged from 68 to 78%. Results indicate significant potential for the use of vowel speech imagery as a speech prosthesis controller. |
| 12:15PM – 12:30PM | **B2-6**<br>**A Comparison of Dimensionality Reduction Techniques for the P300 Response**<br>*Sercan Taha Ahi, Hiroyuki Kambara, Yasuharu Koike*<br>*Tokyo Insititute of Science and Technology, Japan*<br><br>Abstract<br>Although P300 is a fairly stable response and therefore utilized in a wide variety of Brain Computer Interface (BCI) applications, the problems of feature selection and dimensionality reduction still constitute a major setback for the applications. In this study, we focus on the selection of best features of P300 data for decreasing the computation time, improving accuracy and visualizing both the underlying classifcation process and neurophysiological mechanism. To this end, the performances of three feature selection techniques are evaluated. The three techniques are Principle Component Analysis, Spatial Filters for Event Related Potentials and Recursive Channel Elimination. They are applied on the data set acquired through 4-class P300 experiments conducted on 5 subjects. The accuracy profiles along with the computational issues are discussed. |

**Paper Session C1 – Special Education and Augmentative & Alternative Communications**
**Rm 3.3**
**Day 1 – 23 April 2009 (THURSDAY)**
**8:30AM – 10:30AM**

| Session | Description |
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| 8:30AM – 8:45AM | **C1-1**<br>**Generating JSL Gloss Messages for the Deaf**<br>**Kazuo Kamata, Masahiro Fujii, Yu Watanabe**<br>**Utsunomiya University, Japan**<br><br>Abstract<br>This paper presents the experimental results of generating indirect JSL (Japanese Sign Language) messages in emergency situations for deaf people. In emergency situations as well as ordinary ones deaf people need messages in JSL, because it is their own language. We have various restrictions in using information media such as voice, text, movies and others in emergency situations. In this paper, the indirect messaging method that uses JSL glosses in text form instead of the medium of movie that JSL essentially requires for transmission. From the results of experiments with deaf people and signed language interpreters, we can say JSL-gloss based messaging method is one of candidates for information transmission in certain situations with restrictions in resources. We show certain experimental results and issues to be further considered for practical use. |
| 8:45AM – 9:00AM | **C1-2**<br>**Preliminary Vocabulary Frequency Findings for Mandarin Chinese AAC Treatments**<br>*Ming-Chung Chen, Katya Hill*, Tianxue Yao***<br>*National Chiayi University, Taiwan*<br>**University of Pittsburgh, USA*<br>***Carnegie Mellon University, USA*<br><br>Abstract<br>In this paper, we describe the preliminary results of a study to identify the vocabulary frequency of native Mandarin Chinese speakers during a didactic conversation. The language samples based on twelve (N=12) participants were analyzed to report the total number of words, total number of different word roots (TND), and number of spoken words used to make up 50%, 60%, 70% and 80% of the sample. Reported are the top 10 most frequently used MC words for each participant. The results will provide a high frequency or core vocabulary for MC to use for augmentative and alternative communication (AAC) interventions. |

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| 9:00AM – 9:15AM | **C1-3**<br>**Core Vocabulary of Thai Language for Thai Picture Based Communication System**<br>*Sarinya Chompoobutr, Monthika Boriboon, Wantanee Phantachat, Puttachart Potibal*<br>*National Electronics and Computer Technology Center National Science and Technology Development Agency, Thailand*<br><br>Abstract<br>This paper demonstrates how to obtain core vocabulary in Thai. They were collected from writing languages across four sources: BEST corpus (2009), Thai dictionary of the Royal Institute of Thailand: RI (1982), Lexicon of preschool and elementary student (1988) and "Khlang Kham" of Nawawan Phanthumetha (2001). The total corpora were analyzed for core vocabulary of Thai language. The results indicate that the first 100 words, core vocabulary accounting for 49.92 per cent of the corpora. Almost all of them can play two or more parts of speech, depending on their position and context in sentences. |
| 9:15AM – 9:30AM | **C1-4**<br>**Using Advanced Encryption Standard to Secure the Content Dissimination of Electonic Braille Books**<br>*Eakachai Charoenchaimonkon, Paul Janecek, Vatcharin Hamratanaphon**<br>*Asian Institute of Technology, Thailand*<br>**Centre for Educational Technology, Thailand*<br><br>Abstract<br>The scarcity of accessible information mediums for visually impaired people is recognized by many international organizations. The situation is even worst for those students with visual impairment who have integrated themselves into the mainstream schools with their sight peers. Although there are a few online information services available like Braille and digital talking books to serve the needs of visually impaired school students; this information services faced numbers of service restrictions, such as accessing contents of the book with minimal cost of investment, handling with complicated transcribing and brailing task, and some link to the issue of legal distribution.<br><br>This research aims to develop an application named "CET Embossing Manager". With the aid of this software, Electronic Braille producers and consumers can access various types of electronic Braille file formats, view the content of the file, and handle various tasks of embossing. To make the content of the book secured, Advanced Encryption Standard (AES) or Rijndael is used to protect the file from modifications made by unauthorized parties and limit the number of republishing. |

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| 9:30AM – 9:45AM | **C1-5**<br>**Supportive Reading System for Students with Special Educational Needs in Taiwan**<br>*Ming-Chung Chen, Chien-Chuan Ko, Chi-Ren Huang*<br>*National Chiyi University, Taiwan, R.O.C.*<br><br>Abstract<br>Reading is one of the important activities that all students should participate. This paper describes a supportive reading system which provides the teachers a convenient program to edit the supportive material and the students a supportive reading environment. The results of a single subject experiment which recruited four students with learning disabilities also demonstrated that students could gain higher score when reading with supportive environment. |
| 9:45AM – 10:00AM | **C1-6**<br>**Educational Improvement: A Case Study of Good Practice of IT Infusion in the Classroom for Student with Deafness**<br>*Onintra Poobrasert, Nick Cercone*<br>*York University, Canada*<br><br>Abstract<br>In order to develop a useful system for teaching and learning, the system should be designed for the needs and capabilities of the users for whom they are intended. Before developing any systems a User-Centered Design Process is always foremost to carry out. Therefore this paper will summarize main principles of user-centered design, and user-centered design process. This paper will also detail the design and development of a multimedia system for students with deafness. |
| 10:00AM – 10:15AM | **C1-7**<br>**Behavior Modification Strategy for Motivating Children with Attention Deficiency Disorder**<br>*Ravichandran Subbaraman, Jacklyn Huang Qunfang**<br>*Temasek Polytechnic, Singapore*<br>**Singapore Management University, Singapore*<br><br>Abstract<br>Attention-Deficit Hyperactivity Disorder (ADHD) is a neurobehavioral developmental disorder and its manifestation during childhood is characterized by a persistent pattern of inattention and/or hyperactivity. Children with such mental retardation more often exhibit behavior problems than children without disabilities. Teaching these children is more challenging than teaching normal children in the same age group |

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| | and is always considered as one of the most important and challenging functions of special education. ADHD is currently considered a persistent and chronic condition. Though a common behavior modification strategy is not always useful in dealing with neurobehavioral development, it may be more appropriate to design strategies based on the cognitive ability of the subject undergoing treatment. The strategy discussed in this paper is mostly focused on educating children with attention deficit disorder than treating hyperactivity as hyperactivity is mostly managed by the used of medication. The behavior modification strategy suggested is based on the fact that children below 12 years have strong interest in specific activities involving audiovisual stimulus. The strategy aims in motivating the children to learn a specific act such as learning subjects like mathematics. The protocol basically motivates the children to focus and concentrate on solving a problem in order to be rewarded with audiovisual stimulus which are of interest to them. The paper provides a fairly comprehensive picture on the neuro-cognitive modifications associated with this treatment protocol in treating these children. |
| 10:15AM – 10:30AM | **C1-8**<br>**E-learning for People with Cognitive Disabilities on a Web-Accessibility E-learning Platform**<br>*Yao-Ming Yeh, Chih-Ching Yeh*<br>*National Taiwan Normal University, Taiwan, R.O.C.*<br><br>Abstract<br>E-learning is the tool for lifelong learning. On-line learning by internet poses no big problem for students without disabilities. However, it may be difficult or even impossible for students with disabilities. Unfortunately, there have been few studies on e-learning for cognitive disability users. But from the perspective of ecological assessment, we should not disregard their rights of learning. So, the purpose of this study was to develop the accessibility of e-learning courses based on ADDIE procedure on a web-accessibility e-learning platform. There were "Basics of Microsoft Excel", "Basics of Microsoft PowerPoint" and "Interpersonal relationship in organizations". The participants in this study were 16 cognitive disability students. The results showed that the cognitive disability students would like to spend time on more intelligible content. And they spent more time on topic webs than illustration. Few students had problems on interface and hardware, and they would not overcome by themselves or obviate problems by illustration. This demonstrated that the cognitive disability students still need some assistance and support regarding on-line learning. Besides, the further direction of this study was also provided. |

**Paper Session C2 – Assistive Technology and Society**
**Rm 3.3**
**Day 1 – 23 April 2009 (THURSDAY)**
**11:00AM – 12:30PM**

| Session | Description |
|---|---|
| 11:30AM – 11:45AM | **C2-1**<br>**Cultural-Heritage-Friendly without Barriers (CHF-Bs)**<br>*Budsakayt Intarapasan*<br>*King Mongkut's University of Technology Thonburi, Thailand*<br><br>Abstract<br>Set within Greater Mekong Subregion (GMS), there are six comprising countries: Cambodia, The People's Republic of China, Lao People's Democratic Republic, Myanmar, Thailand, and Viet Nam. In this connection, the paper is based on three scenarios namely wonders of nature, urban, and historical heritage. What constitutes physical evidence of a cultural-heritage-friendly without barriers? Physical evidence of cultural-heritage-friendly sometimes may be found in the form of cultural-crossing borders in the application and practices of Universal Design. As such, consideration is given not only to physical access but also to alternative method of providing the tourism services. It is important that such changes are accounted for accurately so that the physical and human processes at work can be fully understood. The lack of consultation with two groups of respondents, experts referring to those stakeholders with professional role to play in relation to the survey of spaces and non-experts who are the general public, is a contributing factor. Consequently, the methodology of this study involves the preference judgment scale, open-ended questions and illustrations. |
| 11:15AM – 11:30AM | **C2-2**<br>**iPSL: Enabling Rehabilitation of Deaf Community in Pakistan**<br>*Hassan Afzal, Sheheryar Nafees, Saad Nasir, Amina Tariq*<br>*FAST National University Islamabad, Pakistan*<br><br>Abstract<br>This paper presents an initiative taken in Pakistan for the rehabilitation of deaf community, enabled by use of technology. iPSL is a system that primarily aims at facilitating communication between the hearing and the deaf community in Pakistan. There is a twofold approach to achieve that, first to implement a system that can translate signs made by deaf into natural language sentences. The second dimension is to implement tools that enable hearing people to understand and learn sign language by converting natural language sentences into sign language. This paper presents the progress made in the project so far in terms of design, |

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| | implementation and evaluation. |
| 11:30AM – 11:45AM | **C2-3**<br>**Accessible Market: A Prototype for People with Disabilities in Thailand**<br>*Benjamas Kutintara, Sayomphu Chaengsri, Supattra Suanlim, Keshanon Phankong, Theerayut Chumnanprai, Worawut Sonsiri, Amaraporn Wongma, Pornpun Somboon**<br>*King Mongkut's Institute of Technology Ladkrabang, Thailand*<br>**Mahidol University, Thailand*<br><br>Abstract<br>Most Thai people like to purchase food at local markets; however, research studies on accessibility to local markets by people with disabilities were still limited. The objective of this study was to develop a prototype of an accessible market for people with disabilities in Thailand by using Salaya market as a case study. Participants in this study consisted of a market owner, food stall owners, assistive technology specialists, general customers, and customers with disabilities. Data were collected by observing environmental features in Salaya market and interviewing several participants. Major findings indicated that people with disabilities could not access the market because of lack of handicap accessible parking zone, no ramps, walkways with obstacles, unsuitable public restrooms, no zoned area for the food court, and no standards for food stalls. All inaccessible data were analyzed and a prototype for parking spaces, ramps, walkways, public restroom, food court, and food stalls were designed to make the market accessible. |
| 11:45AM – 12:00PM | **C2-4**<br>**On Thailand's REAT Institute's Experience in Developing Digital Hearing Aids for Rural Usage**<br>*Pasin Israsena, Apit Hemakom, Anukool Noymai*<br>*National Electronics and Computer Technology Center (NECTEC), Thailand*<br><br>Abstract<br>This paper discusses REAT institute's experience in developing alternative digitals hearing aids targeted for rural usage, where desirable features such as cost-effectiveness, ease of use and maintenance, and fully digital processing capability are imperative. The result shows that modern technology has reached the point where locally developed solutions that are complementary to existing products are feasible. Technological capability, however, is only part of the solution. Any successful hearing rehabilitation program, however, will also need strong leadership from doctors and audiologists, who are the professional experts, and a good servicing model. |

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| 12:00PM – 12:15PM | **C2-5**<br>**The Implementation Status of Thailand's National Social Equality in ICT Master Plan**<br>*Proadpran Punyabukkana, Suchai Thanawastien*, Songporn Komolsuradej***<br>*Chulalongkorn University, Thailand*<br>**Sripatum University, Thailand*<br>***Ministry of Information and Communication Technology, Thailand*<br><br>Abstract<br>The National Social Equality in Information and Communication Technology Master Plan provides a three-year road map for bridging the digital divide, supporting the use of assistive technology and promoting the creation of an assistive technology industry so that the disabled in Thailand will be able to afford the acquisition of the assistive technology. After the first year of implementation, 42% of the Year 1 projects have been implemented, with satisfactory results. The main output has been the training of 150 web designers who can handle the redesign of government websites to conform to the WCAG 1.0 standard at an AA conformance level. Three government websites have been transformed to attain AA conformance as initial pilot projects. |
| 12:15PM – 12:30PM | **C2-6**<br>**Model development of Assistive Technology Centers in Thailand**<br>*Phatcharaporn Kongkerd, Salin Ruangsri, Terdkiat Shaijarung, Daranee Suwapan*<br>*Sirindhorn National Medical Rehabilitation Centre (SNMRC), Thailand*<br><br>Abstract<br>The model development of assistive technology centers illustrates a new innovation of assistive device provision in Thailand as they provide services specialized in assistive devices for people with disabilities. The services delivery process emphasizes on the assessment, prescription and training. Eleven assistive technology centers have been developed as a network which could increase the accessibility for assistive devices for disabled people living in all regions of Thailand. However, knowledge and skills of staff are the main limitation of the provision which need to be strengthened in this specialized field. For further development, wheelchair service and seating provision has been considered as the main theme of the next step as wheelchairs are the main type of devices needed for people with disabilities. |

# IBM Assistive & Rehabilitative Technology Student Design Challenge 2009

**Challenge Entries**

1. **SDC-01 Bus Flagging System**
   Muthukumaran Rangaswamy, Lin Liang,
   Nanyang Polytechnic, Singapore

2. **SDC-02 Mini Intelligent Terminal for Child & Elderly Fitness Development**
   Ong Eng Piao, Leong Jian Jie, Ng Kim Heng, Peter, Koh Wan Fen, Josephine
   ITE College West ( Dover Campus), Singapore

3. **SDC-03 The "Readable" Syringe**
   Yan Lin, Li Ying Ying, Guo Jun
   Nanyang Polytechnic, Singapore

4. **SDC-04 Control the Prototype of Prosthesis Arm with EMG Signal**
   Patinya Tipmabute
   King Mongkut's University, Thailand

5. **SDC-05 An Automatic Page Flipping System for Disabled Readers**
   Danuporn Prommin, Thanawut Thongdangkayasit
   Chiangmai University, Thailand

6. **SDC-06 Tru-Light**
   He Jia Hao, Jeremy, Tee Zee Ching, Joyce
   Nanyang Polytechnic, Singapore

7. **SDC-07 Shower Room for the Disabled and the Elderly**
   Pakpoom Bhumimala, Arnupharp Martmoon, Anupark Martmoon, Supawadee Keawkum, Parimon Chutimakorn
   King Mongkut's University, Thailand

8. **SDC-08 Bright Sight**
   Rapeeporn Pimup , Pakaporn Thisayakorn
   Chulalongkorn University, Thailand

9. **SDC-09 SmartGuide System to Assist Visually Impaired People in a University Environment**
   Tee Zhi heng , Kong Jia Hao , Rocky Lo , Khor Ming Yeang
   The University of Nottingham, Malaysia Campus, Malaysia

10. **SDC-10 Portable Wheelchair Lifter**
    Goh Yong Ren, Abdul Rauf Bin Abdul Rahim, Azhar Bin Ismail, Muhammad Norhafiz Bin Samsudin, Tan En Hui
    National University of Singapore, Singapore

11. **SDC-11 Rotary Table for Wheelchair**
    Hoi Ka Hou , Roy Nathan
    ITE East, Singapore

12. **SDC-12 Sheltered Wheelchair**
    Chua Yong An, Zulfadhli Zameer, Ivy Goh Hui Fang, Gwee Wee Siang
    ITE College West (Balestier Campus), Singapore

13. **SDC-13 Semi-Power Standing Wheelchair**
    Nirun Maipothi Anusit Srichanya
    Thammasat University, Thailand

14. **SDC-14 Head Controlled Electric Wheelchair**
    Lew Kee Wan, Chong Chun Ming, Xiong Qui Lin
    Ngee Ann Polytechnic, Singapore

15. **SDC-15 Multi-Purpose Wheelchair**
    Muhammad Yusof B Sulaiman, Muhammad AL Matin B Sarjali
    ITE East, Singapore

16. **SDC-16 Gripless Mouse for Rehabilitation of RSI**
    Chan Jun Hong, Chua Hui Ling
    Nanyang Polytechnic, Singapore

17. **SDC-17 Health Care Monitoring Based on Wireless Sensor Networks**
    Jirasak Raksachum, Sunisa Julrat
    Prince of Songkla University, Thailand

18. **SDC-18 Foot Mouse**
    Huang Zhi Xiong, Tham Jih Yew, Nur Ashikin Bte Mohd Daud
    ITE College Central (Tampines Campus), Singapore

19. **SDC-19 Say It Aloud**
    Eng Shu Xia, Goh Ying Wei, Berlinda, Ong Yen Ting, Aileen
    Temasek Polytechnic, Singapore

20. **SDC-20 PolyEcomm**
    Chen Xi, Li Hoi Man, Iu Hoi Yan, Ho Yin Ling, Chan Wing Yin
    The Hong Kong Polytechnic University, Hong Kong

21. **SDC-21 Adaptive Input Device (A.I.D)**
    Sunny Neo, Chua Wen Chuan, Peng Jian Zhang, Randall Ong, Brandon Lum
    Temasek Polytechnic, Singapore

22. **SDC-22 Throat Muscles Strengthening Device**
    Lee Khai Ping, Alvin, Chen Wei jie, Eddie, Lee Yuit Woon
    Ngee Ann Polytechnic, Singapore

23. **SDC-23 VirtualStroke**
    Chaya Chansmitmas, Wannaporn Dechpinya , Noppawat Sirinimnualkul
    Chulalongkorn University, Thailand

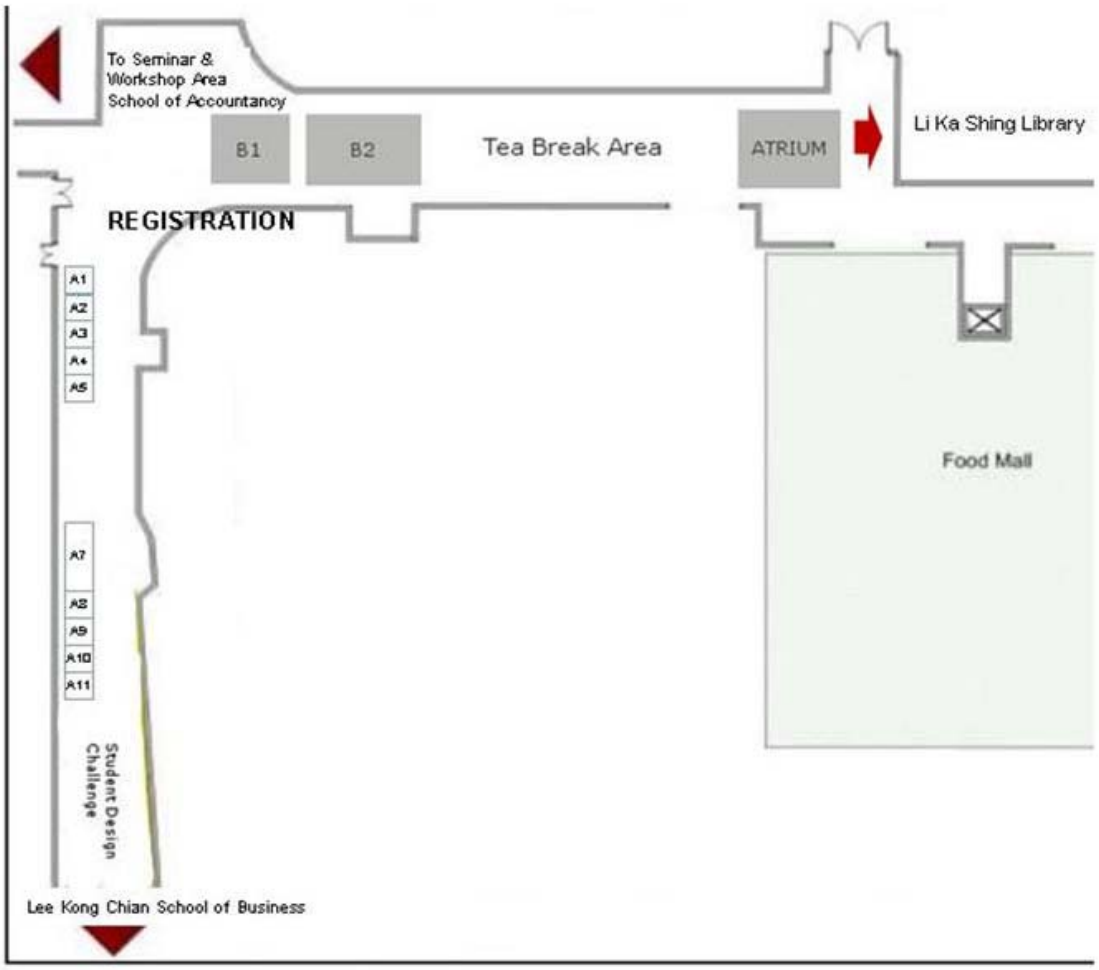
24. **SDC-24 EZ Opener Woo**
    Qi Yang, Muhd Farhan B Ahmad Washi, Muhammad Taufiq B Abdul Majib
    ITE East, Singapore

25. **SDC-25 FantaStick**
    Foo Hao Shen, Daniel, Mohamed Taufiq B Mohamed Noor
    ITE College Central (Tampines Campus), Singapore

# Exhibition

**23 April 2009 (WEDNESDAY) to 25 April 2009 (FRIDAY)**
**School of Accountancy Basement 1**

**Floor Plan**

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| **A1** | LabRehab | **A10** | Dynaforce |
| **A2** | Adaptive Instruments and Services | **A11** | IBM |
| **A3** | Hocoma | **B1** | Humanware & ViewPlus Technologies |
| **A4** | Advanced Biomedical Rehabilitation/ Sirindhorn | B1b | Singapore Association of the Visually Handicapped |
| **A5** | Daedalus Technologies Inc | **B2** | National Electronics and Computer Technology Center |
| **A5b** | Singapore Association of the Visually Handicapped | **B2b** | Exploit Technologies Pte Ltd (A*STAR) |
| **A7** | ARIAN Corporation | **Atrium** | Ottobock |
| **A8** | Asia Travel | **Atrium** | START Centre |
| **A9** | Singapore Action Group of Elders | | |

**3rd International Convention on Rehabilitation Engineering & Assistive Technology**
**22 – 26 April, 2009**
**"Accessible Tourism"**
**Singapore Management University, School of Accountancy, Singapore**

**List of Exhibitors**

| Exhibitor | Booth |
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| **Advanced Biomedical Rehabilitation (ABR)**<br>*ABR is a biomechanically-based rehabilitation method for the motor impaired or developmentally delayed individuals. Its main mission is to improve weight-bearing and functions by strengthening the internal myofascia.*<br><br>93 Holland Road #01-01 Hollandia, Singapore 278537<br>Fax: +65 6898 9857<br>Website: www.miraclekidz.com; www.blyum.com | #A4 |
| **Adaptive Instruments and Services**<br>*Showcasing our very new product - GLUCODER: A fully accessible talking blood glucose meter with display, to help with monitoring of diabetes blood sugar level to help in slowing down of diabetes retinopathy blindness; and slowing down of onset of other complications caused by diabetes. A product designed for the mainstream market with the blind in mind so that cost is compatible with ordinary glucose meters!*<br><br>Marine Parade Post Office Box 654, Singapore 914406<br>Tel: +65 9694 9496 | #A2 |
| **ARIAN Corporation Pte Ltd**<br>*The Company supplies, install and service in Singapore and South East Asia a range of Specialist Access Equipment specifically engineered for the Physically Challenged and Home use comprising Stannah Stairlifts – for both curved and straight stairs, Wheelchair Platform Lifts, Vertical Platform Lifts, Electro Hydraulic Chairs and Wheelchair Lifts for Vehicles.*<br><br>22 Sungei Kadut Way , Singapore 728777<br>Tel: +65 6755 1155; Fax: +65 6755 1156<br>Website: www.arian.com.sg | #A7 |
| **Asia Travel Group**<br>*Asia Travel Group is the first niche travel in Singapore to offer accessible tourism. We customise accessible tour packages to suite customers' expectation and needs.*<br><br>101 Upper Cross Street, #03-68 People's Park Centre, Singapore 058357<br>Tel: +65 6438 0038; Fax: +65 6438 8987<br>Website: www.asiatravelgroup.com.sg | #A8 |

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| **Daedalus Technologies Inc.**<br>*Daedalus Technologies Inc is the designer and manufacturer of DAESSY Mounting Systems. DAESSY Mounts are used to support an augmentative communication device or laptop on a wheelchair, desk or independently.*<br><br>2491 Vauxhall Place, Richmond, BC V6V 1Z5 Canada<br>Tel: +1.604.270.4605; Fax: +1.604.244.8443<br>Website: www.daessy.com | #A5 |
| **DYNAFORCE International Pte Ltd**<br>*Dynaforce is the leader in functional training of frail and deconditioned clients, using the Kinesis movement system, the Fitvibe whole body vibration equipment and the Flexability machine.*<br><br>12 Tannery Road #09-06, HB Centre, Singapore 347722<br>Tel: +65 6842 3166; Fax: +65 6842 3066<br>Website: www.dynaforceintl.com | #A10 |
| **Exploit Technologies Pte Ltd**<br>*Exploit Technologies is the strategic marketing and commercialisation arm of the Agency for Science, Technology and Research (A*STAR). Its mission is to support A*STAR in transforming the economy through commercialising R&D. Exploit Technologies enhances the research output of A*STAR scientists by translating their inventions into marketable products or processes.*<br><br>30 Biopolis Street, #09-02 Matrix , Singapore 138671<br>Tel: +65-6478 8420; Fax: +65-6873 7192<br>Website: www.exploit-tech.com<br>Media Enquiries: Seeto Wei Peng, Assistant Vice President, Corporate Communications<br>DID: +65 6478 8443<br>Email: weipeng@exploit-tech.com | #B2b |

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| **HumanWare Australasia**<br>*HumanWare's products are having a profoundly positive impact on the lives of people who are blind or visually impaired. These are the tools that empower them to live independently and compete effectively in a sighted world. See BrailleNote, GPS, myReader & the SmartView range of magnifiers.*<br><br>Suite 2, 7-11 Railway St., Baulkham Hills NSW 2153, Australia<br>Tel: +61 2 9686 2600; Fax: +61 2 9686 2855<br>Website: www.humanware.com | #B1 |
| **HOCOMA**<br>*Hocoma is the leader in robotic rehabilitation therapy for neurological movement disorders. The Swiss medical technology company develops innovative therapy solutions working closely with leading clinics and research centers.*<br><br>Hocoma AG, Switzerland, Industriestrasse 4, CH-8604 Volketswil<br>Tel: +41 43 444 22 00; Fax: +41 43 444 22 01<br>Website: www.hocoma.com | #A3 |
| **IBM**<br>*Innovation in Corporate Citizenship. Innovation - joining invention and insight to produce important, new value - is at the heart of what we are as a company. And, today, IBM is leading a revolution in corporate citizenship by contributing innovative solutions and strategies that will help transform and empower our global communities.*<br><br>IBM Singapore, Corporate Citizenship and Corporate Affairs, 9 Changi Business Park Central 1, Singapore 486048<br>Fax: +65 65871284<br>Website: www.ibm.com/sg/ | #A11 |

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| **LabRehab Pte Ltd**<br>*Lab Rehab, an ISO 13485 certified local medical device manufacturer develops products that are easy to operate, simple and functional for rehabilitative use. Its principle product, Pro.balance, a project originated from NTU and SGH, keeps track of the balance performance for the user. A new feature includes a gaming module that provides interactive balance training. Since its launch in 2007, Pro.balance has been well received and fast gaining recognition among rehabilitative centres in Singapore.*<br><br>211 Holland Ave #04-03, Singapore 278967<br>Tel: +65 6469-8224; Fax: +65 6466-0987<br>Website: www.lab-rehab.com | #A1 |
| **National Electronics and Computer Technology Center (NECTEC)**<br>*National Electronics and Computer Technology Center, NECTEC is a dynamic organization which is responsible for the development of Information Technology in Thailand. Its mission is to ensure Thailand's competitiveness in Electronics and Computer and the use of IT to stimulate economic and social impact through own R&D programs as well as R&D funding services to universities. NECTEC is an organization under the National Science and Technology Development Agency (NSTDA).*<br><br>National Electronics and Computer Technology Center, National Science and Technology Development Agency, Ministry of Science and Technology<br>112 Thailand Science Park, Phahon Yothin Rd, Klong 1, Klong Luang, Pathumathani 12120, Thailand<br>Tel: +66 0 2 564 6900; Fax: +66 0 2 564 6876<br>Website: astec.nectec.or.th | #B2 |
| **OTTO BOCK**<br>*For over 90 Years, Otto Bock has stood for innovation and entrepreneurial success. We are the global leader in Prosthetics and Rehabilitation Products. Our technology sets standards for the entire industry. It is people-orientated and serves one main purpose:"Quality for Life".*<br><br>QUALITY FOR LIFE<br>Otto Bock South East Asia Co., Ltd., Singapore Representative Office, 7 Bukit Pasoh Road, Singapore 089821<br>Tel: +65 6576 4280; Fax: +65 6576 4299<br>Website: www.ottobock.com | Atrium |

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| **Singapore Action Group of Elders (SAGE)**<br>*It is a non profit voluntary welfare organisation (VWO) affiliated to the National Council of Social Service (NCSS). They have programmes such as:*<br>*Social Enterprise projects and Employment, Community projects include Roadshows., Public Education programmes &, Training programmes like SAGE-CDAC IT Centre for Senior.*<br><br>19 Toa Payoh West Singapore 318876<br>Tel: +65 6353 7159; Fax: +65 6353 7148<br>Website: www.sage.org.sg | #A9 |
| **Singapore Association of the Visually Handicapped**<br>*"SAVH is the only national voluntary welfare organization that provides comprehensive rehabilitation and aftercare services to the blind with the mission To Help The Visually Handicapped Help Themselves."*<br><br>47 Toa Payoh Rise, Singapore 298104<br>Tel: +65 6251 4331; Fax: +65 6253 7191<br>Website: www.savh.org.sg | #A5b & #B1b |
| **START Centre Pte Ltd**<br>*START Centre is a service provider of technological aids that enable people of all ages and disabilities improve their quality of life. With special focus in Assistive, Rehabilitative & Therapeutic (ART) Technology applications and solution, START Centre's range of service includes evaluation; custom design and installation of AT tools to assist people with disabilities achieve their independence, education and vocational living goals. For more information about START Centre, please visit our website at www.start-centre.com.*<br><br>49 Kaki Bukit View, Kaki Bukit Techpark II, Singapore 415973<br>Tel: + 65 6473 0262; Fax: +65 6473 0263<br>Website: www.start-centre.com | Atrium |

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| **VIEWPLUS TECHNOLOGIES**<br>*ViewPlus is recognized throughout the world as a leading innovator in the R&D of assistive technology products for people with print and sensory disabilities. They bring braille printers to a new level. See SpotDot, Iveo & Premier embossers at stand B2.*<br><br>ViewPlus Technologies, Inc. World Headquarters, 1853 SW Airport Avenue<br>Corvallis, Oregon 97333, U.S.A.<br>Tel: + 541 754 4002; Fax: 541 738 6505<br>Website: www.viewplus.com | #B1 |