Computers Helping People with Special Needs

15th International Conference, ICCHP 2016
Linz, Austria, July 13–15, 2016
Proceedings, Part II

Springer
Contents – Part II

Environmental Sensing Technologies for Visual Impairment

Environmental Sensing Technologies for Visual Impairment: Introduction to the Special Thematic Session ................................................................. Roberto Manduchi and James Coughlan  2

Ball Course Detection Function for the Blind Bowling Support System
Using a Depth Sensor .................................................................................. Makoto Kobayashi  5

Catching the Right Bus - Improvement of Vehicle Communication with Bluetooth Low Energy for Visually Impaired and Blind People .................. Elmar Krainz, Werner Bischof, Markus Dornhofer, and Johannes Feiner  9

Navi Rando: GPS-IMU Smart Phone Application for Helping Visually Impaired People Practicing Hiking ............................................................. Jesus Zegarra Flores, Laurence Rasseneur, Clément Gass, and René Farcy  16

Scene Text Detection and Tracking for Wearable Text-to-Speech Translation Camera .......................................................................................... Hideaki Goto and Kunqi Liu  23

Zebra Crossing Detection from Aerial Imagery Across Countries .............. Daniel Koester, Björn Lunt, and Rainer Stiefelhagen  27

Sound of Vision – 3D Scene Reconstruction from Stereo Vision in an Electronic Travel Aid for the Visually Impaired ........................................ Mateusz Owczarek, Piotr Skulimowski, and Pawel Strumillo  35

Experiments with a Public Transit Assistant for Blind Passengers ............ German Flores and Roberto Manduchi  43

Tactile Graphics and Models for Blind People and Recognition of Shapes by Touch

Electromagnetic Microactuator-Array Based Virtual Tactile Display. ........ Zoltan Szabo and Eniko T. Enikov  53

Empowering Low-Vision Rehabilitation Professionals with “Do-It-Yourself” Methods ................................................................. Stéphanie Giraud and Christophe Jouffrais  61
## Expansion Characteristic of Tactile Symbols on Swell Paper: Effects of Heat Setting, Position and Area of Tactile Symbols

Takahiro Hashimoto and Tetsuya Watanabe

Page 69

## Tactile Identification of Embossed Raised Lines and Raised Squares with Variable Dot Elevation by Persons Who Are Blind

Georgios Kouroupetroglou, Aineias Martos, Nikolaos Papandreou, Konstantinos Papadopoulos, Vassilios Argyropoulos, and Georgios D. Sideridis

Page 77

## Early Stimulation with Tactile Devices of Visually Impaired Children

Maria Visitación Hurtado Torres, María Luisa Rodríguez Almendros, María José Rodríguez Fórtiz, Carlos Rodríguez Domínguez, and Maria Bermúdez-Edo

Page 85

## Experimenting with Tactile Sense and Kinesthetic Sense Assisting System for Blind Education

Junji Onishi, Tadahiro Sakai, Msatsugu Sakajiri, Akihiro Ogata, Takahiro Miura, Takuya Handa, Nobuyuki Hiruma, Toshihiro Shimizu, and Tsukasa Ono

Page 92

## Locating Widgets in Different Tactile Information Visualizations

Denise Prescher and Gerhard Weber

Page 100

## A Concept for Re-useable Interactive Tactile Reliefs

Andreas Reichinger, Anton Fuhrmann, Stefan Maierhofer, and Werner Purgathofer

Page 108

## Three-Dimensional Models of Earth for Tactile Learning

Yoshinori Teshima, Yasunari Watanabe, Yohsuke Hosoya, Kazuma Sakai, Tsukasa Nakano, Akiko Tanaka, Toshiaki Aomatsu, Tatsuyoshi Tanji, Kenji Yamazawa, Yuji Ikegami, Mamoru Fujiyoshi, Susumu Oouchi, and Takeshi Kaneko

Page 116

## Tactile Maps and Map Data for Orientation and Mobility

Augmented Reality Tactile Map with Hand Gesture Recognition

Ryosuke Ichikari, Tenshi Yanagimachi, and Takeshi Kurata

Page 123

Blind Friendly Maps: Tactile Maps for the Blind as a Part of the Public Map Portal (Mapy.cz)

Petr Červenka, Karel Břinda, Michaela Hanousková, Petr Hofman, and Radek Seifert

Page 131

BlindWeb Maps – An Interactive Web Service for the Selection and Generation of Personalized Audio-Tactile Maps

Timo Götzelmann and Laura Eichler

Page 139
CapMaps: Capacitive Sensing 3D Printed Audio-Tactile Maps .................. 146
   Timo Götzelmann

Empirical Study on Quality and Effectiveness of Tactile Maps
Using HaptOSM System .................................................. 153
   Daniel Hänßgen, Nils Waldt, and Gerhard Weber

Specification of Symbols Used in Audio-Tactile Maps for Individuals
with Blindness ............................................................. 160
   Konstantinos Papadopoulos, Konstantinos Charitakis, Lefkothea Kartasidou, Efstratios Stylianidis, Georgios Kouroupetroglou, Suad Sakalli Gumus, Karin Müller, and Engin Yilmaz

User Requirements Regarding Information Included in Audio-Tactile Maps
for Individuals with Blindness ......................................... 168
   Konstantinos Papadopoulos, Konstantinos Charitakis, Lefkothea Kartasidou, Georgios Kouroupetroglou, Suad Sakalli Gumus, Efstratios Stylianidis, Rainer Stiefelhagen, Karin Müller, Engin Yilmaz, Gerhard Jaworek, Christos Polimeras, Utku Sayin, Nikolaos Oikonomidis, and Nikolaos Lithoxopoulos

Mobility Support for Blind and Partially Sighted People

Obstacle Detection and Avoidance for the Visually Impaired in Indoors
Environments Using Google's Project Tango Device ..................... 179
   Rabia Jafri and Marwa Mahmoud Khan

System Supporting Independent Walking of the Visually Impaired ........ 186
   Mitsuki Nishikiri, Takehiro Sakai, Hiroaki Kudo, Tetsuya Matsumoto, Yoshinori Takeuchi, and Noboru Ohnishi

Path Planning for a Universal Indoor Navigation System .................... 190
   Elie Kahale, Pierre-Charles Hanse, Valéria Destin, Gérard Uzan, and Jaime Lopez-Krahe

Supporting Pedestrians with Visual Impairment During Road Crossing:
A Mobile Application for Traffic Lights Detection ........................ 198
   Sergio Mascetti, Dragan Ahmetovic, Andrea Gerino, Cristian Bernareggi, Mario Busso, and Alessandro Rizzi

Sound of Vision - Spatial Audio Output and Sonification Approaches ...... 202
   Michal Bujacz, Karol Kropidlowski, Gabriel Ivanica, Alin Moldoveanu, Charalampos Saitis, Adam Csapo, György Wersenyi, Simone Spagnol, Omar I. Johannesson, Runar Unnthorsson, Nikolai Rotnicki, and Piotr Witek
The Use of Mobile Devices by Individuals with Special Needs as an Assistive Tool

Mobile Learning for People with Special Needs: Introduction to the Special Thematic Session ........................................... 212
Linda Chmiliar

Parents’ and Teachers’ Perspectives on Using IPads with Students with Developmental Disabilities: Applications for Universal Design for Learning .... 217
Therese M. Cumming and Iva Strnadová

The iPad Helping Preschool Children with Disabilities in Inclusive Classrooms ..................................................... 223
Linda Chmiliar

Easy Access to Social Media: Introducing the Mediata-App .......................................................... 227
Christian Bühler, Susanne Dirks, and Annika Nietzio

A Tool to Improve Visual Attention and the Acquisition of Meaning for Low-Functioning People ........................................... 234
Maria Luisa Rodríguez Almendros, Marcelino Cabrera Cuevas, Carlos Rodríguez Domínguez, Tomás Ruiz López, María Bermúdez-Edo, and Maria José Rodríguez Fórtiz

Mobility Support for People with Motor and Cognitive Disabilities

A Mobile Travel Companion Based on Open Accessibility Data .......................................................... 245
Christophe Ponsard, Fabrice Estiévenart, Valery Ramon, Alexandre Rosati, Emilie Goffin, Vincent Snoeck, and Stéphanie Hermans

Mobility Support for People with Dementia ..................................................................................... 253
Reinhard Koutny and Klaus Miesenberger

Community Engagement Strategies for Crowdsourcing Accessibility Information: Paper, Wheelmap-Tags and Mapillary-Walks .................................................. 257
Christian Voigt, Susanne Dobner, Mireia Ferri, Stefan Hahmann, and Karsten Gareis

Sharing Real-World Accessibility Conditions Using a Smartphone Application by a Volunteer Group .................................................. 265
Takahiro Miura, Ken-ichiro Yabu, Takeshi Noro, Tomoko Segawa, Kei Kataoka, Akihito Nishimuta, Masaya Sanmonji, Atsushi Hiyama, Michitaka Hirose, and Tohru Ifukube

Development and Evaluation of Navigation System with Voice and Vibration Output Specialized for Persons with Higher Brain Dysfunction .... 273
Akihiko Hanafusa, Tsuyoshi Nojiri, and Tsuyoshi Nakayama
Towards e-Inclusion for People with Intellectual Disabilities

Towards e-Inclusion for People with Intellectual Disabilities: Introduction to the Special Thematic Session

Cordula Edler

Criteria of Barrier-Free Websites for the Vocational Participation of People with Cognitive Disabilities. An Expert Survey Within the Project “Online-Dabei”

Elena Brinkmann, Lena Bergs, Marie Heide, and Mathilde Niehaus

Easy Reader – or the Importance of Being Understood

Peter Heumader, Cordula Edler, Klaus Miesenberger, and Andrea Petz

Potentials of Digital Technology for Participation of Special Needs Children in Kindergarten

Isabel Zorn, Jennifer Justino, Alexandra Schneider, and Jennifer Schönenberg

Reordering Symbols: A Step Towards a Symbol to Arabic Text Translator

Lama Alzaben, Mike Wald, and E.A. Draffan

SAMi: An Accessible Web Application Solution for Video Search for People with Intellectual Disabilities

Tânia Rocha, Hugo Paredes, João Barroso, and Maximino Bessa

Target Group Questionnaire in the “ISG for Competence” Project

Szilvia Paxian, Veronika Szucs, Shervin Shirmohhamadi, Boris Aberšek, Andrean Lazarov, Karel Van Isacker, and Cecilia Sik-Lanyi

The Development and Evaluation of an Assistance System for Manual Order Picking - Called Pick-by-Projection - with Employees with Cognitive Disabilities

Andreas Baechler, Liane Baechler, Sven Autenrieth, Peter Kurtz, Georg Kruell, Thomas Hoerz, and Thomas Heidenreich

The Use and Impact of an Assistance System for Supporting Participation in Employment for Individuals with Cognitive Disabilities

Liane Baechler, Andreas Baechler, Markus Funk, Sven Autenrieth, Georg Kruell, Thomas Hoerz, and Thomas Heidenreich
AT and Inclusion of People with Autism or Dyslexia

Internal Validity in Experiments for Typefaces for People with Dyslexia:
A Literature Review ................................................................. 335
   Trenton Schulz

Characterization of Programmers with Dyslexia .......................... 339
   José L. Fuertes, Luis F. González, and Loïc Martínez

What Technology for Autism Needs to be Invented? Idea Generation
from the Autism Community via the ASCmeI.T. App ...................... 343
   Sarah Parsons, Nicola Yuill, Judith Good, Mark Brosnan, Lisa Austin,
   Clarence Singleton, Benoît Bossavit, and Barnabear

Using Mind Mapping Software to Initiate Writing and Organizing Ideas
for Students with SLD and ADHD .............................................. 351
   Betty Shrieber

Data Quality as a Bottleneck in Developing a Social-Serious-Game-Based
Multi-modal System for Early Screening for ‘High Functioning’ Cases
of Autism Spectrum Condition .................................................. 358
   Miklos Gyori, Zsófia Borsos, Krisztiina Stefanik, and Judit Csákvári

Interpersonal Distance and Face-to-face Behavior During Therapeutic
Activities for Children with ASD .............................................. 367
   Airi Tsuji, Soichiro Matsuda, and Kenji Suzuki

AT and Inclusion of Deaf and Hard of Hearing People

Support System for Lecture Captioning Using Keyword Detection
by Automatic Speech Recognition ............................................... 377
   Naofumi Ikeda, Yoshinori Takeuchi, Tetsuya Matsumoto, Hiroaki Kudo,
   and Noboru Ohnishi

Compensating Cocktail Party Noise with Binaural Spatial Segregation
on a Novel Device Targeting Partial Hearing Loss ....................... 384
   Luca Giuliani, Sara Sansalone, Stefania Repetto, Federico Traverso,
   and Luca Brayda

CoUnSiL: Collaborative Universe for Remote Interpreting of Sign
Language in Higher Education ............................................... 392
   Vit Rusňák, Pavel Troubil, Svatoslav Ondra, Tomáš Sklenák,
   Desana Daxnerová, Eva Hladká, Pavel Kajaba, Jaromír Kala,
   Matej Minárik, Peter Novák, and Christoph Damm

Classifiers in Arab Gloss Annotation System for Arabic Sign Language. 400
   Nadia Aouiti and Mohamed Jemni
Image-Based Approach for Generating Facial Expressions .......................... 407
Ibtissem Talbi, Oussama El Ghoul, and Mohamed Jemni

Developing eLecture Materials for Hearing Impaired Students and Researchers: Designing Multiple-Video Programs and Usability Assessment ................................................................. 415
Ritsuko Kikusawa, Motoko Okumoto, Takuya Kubo, and Laura Rodrigo

Effect of Vibration on Listening Sound for a Person with Hearing Loss ........ 419
Junichi Kanebako, Toshimasa Yamanaka, and Miki Namatame

Designing a Collaborative Interaction Experience for a Puppet Show System for Hearing-Impaired Children ................................................................. 424
Ryohei Egusa, Tsugunosuke Sakai, Haruya Tamaki, Fusako Kusunoki, Miki Namatame, Hiroshi Mizoguchi, and Shigenori Inagaki

SingleScreenFocus for Deaf and Hard of Hearing Students ....................... 433
Raja S. Kushalnagar, Poorna Kushalnagar, and Fadi Haddad

A Web Application for Geolocalized Signs in Synthesized Swiss German Sign Language ................................................................. 438
Anna Jancso, Xi Rao, Johannes Graën, and Sarah Ebling

Accessible Computer Input
Evaluation of a Mobile Head-Tracker Interface for Accessibility ............... 449
Maria Francesca Roig-Maimó, Cristina Manresa-Yee, Javier Varona, and I. Scott MacKenzie

Replacement of the Standard Computer Keyboard and Mouse by Eye Blinks ................................................................. 457
Muhammad Bilal Saif and Torsten Felzer

SWIFT: A Short Word Solution for Fast Typing ........................................ 464
Philippe Roussille and Mathieu Raynal

An Empirical Evaluation of MoonTouch: A Soft Keyboard for Visually Impaired People ................................................................. 472
Saber Heni, Wajih Abdallah, Dominique Archambault, Gérard Uzan, and Mohamed Salim Bouhlel

Zoning-Based Gesture Recognition to Enable a Mobile Lorm Trainer ......... 479
Michael Schmidt, Cathleen Bank, and Gerhard Weber

HandiMathKey: Mathematical Keyboard for Disabled Person .................... 487
Elodie Bertrand, Damien Sauzin, Frédéric Vella, Nathalie Dubus, and Nadine Vigouroux
# Contents – Part II

A Study of an Intention Communication Assisting System Using Eye Movement ................................................................. 495  
*Shogo Matsuno, Yuta Ito, Naoaki Itakura, Tota Mizuno, and Kazuyuki Mito*

A Review of Computer-Based Gesture Interaction Methods for Supporting Disabled People with Special Needs ................................................................. 503  
*Chutisant Kerdvibulvech*

Optimizing Vocabulary Modeling for Dysarthric Speech Recognition ................................................................. 507  
*Minsoo Na and Minhwa Chung*

Comparison of Two Methods to Control the Mouse Using a Keypad ................................................................. 511  
*Torsten Felzer, Ian Scott MacKenzie, and John Magee*

### AT and Rehabilitation for People with Motor and Mobility Disabilities

Kalman-Based Approach to Bladder Volume Estimation for People with Neurogenic Dysfunction of the Urinary Bladder ................................................................. 521  
*Alessandro Palla, Claudio Crema, Luca Fanucci, and Paolo Bellagente*

Sound Feedback Assessment for Upper Limb Rehabilitation Using a Multimodal Guidance System ................................................................. 529  
*Mario Covarrubias Rodriguez, Mauro Rossini, Giandomenico Caruso, Gianluca Samali, Chiara Giovananza, Franco Molteni, and Monica Bordegoni*

Personal Mobility Vehicle for Assisting Short-Range Transportation ................................................................. 537  
*Yoshiyuki Takahashi*

Multimodal Sequential Modeling and Recognition of Human Activities ................................................................. 541  
*Mouna Selmi and Mounim A. El-Yacoubi*

Android Games for Developing Fine Coordination of Movement Skills ................................................................. 549  
*Tibor Guzsvinecz, Veronika Szücs, Szilvia Paxian, and Cecilia Sik Lanyi*

### HCI, AT and ICT for Blind and Partially Sighted People

Extending the Technology Enhanced Accessible Interaction Framework Method for Thai Visually Impaired People ................................................................. 555  
*Kewalin Angkananon and Mike Wald*

Types of Problems Elicited by Verbal Protocols for Blind and Sighted Participants ................................................................. 560  
*Andreas Savva, Helen Petrie, and Christopher Power*

Multimodal Attention Stimulator ................................................................. 568  
*Andrzej Czyzewski, Bozena Kostek, and Lukasz Kosikowski*
Assessing Braille Input Efficiency on Mobile Devices 572  
Norbert Márkus, Szabolcs Malik, and András Arató

Smart Glasses for the Visually Impaired People 579  
Esra Ali Hassan and Tong Boon Tang

EasyTrans: Accessible Translation System for Blind Translators 583  
Dina Al-Bassam, Hessah Alotaibi, Samira Alotaibi, and Hend S. Al-Khalifa

An Accessible Environment to Integrate Blind Participants into Brainstorming Sessions: User Studies 587  
Stephan Pölzer, Andreas Kunz, Ali Alavi, and Klaus Miesenberger

Elements of Adaptation in Ambient User Interfaces 594  
Laura Burzaghi, Fabio Gori, Paolo Baronti, Marco Billi, and Pier Luigi Emiliani

Author Index 603