# The 15th Web for All Conference Lyon, France 2018

http://www.w4a.info/2018/

## #w4a2018

Endorsed by the IW3C2
International World Wide Web Conference Committee

# Foreword

The International Web for All Conference (W4A) began in 2004 as a workshop aiming to make the World Wide Web accessible for people with disabilities. Over the years, the workshop has grown into the top conference for web sites accessibility research, attracting a diverse crowd from academia, industry, government, and non-profit organizations. W4A has become the venue for scientists, students, and practitioners from around the world to showcase their latest research, widen their perspectives through discussions with their peers, and establish future research agendas.

W4A is an influential conference that has a growing impact on the research community. According to the ACM Digital Library Bibliometric, each of the W4A's 398 papers was downloaded on average 357 times and has 4.41 citations. These data confirm that W4A does not only provide excellent visibility to papers but also enables strong scientific impact.

Every year, we select a theme that reflects the emerging trends in web accessibility and encourages researchers to look for innovative solutions that make the Web accessible for all. The 30 billion devices expected to join the "Internet of Things" (IoT) by 2020 provide an unprecedented opportunity to observe the world through their sensors, and the AI trained on this data will make smarter decisions to help us in our everyday lives. We have always embraced the potential of new technologies to provide an accessible user experience for everyone. No longer do we look at technology and only look to overcome the potential challenges it could present to users, but we look for how technology can be used to provide an accessible user experience for all. In recognition of the emergence of this new age, the theme for the 15th International Web for All Conference is "Internet of Accessible Things".

This year, we received 45 submissions from thirteen countries showing steady interest of the research community. The submissions covered a wide range of topics including digital assistants and intelligent agents, Internet of Things (IoT), accessible cloud computing, evaluation and testing methods, mobile technologies, and others. Twelve technical papers and thirteen communication papers were selected through a rigorous peer review process.

This year, W4A will feature two keynote speakers. Amy Hurst, Associate Professor of Human Centred Computing, University of Maryland, Baltimore County, and Justine Cassell, Associate Dean of Technology Strategy and Impact, School of Computer Science, Carnegie Mellon University. The "William Loughborough" Conference After Dinner Talk will be given by  Helen Petrie, Professor of Human Computer Interaction, Department of Computer Science,

University of York.


    Many people have contributed to the success of this conference. We would like to thank the Program Committee for their exceptional work and dedication in the review process. We would also like to thank the authors for their excellent work and thank delegates for their participation. Finally, we would like to thank our sponsors and supporters: Google; IBM; The Paciello Group; Intuit; Capti; OpenConf; WebKeyIT; ACM Digital Library, ACM SIGACCESS, ACM SIGCHI, ACM SIGWEB; and The Web Conference.

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Elaine Pearson and Volker Sorge April 2018.

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# Conference Program

## Sunday April 22, 2018 (pre-conference)

- W4A Google Doctoral Consortium (10:00 - 17:00)

## Monday April 23, 2018

- Conference opening (8:45 - 9:00)
- **Keynote (09:00 - 10:00)**
    - Making "making" Accessible: Amy Hurst, Associate Professor, University of Maryland, Baltimore County.

- **Session 1: Internet of Things - 1 of 2 (10:00 - 10:30)**

    - 10.00 - 10.15: How Context and User Behavior Affect Indoor Navigation Assistance for Blind People (Communication Paper); Joao Guerreiro, Eshed Ohn-Bar, Dragan Ahmetovic, Chris Kitanai, Chieko Asakawa,Carnegie Mellon University.

    - 10.15 - 10.30: Internet of Things (IoT) as Assistive Technology: Potential Applications in Tertiary Education (Communication Paper) ; Scott Hollier, Edith Cowan University; Shadi Abou-Zahra, World Wide Web Consortium (W3C).

- **Morning Break (10.30 - 11.00)**

- **Session 2: Education (11:00 - 12:25)**

    - 11.00 - 11.20: Parallel DOM Architecture for accessible interactive simulations (Technical Paper) Taliesin Smith, Jesse Greenberg, Sam Reid, Emily Moore, University of Colorado, Boulder.

    - 11.20 - 11.40: The accessibility of administrative processes: Assessing the impacts on students in higher education (Technical Paper); Tim Coughlan, Kate Lister, The Open University.

    - 11.40 - 11.55: Improving Usability of Math Editors (Communication Paper); Neil Soiffer, Talking Cat Software. **(Best Communication Paper Nominee)**

    - 12.05 - 12.20: On Accessibility Policies for Higher Education Institutions (Communication Paper); Giorgio Brajnik, Sanela Graca, University of Udine.

- **Lunch Break (12.25 - 13.30)**

- **Session 3:IBM Award for Students with Disabilities (13:30 - 14:00)**
    - Shantanu D. Ladkat, Savitribai Phule, University, Pune, India.
    - Davide Mulfari, University of Pisa, Italy.

- **Session 4: Paciello Group Web Accessibility Challenge - Presentation Session (14.00- 15:00)**

- **Afternoon Break (15.00 - 15.30)**

- **Session 5: Paciello Group Web Accessibility Challenge - Demonstration Session (15.30 - 16:25)**

- **Session 6: W4A Google Doctoral Consortium - Presentation Session - 1 of 2 (16.30 - 17.00**)
    - Davide Mulfari, University of Pisa, Italy – A TensorFlow-based Assistive Technology System for Users with Visual Impairments.
    - Claudia De Los Rios Perez, Curtin University Australia – Adaptable User Interfaces for People with Autism: A Transportation Example.

- **Session 7: User Interface Design (17.00 - 17.35)**
    - 17.00 - 17.20: Exploring the Role of Tunnel Vision Simulation in the Design Cycle of Accessible Interfaces (Technical Paper); Rie Kamikubo, Keita Higuchi, Ryo Yonetani, Yoichi Sato, University of Tokyo; Hideki Koike, Tokyo Institute of Technology.
    - 17.20 - 17.35: Application for the configuration and adaptation of the Android operating system for the visually impaired (Communication Paper); Brunoa De Oliveira, Juliana Braga, Rafael Damaceno, Federal University of ABC.

- **W4A Conference Dinner (19.00)**
    - The "William Loughborough" After Dinner Talk: 25 years at the coalface of accessibility: time flies when you are having fun!: Professor Helen Petrie, University of York.

# Tuesday April 24, 2018

- **Keynote (9.00 - 10.00)**
  - "A Person Like Me: Virtual Peers as Interface and Education":Justine Cassell, Associate Dean of Technology Strategy and Impact, School of Computer Science, Carnegie Mellon University.

- **Session 8: Internet of Things - 2 of 2 (10.00 - 10:20)**
  - 10.00 - 10.20: Home Automation for an Independent Living: Investigating Needs of the Visually Impaired People (Technical Paper); Barbara Leporini, Marina Buzzi, ISTI-CNR. **(Best Technical Paper Nominee)**

- **Morning Break (10.20 - 11.00)**
- **Session 9: Learning Disabilities (11:00 - 12:30)**
  - 11.00 - 11.20: Detecting Autism Based on Eye-Tracking Data from Web Searching Tasks (Technical Paper); Victoria Yaneva, Le An Ha, Ruslan Mitkov, University of Wolverhampton; Sukru Eraslan, Yeliz Yesilada, Middle East Technical University. **(Best Technical Paper Nominee)**
  - 11.20 - 11.40: Towards a Language Independent Detection of Dyslexia with a Web-Game (Technical Paper);Maria Rauschenberger, Ricardo Baeza-Yates, Universitat Pompeu Fabra; Luz Rello, Jeffrey P. Bigham, Carnegie Mellon University.
  - 11.40 - 12.00: Computer Anxiety and Interaction: A Systematic Review (Technical Paper); Thiago Donizetti dos Santos, Federal University of ABC; Vagner Figueredo de Santana, IBM Research.
  - 12.00-12.15: Automatic Natural Language Generation Applied to Alternative and Augmentative Communication for Online Video Content Services using SimpleNLG for Spanish (Communication Paper); Silvia García-Méndez, Milagros Fernández-Gavilanes, Enrique Costa-Montenegro, Jonathan Juncal-Martínez, Francisco Javier González-Castaño, GTI Research Group, atlanTTic.
  - 12.15-12.30: Artificial Intelligence for Web Accessibility – Conformance Evaluation as a Way Forward?(Communication Paper); Shadi Abou-Zahra, Judy Brewer, Michael Cooper, W3C Web Accessibility Initiative (WAI). **(Best Communication Paper Nominee)**

- **Lunch Break (12.30 - 13.30)**
- **Session 10: Evaluation and Testing (13.30 - 14:30)**
  - 13.30 - 13.45: Automatic Role Detection of Visual Elements of Web Pages for Automatic Accessibility Evaluation (Communication Paper);Carlos Duarte, Ana Salvado, Luis Carrico, LASIGE, Faculdade de Ciências da Universidade de Lisboa; M Elgin Akpinar, Yeliz Yesilada, Middle East Technical University.
  - 13.45-14.00: Semantic Content Analysis Supporting Web Accessibility Evaluation (Communication Paper); Carlos Duarte, Ines Matos, Luis Carrico, LASIGE, Faculdade de Ciências da Universidade de Lisboa. **(Best Communication Paper Nominee)**
  - 14.00-14.15: Web Accessibility Evaluation in a Crowdsourcing-Based System with Expertise-Based Decision Strategy (Communication Paper); Shuyi Song, Bu Jiajun, Ye Wang, Zhi Yu, Andreas Artmeier, Can Wang, Zhejiang University; Lianjun Dai, China Disabled Persons' Federation Information Center.
  - 14.15-14.30: Reliability Aware Web Accessibility Experience Metric (Communication Paper); Shuyi Song, Jiajun Bu, Chengchao Shen, Andreas Artmeier, Zhi Yu, Zhejiang University; Qin Zhou, China Disabled Persons' Federation Information Center.

- **Session 11: Doctoral Consortium Presentations - 2 of 2 (14:30 - 15.00)**
  - Muhammad Saleem, Edith Cowan University, Western Australia – Arabic Accessibility Guidelines – Understanding and Use by Web Developers in Kuwait.
  - Jens Pelzetter – University of Bremen, Germany – Using Ontologies as a Foundation for Web Accessibility Tools.

- **Afternoon Break (15.00 - 15.30)**
- **Session 12: Assistive Technology (15:30 - 16:30)**
  - 15.30 - 15.50: Exploring Aural Navigation by Screenless Access (Technical Paper);Mikaylah Gross, Joe Dara, Christopher Meyer, Davide Bolchin, IU School of Informatics and Computing - Indianapolis. **(Best Technical Paper Nominee)**
  - 15.50 - 16.10: Multi-view Mouth Renderization for Assisting Lip-reading (Technical Paper); Andrea Britto Mattos, Dario Augusto Borges Oliveira, IBM Research.
  - 16.10 - 16.25: Accessify: An ML Powered Application to

Automatically Provide Image Descriptions on Website (Communication Paper); Shivam Singh, Anurag Bhandari, Nishith Parak, Accenture.

- **Session 13: Motor Impairments  (16.30 - 17.30)**
    - 16.30 - 16.50: Vocal Programming for People with Upper-Body Motor Impairments (Technical Paper); Lucas Rosenblatt, Brown University; Patrick Carrington, Jeffrey Bigham, Carnegie Mellon University;Kotaro Hara, Singapore Management University.
    - 16.50 - 17.10: Designing an Adaptive Web Navigation Interface for Users with Variable Pointing Performance (Technical Paper);Aqueasha Martin-Hammond, Purdue University Indianapolis; Foad Hamidi, Tajas Bhalerao, Catherine Hornback, Amy Hurst, University of Maryland, Baltimore County; Abdullah Ali, University of Washington; Casey Means, Rhodes College.
    - 17.10 - 17.30: Collaborative Accessibility Assessments by Senior Citizens Using Smartphone Application ReAcTS (Real-world Accessibility Transaction System) (Technical Paper); Takahiro Miura, Ken-ichiro Yabu, Institute of Gerontology (IOG), The University of Tokyo.

- **Awards and Closing (17:30 – 18:00)**

# Wednesday April 25, 2018

- WWW Keynote  (9:00 - 10:30) (Optional, paid-for add on)
- W4A Unconference Activities (11:30 - 17:00):

# Conference Information

### Publications

Conference proceedings have the ISBN is 978-1-4503-5651-0 and include abstracts and notes sections for all our technical, communications, challenge, doctoral consortium and keynote presentations. The conference proceedings will be published as part of the ACM International Conference Proceedings Series and will be available at the ACM Digital Library.

## History

W4A was established in 2004 as a cross-disciplinary conference focusing on research in the area of the Web and accessibility, primarily for people with disabilities. Since then, it has become an established part of the accessibility research calendar, taking place alongside the annual WWW conference. Every year, we welcome between 50-70 attendees, who come from a large number of research institutions around the world, including academia, industry, government, and disability support organizations.

Papers have typically been reviewed by at least three of our program committee members with an average acceptance rate of 35%. Papers of our conference are published in ISBNed ACM proceedings and in various Special Issues of respected journals within the field. We also solicit sponsorship from the ACM SIGACCESS, ACM SIGCHI, ACM SIGWEB, plus organisations including IBM Research, Adobe, Mozilla Foundation, Google, Microsoft, The Paciello Group, Zakon Group.

## Lunch and Coffee

The conference lunch and coffee will be held together with the World Wide Web conference. The morning coffee break is scheduled for 10:30-11:00, the lunch for 12:30-13.30 and the afternoon coffee break is scheduled for 15:00-15:30.

## Past Conference Locations:

W4A 2017, Perth, Australia            W4A 2016, Montreal, Canada
W4A 2015, Florence, Italy             W4A 2014, Seoul, South Kore
W4A 2013, Rio de Janeiro, Brazil      W4A 2012, Lyon, France
W4A 2011, Hyderabad, India            W4A 2010, Raleigh, NC, USA
W4A 2009, Madrid, Spain               W4A 2008, Beijing, China
W4A 2007. Banff, Canada               W4A 2006, Edinburgh, UK
W4A 2005, Chiba, Japan                W4A 2004, New York, NY, USA

# Keynote Speakers

## Amy Hurst

Amy Hurst is an associate professor of Human-Centered Computing in the Information Systems Department at University of Maryland Baltimore County and studies accessibility challenges in real-world settings. Her research focuses on addressing accessibility problems understanding diverse user's abilities, habits, and preferences. At UMBC she founded the Prototyping and Design Lab (a collaborative

making space for technologists and artists) and is an active member of the Interactive Systems Research Center. Amy received her PhD in Human-Computer Interaction from the HCII at Carnegie Mellon in 2010 and has an undergraduate degree in Computer Science from Georgia Institute of Technology.

**Justine Cassell**

Justine Cassell is Associate Dean of Technology Strategy and Impact in the School of Computer Science at Carnegie Mellon University, and Director Emerita of the Human Computer Interaction Institute. She co-directs the Yahoo-CMU InMind partnership on the future of personal assistants. Previously Cassell was faculty at Northwestern University where she founded the Technology and Social Behavior Doctoral Program and Research Center. Before that she was a tenured professor at the MIT Media Lab. Cassell received the MIT Edgerton Prize, and Anita Borg Institute Women of Vision award, in 2011 was named to the World Economic Forum Global Agenda Council on AI and Robotics, in 2012 named a AAAS fellow, in 2016 made a Fellow of the Royal Academy of Scotland, and in 2017 made a Fellow of the ACM. In 2017-2018 Cassell holds the Chaire Blaise Pascal in Paris, where she is a visiting researcher at the Sorbonne. Cassell has spoken at the World Economic Forum in Davos for the past 7 years on topics concerning the impact of AI and Robotics on society.

**Professor Helen Petrie: The William Loughborough After-Dinner Speaker**

Helen Petrie is Professor of Human-Computer Interaction in the Department of Computer Science at the University of York. She is a Chartered Psychologist and Associate Fellow of the British Psychological Society and has degrees in both psychology and computer science. Her interest in accessibility started when she worked for the Royal National Institute for Blind People (RNIB) helping to design and evaluate one of the first screenreaders for Windows. Since then she has worked on many aspects of accessibility and assistive technology, particularly for visually impaired and older people. She has received a Royal Television Society Technical Innovation Prize, a Social Impact Award from the Association of Computing Machinery (ACM), and a Lifetime Achievement Award from the RNIB

# W4A/TPG Web Accessibility Challenge

The W4A/TPG Web Accessibility Challenge has been generously sponsored by The Paciello Group, and is offered as a medium for researchers, web developers and software engineers to showcase new and innovative technologies in the area of Web accessibility.

The W4A/TPG Web Accessibility Challenge consists of two prizes: the Judges Award and the Delegates Award. The Judges Award is awarded by a panel of recognised experts from a wide range of sectors covering industry bodies and academic institutions. This year, we are honoured to have the participation of Anke Brock, Assistant Professor at ENAC in Toulouse; Mark T. Hakkinen - Educational Testing Service (ETS); Mike Wald - Professor at the University of Southampton; Andrea Mangiatordi - Assistant Professor at the University of Milan and Other Sharif - Comcast/EvoXlabs. We'd like to take this opportunity to thank the distinguished judges for their contribution to the conference.

The Delegates Award is awarded by the delegates of the W4A Conference by secret ballot after listening to the Challenge presentations and being able to experience the solutions during a demonstration session. This is an interesting and exciting part of the W4A Conference, since authors can make their own case for the impact of their Accessible Technology and the results may be different from the Judges' decision.

Given that entries to the main track can also qualify for the Delegates Award, we received a total of 5 high-quality entries from across globe including representatives from Brazil, the United Kingdom, Australia, India, the Czech Republic. The contributions focus on different areas of web accessibility, and, when examined as a whole, the solutions provide a collection of innovations that support the needs of a diverse range of users, fitting the ethos of the W4A Conference perfectly.

All authors will receive valuable feedback from the conference attendees, and have the possibility of networking with individuals from industry, academia and regulatory and standards bodies regarding their technologies.

David Sloan and Silvia Mirri
April 2018

# W4A Google Doctoral Consortium

The 2018 W4A Conference also features the fourth edition of the W4A Google Doctoral Consortium. As in previous years we are generously supported by Google sponsoring the event, allowing us to give Doctoral Consortium Awards to talented students. The awards provide financial support for four students to attend the W4A Conference, present their research and gain valuable feedback from top researchers and practitioners in the field of Web Accessibility.

This year we received five submissions, leading to a selection process for the four successful candidates. All submissions were thoroughly reviewed by the panel of expert judges and evaluated with respect to previously announced review criteria in terms of their relevance to W4A, overall awareness of their field, originality of the work and its potential impact.

The W4A Organizing Committee would therefore like to thank the judges for their dedicated effort and is happy to introduce the 2018 participants in the Doctoral Consortium:

- Davide Mulfari, University of Pisa, Italy
- Muhammad Saleem, Edith Cowan University, Western Australia
- Jens Pelzetter, University of Bremen, Germany
- Claudia De Ros Rios Perez, Curtin University, Australia

The Doctoral Consortium session will be held the day before the main conference. Students present their research to the Doctoral Consortium Panel comprised of Helen Petrie (University of York), Sergio Mascetti (University of Milan), Silvia Rodríguez Vázquez (University of Geneva), Mireia Ribera (University of Barcelona), Hironobu Takagi (IBM), Yu Zhong (Google) and chaired by Giorgio Brajnik (University of Udine) and Dragan Ahmetovic (Carnegie Mellon University). In addition, all students will give short presentations of their work during the main conference and their extended abstracts are included in these proceedings.

Once again, we are most thankful to Google Inc. for their generous support, and we look forward to their ongoing involvement in W4A.

Giorgio Brajnik Dragan Ahmetovic
April 2018

# WWW/W4A Unconference

On Wednesday, 25th April, delegates will have access to W4A informal 'unconference' activities. W4A brings together developers, researchers and practitioners from all over the world, many of whom share interests or are working on similar solutions to support accessibility for a range of users. We will provide a space to facilitate discussion, foster collaboration and build new relationships in the community among W4A delegates who are recognised experts in their field.

Whether it be a mini-hackathon for developers to investigate technical solutions

to accessibility, a moderated group discussion to debate current or future trends in the field or a place for PhD students to share experiences and challenges, we invite you to actively contribute to the W4A conference program.

While topics and areas of interest can be suggested during the conference, we invite delegates to submit on-going projects and topics for discussion to be considered beforehand to enable us to maximise your benefit from these sessions. Please contact the General Chairs directly with suggestions (gc2018@w4a.info).

## Time & Place
Location: **Salle St Clair 4 – NIVEAU + 2**
Date: Wednesday April 25, 11:30 am to 5.00pm (following the WWW Keynote)

## Signup
Attendees who are registered for W4A are eligible to participate as part of their conference experience at no extra cost.

# IBM People with Disabilities Award

This is the 3rd year that W4A is able to grant qualifying students the IBM People with Disabilities Award. This year, we received some strong applications, but only two winners will receive the award, which will reimburse all their attendance costs. The awardees will be introduced to the community of W4A researchers and practitioners who are working to make Web, Mobile, and Wearable devices accessible for all. We thank IBM for their generous sponsorship and hope to see more submissions in 2018.

The W4A Organizing Committee is happy to introduce the 2018 winners:

Shantanu D. Ladkat, Savitribai Phule University, Pune, India

Davide Mulfari, University of Pisa, Italy

Chieko Asakawa and Yevgen Borodin
April 2018

# Intuit Best Paper Awards

The W4A Organizing Committee are proud to announce the awards for Best Technical Paper and Best Communication Paper are sponsored in 2018 by Intuit. We are grateful for their continued support.

Best Technical Paper Nominees:
- Home Automation for an Independent Living: Investigating Needs of the Visually Impaired People: Barbara Leporini, Marina Buzzi, ISTI-CNR.
- Detecting Autism Based on Eye-Tracking Data from Web Searching Tasks: Victoria Yaneva, Le An Ha, Ruslan Mitkov, University of Wolverhampton; Sukru Eraslan, Yeliz Yesilada, Middle East Technical University.
- Exploring Aural Navigation by Screenless Access: Mikaylah Gross, Joe Dara, Christopher Meyer, Davide Bolchini, IU School of Informatics and Computing – Indianapolis.

Best Communication Paper Nominees:
- Improving Usability of Math Editors: Neil Soiffer, Talking Cat Software.
- Artificial Intelligence for Web Accessibility – Conformance Evaluation as a Way Forward?: Shadi Abou-Zahra, Judy Brewer, Michael Cooper, W3C Web Accessibility Initiative (WAI).
- Semantic Content Analysis Supporting Web Accessibility Evaluation:  Carlos Duarte, Ines Matos, Luis Carrico, LASIGE, Faculdade de Ciências da Universidade de Lisboa.

# Program

## Keynote

### Making "Making" Accessible

Amy Hurst, Associate Professor, University of Maryland, Baltimore County

Assistive Technologies empower individuals to accomplish tasks they might not be able to do otherwise. Unfortunately, a large percentage of Assistive Technologies end up unused or abandoned, leaving people with solutions that are inappropriate for their needs. My students and I are working to help more people gain access to the Assistive Technology they need by empowering non-engineers to "Do-It-Yourself" (DIY) and create, modify, or build their own solutions. In this talk I will discuss our work understanding the potential and reality of using 3D printing to create DIY Assistive Technologies from both the clinician and end-user perspective. I will also discuss several of the challenges non-engineers face learning these technologies and our work to overcome them.

## Session 1: Internet of Things

### How Context and User Behavior Affect Indoor Navigation Assistance for Blind People

Joao Guerreiro, Eshed Ohn-Bar, Dragan Ahmetovic, Chris Kitanai, Chieko Asakawa, Carnegie Mellon University

Recent techniques for indoor localization are now able to support practical, accurate turn-by-turn navigation for people with visual impairments (PVI). Understanding user behavior as it relates to situational contexts can be used to improve the ability

of the interface to adapt to problematic scenarios, and consequently reduce navigation errors. This work performs a fine-grained analysis of user behaviour during indoor assisted navigation, outlining different scenarios where user behaviour (either with a white-cane or a guide-dog) is likely to cause navigation errors. The scenarios include certain instructions (e.g., slight turns, approaching turns), cases of error recovery, and the surrounding environment (e.g., open spaces and landmarks). We discuss findings regarding user behavior and lessons learned from a real-world user study to guide future directions for the development of assistive navigation interfaces that consider the users' behaviour and coping mechanisms.

**Notes:**


### Internet of Things (IoT) as Assistive Technology: Potential Applications in Tertiary Education

Scott Hollier, Edith Cowan University; Shadi Abou-Zahra, World Wide Web Consortium (W3C)


The recent popularity of the Internet of Things (IoT) in the consumer space and Web of Things (WoT) work by the World Wide Web Consortium (W3C) has led to a Curtin University research project that has investigated the use of IoT by people with disabilities in the education space. Potential education-related IoT solutions raised in the research include the delivery of smartboard materials directly to the student to ensure compatibility with assistive technologies, the use of consumer-based IoT to provide captions and the monitoring of lecturer and student engagement in real-time to improve education delivery. While the use of IoT in these contexts may be considered an assistive technology in its own right, issues of privacy, security, and interoperability need to be addressed. As such, it is imperative that the W3C WoT work in this area continues to provide guidance and further academic research is needed.

**Notes:**


# Session 2: Education


### Architecture for Accessible Interactive Simulations

Taliesin Smith, Jesse Greenberg, Sam Reid, Emily Moore, University of Colorado, Boulder

Interactive simulations are used in classrooms around the world to support student

learning. Creating accessible interactive simulations is a complex challenge that pushes the boundaries of current accessibility approaches and standards. In this work, we present a new approach to addressing accessibility needs within complex interactives. Within a custom scene graph that utilizes a model-view-controller architectural pattern, we utilize a parallel document object model (PDOM) to create interactive simulations (PhET Interactive Simulations) accessible to students through alternative input devices and descriptions accessed with screen reader software. In this paper, we describe our accessibility goals, challenges, and approach to creating robust accessible interactive simulations, and provide examples from an accessible simulation we have developed and possibilities for future extensions.

**Notes**

### The accessibility of administrative processes: Assessing the impacts on students in higher education
Tim Coughlan, Kate Lister, The Open University.

Administrative processes that need to be completed to maintain a basic standard of living, to study, or to attain employment, are perceived to create burdens for disabled people. The navigation of information, forms, communications, and assessments to achieve a particular goal raises diverse accessibility issues. In this paper we explore the different types of impacts these processes have on disabled university students. We begin by surveying literature that highlights the systemic characteristics of administrative burdens and barriers for disabled people. We then describe how a participatory research exercise with students led to the development of a survey on these issues. This was completed by 104 respondents with a diverse range of declared disabilities. This provides evidence for a range of impacts, and understanding of the perceived level of challenge of commonly experienced processes. The most common negative impact reported was on stress levels. Other commonly reported impacts include exacerbation of existing conditions, time lost from study, and instances where support was not available in a timely fashion. Processes to apply for disability-related support were more commonly challenging than other processes. We use this research to suggest directions for improving accessibility and empowerment in this space.
**Notes:**

### Improving Usability of Math Editors
Neil Soiffer, Talking Cat Software.

WYSIWYG mathematical editors have existed for several decades. Recent editors

have mostly been web-based. These editors often provide buttons or palettes containing hundreds of symbols used in mathematics. People who use screen readers and switch devices are restricted to semi-linear access of the buttons and must wade through a large number of buttons to find the right symbol to insert if the symbol is not present on the keyboard. This paper presents data gleaned from textbooks that shows that if the subject area is known, the number of buttons needed for special symbols is small and so usability can be greatly improved.
**Notes:**


## A survey on accessibility awareness of Brazilian web developers

Humberto Lidio Antonelli, Sandra Souza Rodrigues, Renata Pontin de Mattos Fortes, University of Sao Paulo; Willian Massami Watanabe, Federal University of Technology – Paraná.

A huge amount of content have been made available on the Web.
Although there are several initiatives to guide an accessible web development, researchers have showed that web developers are rarely aware of accessibility issues in their web projects.
In this paper, we conducted a survey to verify the evolution of web accessibility awareness in Brazil.
We have conducted an exploratory study based on web questionnaire, using a self-selected and non-probabilistic sampling method. The study had 404 valid answers, covering all regions of Brazil.
The results show that most of participants has never developed an accessible website and 33.2% of them are not worried about considering the accessibility in their future projects.
Therefore, it is important to create public policies that improve the current web accessibility scenario, raising the awareness of the people involved in web development, as well as obligating compliance with Brazilian legislation.
**Notes:**


## On Accessibility Policies for Higher Education Institutions

Giorgio Brajnik, Sanela Graca, University of Udine

Accessibility policies are a fundamental instrument for implementing accessibility solutions, and this is true also for university websites. However writing a good accessibility
policy is not trivial. In this paper we present a brief outline of a survey we performed on twenty university policies. Drawing on these examples, we explain what should be included in a policy and how such a content should be formulated.
**Notes:**

# Session 3: IBM Award for Students with Disabilities

W4A is happy to announce the IBM People with Disabilities Student Award. The award reimburses the attendance costs for several students with disabilities and introduces them to the community of W4A researchers and practitioners who are working to make Web, Mobile, and Wearable devices accessible for all.

**This year the awardess are:**
- Shantanu D. Ladkat, Savitribai Phule University, Pune, India
- Davide Mulfari, University of Pisa, Italy

# Session 4: Paciello Group  Web Accessibility Challenge - Presentation Session

This year the W4A/TPG Web Accessibility Challenge will involve two activities:
- A five to ten minute pitch presentation (Session 4)
- A five to ten minute lightning demo

**Presentation Session:**

During a 5-10 minute presentation, each Challenge entrant will "pitch" their solution to delegates and articulate the innovative aspects of their technology and how it advances accessibility and usability. Their presentation will define the accessibility issue their

technology solves, and describe the innovations one can expect to see during the demonstration session that will follow.

There will be scheduled break following the Presentation Session.

# Session 5: Paciello Group Web Accessibility Challenge - Demonstration

**Demonstration Session**

To ensure the session can commence on schedule, please return from the break on time. Delegates will then be given a voting ballot paper, split into groups and assigned a station where they will start the demonstration session. When the bell rings, the presenter at the station will do his or her 5-10 minute demo of the innovative aspect of their technology. The presenter may or may not allocate time for questions during the session.

After five minutes the bell will ring again, at which time your group will move on to the next demo. This continues until all groups have visited all the demos. "Timekeepers" will be present who will facilitate the rotation between demo stations.

**Presenters**

**Multi-view Mouth Renderization for Assisting Lip-reading**
Andrea Britto, Mattos Lima, Dario Augusto, Borges Oliveira, IBM Research, Brazil

**Adaptable Maps for People with Autism**
Claudia De Los Rios Perez, David A. McMeekin, Marita Falkmer, Tele Tan, Curtin University, Australia

**WebSight: Using AR and WebGL Shaders to Assist the Visually Impaired**
Dan Ruta, Louis Jordan, Tom James Fox, University of Portsmouth, UK

**DysHelper – The Dyslexia Assistive User Experience**
Tereza Pařilová, Romana Remšíková, Filip Mrvan, Masaryk University, Czech Republic

**Accessify: An ML Powered Application to Automatically Provide Image Descriptions on Website**

Shivam Sing, Anurag Bhandari, Nishith Pathak , Accenture, India

**Parallel DOM Architecture for Interactive Simulations**
Taliesin Smith, Jesse Greenberg, Sam Reid, Emily Moore, University of Colorado, Boulder

# Session 6: W4A Google Doctoral Consortium

## A TensorFlow-based Assistive Technology System for Users with Visual Impairments

Davide Mulfari, University of Pisa, Italy

The paper investigates the potential benefits of bringing together Internet of Things and deep learning techniques toward the development of assistive technologies for users with visual disabilities. We propose a computer vision system designed to classify objects in the user's surroundings and to provide its user with an audio description of the detected things. The solution exploits a wearable vision sensor, which is mounted on the user's glasses and controlled by a single board computer running Google TensorFlow framework. With this software layer, the aid may support users in specific environments, e.g., museums. Finally, experiments show promising results in the context of image classification.

## Adaptable User Interfaces for People with Autism: A Transportation Example

Claudio De Los Rios Perez, Curtin University Australia

Many studies support the idea to use computer technologies to facilitate socialization and social inclusion for people with autism, but in reality many websites and mobile applications are lacking in accessibility features. This research aims to develop an accessibility framework based on the compilation of Web Accessibility standards, semantic web technologies (i.e. HTML5, CSS, Ontologies, RDFa) and evidence-based best practices and recommendations for user interface design for people with autism. This adaptation framework will be illustrated using a transportation use case example.

# Session 7: User Interface Design

**Exploring the Role of Tunnel Vision Simulation in the Design Cycle of Accessible Interfaces**

Rie Kamikubo, Keita Higuchi, Ryo Yonetani, Yoichi Sato, University of Tokyo; Hideki Koike, Tokyo Institute of Technology

Despite the emphasis of involving users with disabilities in the development of accessible interfaces, user trials come with high costs and effort. Particularly considering the diverse range of abilities such as in the case of low vision, simulating the effect of an impairment on interaction with an interface has been approached. As a starting point to assess the role of simulation in the design cycle, this research focuses on allowing sighted individuals to experience the interface under tunnel vision using gaze-contingent simulation. We investigated its implementation reliability through the analysis of empirical tests of prototypes compared between participants under simulation and intended groups. We found that the simulation-based approach can enable developers to not only examine problems in interfaces but also be exposed to user feedback from simulated user trials with necessary evaluation measures. We discussed how the approach can complement accessibility qualities associated with user involvement at different development phases.

**Notes:**

**Application for the configuration and adaptation of the Android operating system for the visually impaired**

Brunoa De Oliveira, Juliana Braga, Rafael Damaceno, Federal University of ABC

Mobile devices can be used as assistive technologies as they help improve the quality of life of people with visual impairments (PVI). Despite the advantages of mobile devices, it is necessary to overcome some challenges regarding the difficulties of interacting of these users with the operating system of these devices. This is important for the use of this technology to reach a greater number of the visually impaired. Therefore, this study aimed to perform an interface design and the development of an application. It automatically adapts the Android® operating system according to the accessibility preferences of the visually impaired through voice commands. These preferences were validated in previous studies. With the help of computational tools and tests with PVI, it was possible to create the prototype of the application interface and to know the improvements to be made.

The developed application showed potential to be a useful tool for the visually impaired, also bringing specific benefits of using the voice command to partially impaired people.

**Notes:**

# Conference Dinner

The conference dinner will be held at the **Brasserie Georges**, a restaurant located in the 2nd arrondissement of Lyon. It is the oldest brasserie in the city and one of the largest brasseries in Europe.Its has an international reputation and its history is closely linked to that of Lyon. The brasserie serves typical dishes including the famous sausage of Lyon with pistachios, as well as dishes from other regions. The Brasserie Georges website is: http://www.brasseriegeorges.com/en/

The shuttle bus will depart at **19:00** from Entrance H of the conference Centre (see map below).
The bus stop is located just on front of the bear statue.
Note: The entrance for the Conference is entrance C.

The shuttle bus will depart from Brasserie Georges will be at **22.15**.

# The "William Loughborough" After-Dinner Talk

**About the William Loughborough Speech.** This has been an annual and eagerly-anticipated part of W4A since 2010, when it was introduced in memory of

William Loughborough, a long-time advocate for accessibility and inclusive design. William was a talented technologist and engineer, and an enthusiastic supporter of W4A, regularly providing thoughtful feedback to presenters in his inimitable way. We invited William to speak at the W4A 2010 conference dinner in Raleigh, North Carolina; but sadly he died shortly before the event. So, in William's honour, every year we invite a well-regarded speaker from the accessibility community to address the conference delegates with a speech that is likely to be provocative, challenging conventions, insightful and humorous—and always one that will give us food for thought.

Find out more about William's life and work at: [http://media-dis-n-dat.blogspot.co.uk/2010/05/obituary-william-loughborough-pioneer.html](http://media-dis-n-dat.blogspot.co.uk/2010/05/obituary-william-loughborough-pioneer.html)

This year's speech will be given by Helen Petrie, University of York, UK:

**25 years at the coalface of accessibility: time flies when you are having fun!**

It is hard to believe that I have been working on accessibility for exactly 25 years. This was a field I just fell into, like Alice in Wonderland falling down the rabbit hole, into a strange new world of European projects, trying to learn braille and being expected to have the entire body of psychological knowledge at my fingertips. In 25 years of research I have worked on over 50 projects and supervised over 20 PhDs, many on technology for visually disabled people, but also on technology for people with hearing disabilities, people who are deafblind, people with physical disabilities, people with dyslexia and now increasingly for older people. In that time I've seen attitudes towards people with disabilities and older people change considerably, and the sophistication of research improve greatly. But we still face many challenges. In this talk I will highlight some of the things I have learnt, some of the challenges I have faced as a researcher and some of the odd things I have encountered. I hope I will be able to convey why I am still passionate about this research area after 25 years.

**Notes:**

# Keynote

**A Person Like Me:Virtual Peers as Interface and Education**
Justine Cassell, Carnegie Mellon University, USA

Students learn more when they study with friends than with strangers. Patients who feel respected by their doctors are more likely to enroll in medical trials. Sometimes you just need somebody like you - or even who just likes you - to help you succeed. In this talk I'll describe how we build this same experience - of working with somebody like you - into technology. Applications include peer tutoring of linear algebra, scaffolding social skills in individuals with Aspergers, teaching science to children who speak non-mainstream dialects, and virtual personal assistants who really get what their human bosses are looking for. Each step of the talk is illustrated by experiments that involve human-human and human-virtual human interaction. I include novel approaches to modeling and generating behaviors for human-computer interaction on the basis of human-human corpora. And finally, lessons are drawn both for the understanding of human behavior, and the improved design of technologies capable of engaging in satisfying relationships and more effective interactions with people over the long-term.

**Notes:**

# Session 8:  Internet of Things - 2 of 2

**Home Automation for an Independent Living: Investigating Needs of the Visually Impaired People**
Barbara Leporini, Marina Buzzi, ISTI-CNR

Independence is essential for anyone and crucial for people with disabilities. Being able to perform daily actions as much as possible autonomously is an important step towards a real inclusion and an independent life. Several technology-enhanced services and tools are steadily proposed to the special-need users, but are they

really used and appreciated by them? New technology and sensors are increasingly used to develop solutions aimed at improving the quality of life for all, including people with vision impairments. Smart home is an example going into this direction. This paper collects blind users' expectations and habits regarding technology for home automation through an online survey and some interviews. Specifically forty-two visually impaired people answered to an accessible online questionnaire shedding light on their needs and preferences. Next some semi-structured short interviews conducted with a group of eight thoroughly blind participants have enabled the collection of relevant user requirements useful for better understanding some aspects of experienced obstacles, and for designing usable functions of home automation and remote control systems. Results showed that main requests are for gaining autonomy in every day tasks and having more usability and flexibility in using remote control and home automation systems. Thanks to the collected feedback a set of general suggestions for designers and developers of home automation systems and devices has been proposed in order to enhances their accessibility and usability.

**Notes:**

# Session 9: Learning Disabilities

**Detecting Autism Based on Eye-Tracking Data from Web Searching Tasks**

Victoria Yaneva, Le An Ha, Ruslan Mitkov, University of Wolverhampton; Sukru Eraslan, Yeliz Yesilada, Middle East Technical University

The ASD diagnosis requires a long, elaborate, and expensive procedure, which is subjective and is currently restricted to behavioural, historical, and parent-report information. In this paper, we present an alternative way for detecting the condition based on the atypical visual-attention patterns of people with autism. We collect gaze data from two different kinds of tasks related to processing of information from web pages: Browsing and Searching. The gaze data is then used to train a machine learning classifier whose aim is to distinguish between participants with autism and a control group of participants without autism. In addition, we explore the effects of the type of the task performed, different approaches to defining the areas of interest, gender, visual complexity of the web pages and whether or not an

area of interest contained the correct answer to a searching task.
Our best-performing classifier achieved 0.75 classification accuracy for a combination of selected web pages using all gaze features. These preliminary results show that the differences in the way people with autism process web content could be used for the future development of serious games for autism screening. The gaze data, R code, visual stimuli and task descriptions are made freely available for replication purposes.
**Notes:**

**Towards a Language Independent Detection of Dyslexia with a Web-Game**

Maria Rauschenberger, Ricardo Baeza-Yates, Universitat Pompeu Fabra; Luz Rello, Jeffrey P. Bigham, Carnegie Mellon University

Detecting dyslexia is important because early intervention is key to avoid the negative effects of dyslexia such as school failure. Most of the current approaches to detect dyslexia require expensive personnel (i.e. psychologists) or special hardware (i.e. eye trackers or MRI machines). Also, most of the methods can only be used when children are learning how to read but not before, necessarily delaying needed early intervention. In this paper, we present a study with 178 participants speaking different languages (Spanish, German, English, and Catalan) with and without dyslexia using a game build with language independent content: musical and visual elements. The study reveals eighth game measures with significant differences for children with and without dyslexia, which could be used in future work as a basis for language independent detection.
**Notes:**

**Computer Anxiety and Interaction: A Systematic Review**

Thiago Donizetti dos Santos, Federal University of ABC; Vagner Figueredo de Santana, IBM Research

With the increasing use of technology in everyday life, one would expect that the use of computers would be comfortable and straightforward for everyone. However, some people still feel intimidated when using computers.
Those people face multiple levels of anxiety and, for high levels, demonstrate what is called Computer Anxiety. People with Computer Anxiety (PwCA) face problems when using computers/technology at home, in the workplace, or for study purposes, which might result in multiple forms of barriers.
This work contributes with a systematic review, summarizing the main approaches related to Computer Anxiety and the understanding of the contexts of use involving PwCA.
The main results are that Computer Anxiety Rating Scale (CARS) is the most popular scale for measuring Computer Anxiety, Computer Self-Efficacy has a negative strong relationship with Computer Anxiety, experience in using computers reduce Computer Anxiety, PwCA tend to take more time to complete tasks, and

that higher education levels are related with lower levels of Computer Anxiety. The results obtained are valuable for researchers working on identifying and removing barriers in systems aiming at the population of older adults, given that they are greatly impacted by Computer Anxiety in the context of technology adoption.

**Notes:**

## Automatic Natural Language Generation Applied to Alternative and Augmentative Communication for Online Video Content Services using SimpleNLG for Spanish

Silvia García-Méndez, Milagros Fernández-Gavilanes, Enrique Costa-Montenegro, Jonathan Juncal-Martínez, Francisco Javier González-Castaño, GTI Research Group, atlanTTic

We present our work to build the Spanish version of SimpleNLG, the Natural Language Generation library, by adapting the existing free version of the library and creating new code to satisfy the linguistic requirements of Spanish. Not only have we developed a Spanish version of SimpleNLG, but also we have achieved a library that only needs the main words as input and it is able to conduct the generation process on its own, taking care of syntax structures and morphology inflections, among other linguistic considerations. The adaptation of the library uses aLexiS, a complete and reliable lexicon with morphology that we created. On the other hand, the enhanced version of SimpleNLG uses Elsa: the Augmentative Spanish Lexicon created from the pictogram domain, containing not only morphological data (as aLexiS) but also syntactic and semantic information needed to conduct the generation process automatically. Both the adaptation of SimpleNLG to Spanish and its enhanced version may be useful integrated in several applications as well as web applications, bringing them natural language generation functionalities. We provide a use case of the system focused on Augmentative and Alternative Communication and online video content services.

**Notes:**

## Artificial Intelligence for Web Accessibility - Conformance Evaluation as a Way Forward?

 Shadi Abou-Zahra, Judy Brewer, Michael Cooper, W3C Web Accessibility Initiative (WAI)

The term "artificial intelligence" is a buzzword today and is heavily used to market products, services, research, conferences, and more. It is scientifically disputed which types of products and services do actually qualify as "artificial intelligence" versus simply advanced computer technologies mimicking aspects of natural intelligence.

Yet it is undisputed that, despite often inflationary use of the term, there are mainstream products and services today that for decades were only thought to be science fiction. They range from industrial automation, to self-driving cars, robotics,

and consumer electronics for smart homes, workspaces, education, and many more contexts.

Several technological advances enable what is commonly referred to as "artificial intelligence". It includes connected computers and the Internet of Things (IoT), open and big data, low cost computing and storage, and many more. Yet regardless of the definition of the term artificial intelligence, technological advancements in this area provide immense potential, especially for people with disabilities.

In this paper we explore some of these potential in the context of web accessibility. We review some existing products and services, and their support for web accessibility. We propose accessibility conformance evaluation as one potential way forward, to accelerate the uptake of artificial intelligence to improve web accessibility.

**Notes:**

# Session 10:  Evaluation and Testing

**Automatic Role Detection of Visual Elements of Web Pages for Automatic Accessibility Evaluation**

Carlos Duarte, Ana Salvado, Luis Carrico, LASIGE, Faculdade de Ciências da Universidade de Lisboa; M Elgin Akpinar, Yeliz Yesilada, Middle East Technical University

Understanding what role a visual element plays in a web page can have a significant impact in the accessibility of that page. From an accessibility conformance testing perspective, several WCAG techniques require role identification of some visual elements during the testing process. This has prevented automatic accessibility evaluation tools from processing these techniques. A technique for automatic role detection of visual elements of web pages was recently developed as a complement to a web page segmentation process. This paper explores this role identification technique in the context of automatic web accessibility evaluation. The technique is integrated with an automated evaluation tool, and demonstrated to successfully evaluate some WCAG techniques that rely on the identification of visual elements, in particular menu and list elements.

**Notes:**

## Semantic Content Analysis Supporting Web Accessibility Evaluation

Carlos Duarte, Ines Matos, Luis Carrico, LASIGE, Faculdade de Ciências da Universidade de Lisboa

Despite its many advantages, automated web accessibility evaluation's main limitation is still its inability to assess rules and techniques that require a semantic understanding of the web content. Today, machine learning solutions are available that can interpret different media content with a reasonable degree of confidence. These solutions have an untapped potential to increase the accessibility of web pages. This potential extends to the evaluation of web pages also. This paper proposes an algorithm to automatically rate the similarity between a content and its textual description in a web accessibility evaluation context. The validity of the algorithm is demonstrated by comparing its ratings of descriptions of images obtained from their alt texts with human ratings of the same descriptions.

**Notes:**

## Web Accessibility Evaluation in a Crowdsourcing-Based System with Expertise-Based Decision Strategy

Shuyi Song, Bu Jiajun, Ye Wang, Zhi Yu, Andreas Artmeier, Can Wang, Zhejiang University; Lianjun Dai, China Disabled Persons' Federation Information Center

The rising awareness of accessibility increases the demand for Web accessibility evaluation projects to verify the implementation of Web accessibility guidelines and identify accessibility barriers in websites. However, the complexity of accessibility evaluation tasks and the lack of experts limits their scope and reduces their significance. Due to this complexity, they could not directly rely on a technique called crowdsourcing, which made great contributions in many fields by dividing a problem into many tedious micro-tasks and solving tasks in parallel. Addressing this issue, we develop a new crowdsourcing-based Web accessibility evaluation system with two novel decision strategies, golden set strategy and time-based golden set strategy. These strategies enable the generation of task results with high accuracy synthesized from micro-tasks solved by workers with heterogeneous expertise. An accessibility evaluation of 98 websites by 55 workers with varying experience verifies that our system can complete the evaluation in half the time with a 7.21% improvement on accuracy than the current approach.

**Notes:**

**Reliability Aware Web Accessibility Experience Metric**

Shuyi Song, Jiajun Bu, Chengchao Shen, Andreas Artmeier, Zhi Yu, Zhejiang University; Qin Zhou, China Disabled Persons' Federation Information Center

Web accessibility metrics measure the accessibility levels of websites, especially for people with disabilities. Although many metrics with different motivations have been proposed in recent years, current metrics are limited in their applicability when considering user experience. In this study, we propose Reliability Aware Web Accessibility Experience Metric (RA-WAEM), a novel Web accessibility metric which considers the user experience of people with disabilities by their provided pairwise comparisons of user experience between different websites and their heterogeneous reliability in objectively accessing the severity of accessibility barriers. Since determining the reliability of users is difficult and time-consuming, we develop an optimization algorithm based on Expectation Maximization to derive the parameters of RA-WAEM. Furthermore, we present a complete Web Accessibility evaluation framework, which we facilitate to conduct an extensive accessibility study on 46 websites with 323,098 Web pages and collect the user experience of 122 people on these websites. An evaluation on this dataset shows that RA-WAEM outperforms state of the art Web accessibility metrics in reflecting the user experience of people with disabilities.

**Notes:**

# Session 11: Doctoral Consortium Presentations - 2 of 2

**Arabic Accessibility Guidelines – Understanding and Use by Web Developers in Kuwait**
Muhammad Saleem, Edith Cowan University, Western Australia

The aim of this research is to develop and implement Arabic accessibility resources for developers, web content managers and designers. The Arabic guidelines will not only assist Arabian developers and designers for a deep understanding of

accessibility features, but also to apply these criteria on their Arabic websites in order to make them accessible to everyone including people with disabilities. The Arabic web accessibility guidelines will be designed to be reachable to all developers and designers in the Middle East including Kuwait.

## Using Ontologies as a Foundation for Web Accessibility Tools

Jens Pelzetter, University of Bremen, Germany

Creating web sites has become quite a complex task. One of most important aspects of a modern web site is accessibility. However, despite extensive standards many web sites have accessibility issues. This paper presents a new approach for creating tools to improve the accessibility of web sites using ontologies.

**Notes:**

# Session 12: Assistive Technology

## Exploring Aural Navigation by Screenless Access

Mikaylah Gross, Joe Dara, Christopher Meyer, Davide Bolchin, IU School of Informatics and Computing – Indianapolis

When the Blind and Visually Impaired (BVI) navigate the mobile web, they have to hold a phone in their hands at all times. Such continuous, two-handed interaction on a small screen hampers the user's ability to keep hands free to control aiding devices (e.g., cane) or touch objects nearby, especially on-the-go. In this paper, we introduce screenless access: a browsing approach that enables BVI to interact touch-free with aural navigation architectures using one-handed, in-air gestures recognized by an off-the-shelf armband. In a study with ten BVI participants, we observed fast learnability of the gestures, good aural navigation performance, user's conceptual fit with a screen-free paradigm, and low levels of cognitive load. Our findings uncovered distinct navigation styles that participants used when approaching screenless browsing and a range of unprompted adaptations of touch-free gestures and arm-body postures that were effectively enacted to appropriate the technology. User feedback revealed insights into the potential and limitations of screenless navigation to support convenience in traveling, work contexts and

privacy-preserving scenarios, as well as concerns for gestures that may become socially conspicuous.

**Notes:**


## Multi-view Mouth Renderization for Assisting Lip-reading

Andrea Britto Mattos, Dario Augusto Borges Oliveira, IBM Research

Previous work demonstrated that people who rely on lip-reading often prefer to have a frontal view of their interlocutor, but sometimes a profile view may display certain lip gestures more noticeably. This work refers to an assistive tool that receives an unconstrained video of a speaker, captured at an arbitrary view, and not only locates the mouth region but also displays augmented versions of the lips in the frontal and profile views. This is made using a deep Generative Adversarial Network (GAN) trained on several pairs of images. In the training set, each pair contains a mouth picture taken at a random angle and the corresponding picture (i.e., relative to the same mouth shape, person, and lighting condition) taken at the frontal view. In the test phase, the network is able to receive an unseen mouth image taken at an arbitrary view and map it to the frontal position -- the profile views are rendered accordingly. Because building a large-scale pairwise dataset is time consuming, we use realistic synthetic 3D models for training, and videos of real subjects as input for testing. Our approach is speaker-independent, language-independent and our results demonstrate that the GAN is able to produce visually compelling results that may assist people with hearing impairment.

**Notes:**

## Accessify: An ML Powered Application to Automatically Provide Image Descriptions on Website

Shivam Singh, Anurag Bhandari, Nishith Parak, Accenture

Web Accessibility is one of the major concerns for rapidly growing internet community. Accessing online content is crucial for many people as they engage in variety of tasks every day. The content can be of any form like audio, video, images and text. A major portion of website screen generally contains images and there are set standards for providing information about these images while creating the image component. Yet, most of the website available online do not strictly follow the accessibility guidelines and as a result, either the website contains no description of the image or the description provided is not sufficient enough to convey the meaning to visually impaired people who use screen readers for

accessing the web content. In this paper, we propose a solution by providing alternate image descriptions to all images on any website with help of Machine Learning in a complete unobtrusive environment. The application does not require any setup and can be used on static as well as dynamic websites.

**Notes:**

# Session 13: Motor Impairments

**Vocal Programming for People with Upper-Body Motor Impairments**

Lucas Rosenblatt, Brown University; Patrick Carrington, Jeffrey Bigham, Carnegie Mellon University;Kotaro Hara, Singapore Management University

Programming heavily relies on entering text using traditional QWERTY keyboards, which poses challenges for people with limited upper-body movement. Developing tools using a publicly available speech recognition API could provide a basis for keyboard free programming. In this paper, we describe our efforts in design, development, and evaluation of a voice-based IDE to support people with limited dexterity. We report on a formative Wizard of Oz (WOz) based design process to gain an understanding of how people would use and what they expect from a speech-based programming environment. Informed by the findings from the WOz, we developed VocalIDE, a prototype speech-based IDE with features such as Context Color Editing that facilitates vocal programming. Finally, we evaluate the utility of VocalIDE with 8 participants who have upper limb motor impairments. The study showed that VocalIDE significantly improves the participants' ability to make navigational edits and select text while programming.

**Notes:**

**Designing an Adaptive Web Navigation Interface for Users with Variable Pointing Performance**
Aqueasha Martin-Hammond, Purdue University Indianapolis; Foad Hamidi, Tajas Bhalerao, Catherine Hornback, Amy Hurst, University of Maryland, Baltimore County; Abdullah Ali, University of Washington; Casey Means, Rhodes College

Many online services and products require users to point and interact with user interface elements. For individuals who experience variable pointing ability due to physical impairments, environmental issues or age, using an input device (e.g., a computer mouse) to select elements on a website can be difficult. Adaptive user interfaces dynamically change their functionality in response to user behavior. They can support individuals with variable pointing abilities by 1) adapting dynamically to make element selection easier when a user is experiencing pointing difficulties, and 2) informing users about these pointing errors. While adaptive interfaces are increasingly prevalent on the Web, little is known about the preferences and expectations of users with variable pointing abilities and how to design systems that dynamically support them given these preferences.

   We conducted an investigation with 27 individuals who intermittently experience pointing problems to inform the design of an adaptive interface for web navigation. We used a functional high-fidelity prototype as a probe to gather information about user preferences and expectations. Our participants expected the system to recognize and integrate their preferences for how pointing tasks were carried out, preferred to receive information about system functionality and wanted to be in control of the interaction. We used findings from the study to inform the design of an adaptive Web navigation interface, PINATA, that tracks user pointing performance over time and provides dynamic notifications and assistance tailored to their specifications. Our work contributes to a better understanding of users' preferences and expectations of the design of an adaptive pointing system.

**Notes:**

**Collaborative Accessibility Assessments by Senior Citizens Using Smartphone Application ReAcTS (Real-world Accessibility Transaction System)**
Takahiro Miura, Ken-ichiro Yabu, Institute of Gerontology (IOG), The University of Tokyo

Rapid improvements in real-world accessibility conditions have enabled greater mobility of people with disabilities as well as senior citizens.However, while the accessibility infor- mation of downtown areas and sightseeing locations is fre- quently updated, the most recent information on accessibility conditions in areas such as suburbs is difficult to obtain quickly because of infrequent updates of this type of information along with local information upgrades. On the other hand, healthy seniors aged over 65 years are known to engage in volunteer activities in developed countries with a high population of the elderly. In this regard, collaborative work on the accessibility assessments of places unexplored by these senior citizens can enable not only the efficient data collection on local areas but

also lead to increase in their awareness and motivation to participate in social activities. In this study, we propose an accessibility-sharing application for volunteers including se- niors and youngsters along with a scheme to efficiently record real-world conditions. In particular, we develop a smartphone application named Real-world Accessibility Transaction Sys- tem (ReAcTS), and we conduct events to share accessibility information in cooperation with volunteer groups mainly composed of senior citizens.

**Notes:**

# Awards and Closing

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