

ISTAS2013 

2013 IEEE International Symposium  
on Technology and Society

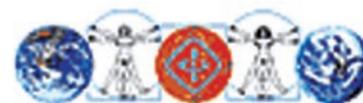
# Social Implications of Wearable Computers and Augmented Reality in Everyday Life

27-29 June 2013

University of Toronto | Ontario, Canada



PROGRAMME  
& ABSTRACTS



IEEE Society on  
Social Implications  
of Technology



UNIVERSITY OF  
TORONTO

UNIVERSITY OF  
WOLLONGONG



Edited by

**Katina Michael**



IFMBE



**ISTAS 2013**

*2013 IEEE International Symposium on*  
**Technology and Society (ISTAS)**

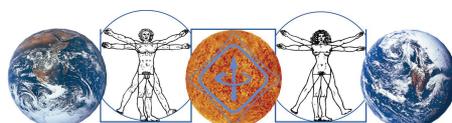
---

*Social Implications of Wearable Computing and  
Augmented Reality in Everyday Life*

27 – 29 June 2013  
University of Toronto,  
Toronto, Canada

**PROGRAMME & ABSTRACTS**

*Edited by*  
**Katina Michael**  
*University of Wollongong, Australia*



*IEEE Society on Social Implications  
of Technology*



UNIVERSITY OF  
**TORONTO**

UNIVERSITY OF  
**WOLLONGONG**  
AUSTRALIA



**IFMBE**



*Published by*

**ISTAS 2013 Program Committee**

*University of Wollongong*

*Wollongong NSW 2522*

*Australia*

Copyright © 2013 ISTAS Program Committee.  
All rights reserved.

Personal use of this material is permitted. However, permission to reprint/republish this material for advertising or promotional purposes or for creating new collective works for resale or redistribution to servers or lists, or to reuse any copyrighted component of this work in other works must be obtained from the Publisher.

ISBN: 978-1-4799-0929-2 [Compliant PDF Files]  
IEEE Catalog Number: CFP13SIT-ART



*Design, Typeset & Printed by Research Publishing Services, Singapore.*  
E-mail: [enquiries@rpsonline.com.sg](mailto:enquiries@rpsonline.com.sg)

## Brief Contents

### Welcome Message

The General Chair	Info-5
The Organising Committee Chair	Info-6
The Program Committee Chair	Info-7
The IEEE SSIT President	Info-10
The Publicity Chairs	Info-11
The Exhibitor/Patron Chair	Info-12

Organising Committee	Info-13
Technical Program Committee	Info-14
International Reviewers	Info-17
Volunteers	Info-21
Conference General Information	Info-23
Conference Venue and Location	Info-25
Conference Activities	Info-27

### Keynote Speeches

Early in the 21st Century, Intelligence will Underlie Everything of Value by <i>Ray Kurzweil</i>	1
The Society of Mind by <i>Marvin Minsky</i>	2
Veillance and Reciprocal Transparency: Surveillance versus Sousveillance, AR Glass, Lifelogging, and Wearable Computing by <i>Steve Mann</i>	3
The Experience and Joy of Becoming Immortal by <i>Gordon Bell</i>	4
Light: The Essence of Civilization by <i>David Brin</i>	5

### Invited Speeches

Mobile Music Touch: Passive Haptic Learning and Rehabilitation by <i>Thad Starner</i>	6
Privacy by Design and Wearable Computing by <i>Ann Cavoukian</i>	7
Beyond Sunglasses and Spray Paint: A Taxonomy of Surveillance Countermeasures by <i>Colonel Lisa A. Shay</i>	9
Ready to Wear (or Not): Examining the Rhetorical Impact of Proposed Wearable Devices by <i>Isabel Pedersen</i>	10
Lifelog Semantics from Wearable Computing by <i>Cathal Gurrin</i>	11
Wearable Computing and Security Implications by <i>Monique Morrow</i>	12
Sociocultural Conventions, Sensitiveness and Learning in the (So-called) Smart World by <i>Teemu Leinonen</i>	13
“You are Your Data”: Digital Self-Tracking and Algorithmic Subjectivity by <i>Natasha Dow Schull</i>	14
Formal Models of Social Processes: Towards a New Science of Institutions by <i>Jeremy Pitt</i>	15
Connecting Memory Extensions to Internal Memory by <i>Jean-Gabriel Ganascia</i>	16
Wearable Monitors on Babies: Big Data Saving Little People by <i>Carolyn McGregor</i>	17
Bio-Inspired Solutions for Intelligent Android Perception and Control by <i>Emil M. Petriu</i>	18
The 3 Laws of Augmented Reality Design: How to Design Augmented Reality Applications that Add Value and Delight Users by <i>Ori Inbar</i>	19
Autonomous Systems for Smarties by <i>Nikola Serbedzija</i>	20

## Brief Contents

Electronic Textile Interfaces by <i>Clint Zeagler</i>	21
The Future is Un-Real by <i>Rob Manson</i>	22
Augmented Reality and the Emergence of 'Point-of-Eye' in Visual Culture by <i>Helen Papagiannis</i>	23
<b>Plenary Speeches</b>	
Drones for Good by <i>Matthew Schroyer</i>	25
If Technology is a Dissipative Structure, Bring It On Deserves a Closer Look by <i>Jeff Robbins</i>	26
The Design of a Lifelogging Camera by <i>Martin Kallstrom</i>	27
Governmental and Private Video Surveillance by <i>Susan N. Herman</i>	28
The Need for User Centered Wearable Devices for the Blind by <i>Daniel Kish</i>	30
Brain Computer Interfaces: Ethical and Policy Considerations by <i>Ellen M. McGee</i>	32
Moving Surveillance Techniques to Sousveillance: Towards Equiveillance using Wearable Computing by <i>Corey Manders</i>	33
<b>Panels Session</b>	
<i>Mobile Health Panel</i>	
Healthcare & Public Health: Perspectives on Wearable Computing, Augmented Reality and the Veillances by <i>Luis Kun</i>	34
Ambient Assisted Living Technologies and Their Social Implications: A Perspective from Europe by <i>José L. Monteagudo</i>	36
Will Wearable Computers and Augmented Reality Enable Us to Lead Healthy and Happy Lives? by <i>Alejandro (Alex) R. Jadad</i>	38
Wireless Platforms for the Hemodynamic Monitoring of the Elderly Patient by <i>Ricardo L. Armentano</i>	39
<i>Keynote Panel</i>	
The Society of Intelligent Veillance by <i>Marvin Minsky, Ray Kurzweil, Steve Mann</i>	41
Sponsors	42
Patrons	43
Exhibitors	46
<b>Technical Program</b>	
Day 1 — June 27, 2013 (Thursday)	49
Day 2 — June 28, 2013 (Friday)	51
Day 3 — June 29, 2013 (Saturday)	55
<b>Abstracts</b>	
Friday, 28 June 2013	61
Saturday, 29 June 2013	83
Press Releases	96
<b>7th Forum on the Social Implications of National Security</b>	
Pros and Cons in Policing, Security & Everyday Life	99
UAVs: Pros vs Cons Symposium   Program	100
Author Index	101

## Welcome Message from The General Chair



My grandfather taught me to weld when I was 4 years old, so early in my life I became aware of what the world looked like when “*Seen Through the Glass, Darkly*”. Darkglass (the welder’s glass) diminishes reality. Diminished Reality is the logical opposite of Augmented Reality.

A childhood vision of mine was to use television cameras and miniature displays, with contrast adjustment, to be able to see-in-the-dark while still being able to clearly see the electric welding arc without hurting my eyes.

In my childhood, back in the 1970s, as an amateur scientist and amateur inventor, my experiments in contrast reduction became experiments in a general-purpose wearable computer system, using hybrid analog and digital computing equipment. I also began to add overlays of text and graphics on top of my visual reality.

I started to think of the “Digital Eye Glass” as something to be used to help people see better in everyday life, not just while welding.

Around that time others started putting electronics in glass, e.g. 3M’s Speedglas/Speedglass was introduced in 1981.

Wearing “Glass” in everyday life back then scared people – first because it looked strange – which later was to become something people thought was “cool” rather than strange – but ultimately because of the sensors/camera(s).

As I refined the Glass into a sleek and slender eyeglass form-factor in the 1980s and early 1990s the appearance became acceptable to the general public, but I began to find myself harassed by police and security guards afraid that the “Glass Eye” might be recording them.

How ironic it was that the very people who were installing and monitoring surveillance cameras – watching us – were the people most afraid of being watched!

Glass (Digital Eye Glass, GlassEye, Mannglas, Speedglas, etc.) became a metaphor for a fragile and transparent society. We can learn a lot from a society by how readily its police accept Glass – i.e. how readily the society accepts reciprocal transparency and the mutual vulnerability we share when the “Glass Eye” becomes as commonplace as the surveillance cameras of the authorities.

This year’s ISTAS theme, therefore, is not Surveillance (Watching from above, in a hierarchy, e.g. police watching suspects) but, rather, Veillance (watching in a politically neutral sense).

Please join us as we explore this half-silvered world of two-way transparency.

**Steve Mann**  
University of Toronto  
General Chair – ISTAS 2013

## Welcome Message from The Organising Committee Chair



With great pleasure I welcome you to an incredibly unique event that brings together an extraordinary array of great minds. In a world of augmented reality, mass veilance, data sharing and data mining, how do we design technology for humanity's benefit, and how do we understand the deeper technical, ethical and sociological underpinnings of massive changes in the engineering and scientific worlds that are occurring as we speak?

Toronto, one of the most multicultural cities on the planet, hosts the 2013 IEEE International Symposium on Technology and Society.

Welcome to the academic home of 10 Nobel Prize laureates, the birthplace of insulin, the origin of stem cell research and the first practical prototype of the electron microscope. The University of Toronto, one of the world's premier research institutions, is made richer by its scenic landscape and historic campus, and we hope you enjoy your stay.

**Ryan Janzen**

*Engineering Researcher + Composer*

*University of Toronto*

*Organizing Chair, IEEE ISTAS 2013*

## Welcome Message from The Program Committee Chair



It was in July 2012 that Steve Mann and I corresponded on the possibility of hosting a conference on wearable computing in Toronto, Canada. Steve had just returned home from a family holiday to France and publicly blogged about an unfortunate incident that had happened to him while away. On 17<sup>th</sup> July 2012 he posted: “Physical assault by McDonald’s for wearing Digital Eye Glass”. I could not be helped but to be reminded of that exchange during *Star Wars* between Luke Skywalker and the bartender:

LUKE: Do you really think we’re going to find a pilot here that’ll take us to Alderaan?

BEN: Well, most of the best freighter pilots can be found here. **Only watch your step. This place can be a little rough.**

LUKE: I’m ready for anything.

THREEPIO: Come along, Artoo.

INTERIOR: TATOOINE – MOS EISLEY – CANTINA.  
The young adventurer and his two mechanical servants follow Ben Kenobi into the smoke-filled cantina. The murky, moldy den is filled with a startling array of weird and exotic alien creatures and monsters at the long metallic bar. At first the sight is horrifying. One-eyed, thousand-eyed, slimy, furry, scaly, tentacled, and clawed creatures huddle over drinks. Ben moves to an empty spot at the bar near a group of repulsive but human scum. A huge, rough-looking Bartender stops Luke and the robots.

**BARTENDER: We don’t serve their kind here!**  
Luke still recovering from the shock of seeing so many outlandish creatures, doesn’t quite catch the bartender’s drift.

LUKE: What?

**BARTENDER: Your droids. They’ll have to wait outside. We don’t want them here.**  
Luke looks at old Ben, who is busy talking to one of the Galactic pirates. He notices several of the gruesome creatures along the bar are giving him a very unfriendly glare. Luke pats Threepio on the shoulder.

LUKE: Listen, why don’t you wait out by the speeder. We don’t want any trouble.

THREEPIO: I heartily agree with you sir.

We both knew the timing was right for such an event that was not just a technical engineering or applied orientation on the theme of smart worlds, but an event that would grapple with the dichotomies of transparency and human rights, privacy and security, and of course technology and society more broadly. If I could credit Mann for one thing, beyond his savvy inclination toward innovation, it is that he has multiple dimensions to his thought, seeing the same problem through different lenses- not just eyetaps but the big picture view.

The basic premise for ISTAS13 was- if the numbers of people wearing cameras grew substantially by 2015 what would be the ensuing social implications? Rather than wait to answer that question in 2015, we decided to begin proactively with our intent, so as outcomes from the conference would be considered as viable feedback into the design process of these emerging devices that would be worn on the body much like a watch or arm band.

## *Welcome Message from The Program Committee Chair*

The opportunity to deliver the proposed conference under IEEE SSIT's annual conference, the IEEE Symposium on Technology and Society (ISTAS), was an opportunity we could not pass up, and after gaining approval from the board of governors of SSIT in October 2012, we went full steam ahead.

I don't know too many people who would bravely put an international conference of standing together within a 9 month timeframe but I was astounded by the passion of everyone I came into contact with- from Ryan Janzen our youthful and switched on Organising Chair, to Steve Mann our powerhouse engineer who seemed to be available all day and all night at times as General Chair, our absolutely dedicated dynamic duo Alexander Hayes and Susannah Sabine as publicity chairs and web developers/masters, to Russell Verbeeten who managed to seal some very important and outstanding patronage and exhibits for us to enjoy at the conference. I also cannot forget the amazing volunteerism of members of the EyeTap Laboratory, most of them students of Steve Mann. These young men and women are our future, and it has been refreshing to see firsthand their approaches to philosophy, deep thinking about society, and how they will contribute both great innovations and imagination to the tech sector. I also thank Doug Nix who was there at the vital beginning and organized all our sponsors and submitted IEEE paperwork, and former chair Rabiz Foda enthusiastic within IEEE Toronto Chapter, and Purav Patel our former treasurer who left us in excellent condition before some personal matters presided in priority. Thanks also to the patient staff at IEEE Conferences.

Of my program committee, I say especially a thank you. You never tired of my messaging to you, for additional reviews when they were needed, and in re-reviewing on occasion to ensure that the appropriate changes had been made. Despite that we have 80 or so papers on the program, 40 full papers were finally accepted, and another 40 abstract only papers through invitation, plenary or otherwise. We received over 110 submissions for the conference which was substantial given the timelines. To our ad-hoc reviewers, I thank you too- even when you could not offer substantial commentary you did provide us with feedback which in turn helped our authors submit stronger pieces of work.

Thank you to the keynotes of Steve Mann, Marvin Minsky, Ray Kurzweil, Gordon Bell, and David Brin. On occasion I have had to pinch myself to remind myself that such a line up was possible. To our top class invited and plenary speakers- (I): Thad Starner, Ann Cavoukian, Colonel Lisa Shay, Isabel Pedersen, Cathal Gurrin, Monique Morrow, Teemu Leinonen, Natasha Dow Schull, Jeremy Pitt, Jean-Gabriel Ganascia, Carolyn McGregor, Emil M. Petriu, Ori Inbar, Nikola Serbedzija, Clint Zeagler, Rob Manson, Helen Papagiannis, (P): Matthew Schroyer, Jeff Robbins, Martin Kallstrom, Susan Herman, Daniel Kish, Ellen M. McGee, Corey Manders, Leigh Blackall, and Pia Waugh... I am privileged to call you friends. You all share one amazing quality- of course your expertise goes without saying, but you all wanted to be a part of this debate from the instant I asked you to be a part of the event. I will also say openly to the academic community, that you paid your own way to get to ISTAS13, and that goodwill won't be forgotten especially during these economic times.

Our program represents diversity- on day 1 at Hart House we have a day dedicated to engineering; day 2 and 3 will be at the Bahen Centre respectively addressing topics to do with application development/design methods and the socio-legislative implications of wearables.

As an indication of the internationalization of this conference delegates and paper submissions have come from the following nation states: Australia, Canada, England, Finland, France, Germany, Ireland, Israel, Poland, Saudi Arabia, Singapore, South Africa, Spain, Sweden, United States of America, Uruguay. We also have representation from a full range of sectors including commercial, government, non-government organisations, and users. We appreciate the participation of the Privacy and Information Commissioner of Ontario, the American Civil Liberties Union, companies like EPSON, APX Labs, META, CISCO, Microsoft, ESRI, Memoto, Autographer, buildAR, Streamfolio, Augmate and Infinty Augmented Reality, Institute for Infocomm Research; as well as institutions and industry research and development units, such as the University of Wollongong, uberveillance.com, Optinvent, Singularity Weblog.

Our co-sponsors and technical sponsors also need to be acknowledged including: IEEE SSIT, IFMBE (International Federation of Medical and Biological Engineering), University of Wollongong, University of Toronto, PSES (Product Safety Engineering Society). The breadth and depth of the patrons and sponsors indicates the growing importance of such dialogue today. Our delegate list also welcomes participation from Sony,

## *Welcome Message from The Program Committee Chair*

Samsung, Qualcomm, Gartner, Verizon, Blackberry, Thalmic Labs, Ambient Ease, Telepresence Systems, OMG Life, Myplanet Digital, BMC Software, Smart Street Worlds, Illuminating Concepts, KIWI Wearables, LG Electronics. It is great to see this industry involvement and we hope we can really provide some substantial food for thought as we all contribute to technologies with ever-changing impacts on our life.

A note on the peer review process that was followed in this conference. Authors had the opportunity to either submit “abstract only” presentations, short papers of no more than 2,000 words or full papers of 5,000 words or more. Papers were sent to external reviewers and each paper received at least two blind reviews. Where there was a discrepancy in opinion an individual author may have received three or even four reviews. A list of reviewers can be found in this booklet. A note, that full papers were the only papers to undergo peer review. Abstracts and short papers were however vetted by an individual member from the program committee for technical accuracy.

What the general chair, organizing committee, and program committee can promise you all, is that this is just the beginning of the discussion on *VEILLANCE*. With Roger Clarke’s dataveillance conception, Steve Mann’s sousveillance conception, and MG Michael’s uberveillance conception, the stage is set for “watching”. All of these perspectives are vital and their historical contributions must reflect a new language of understanding, as technology far outstrips our current laws and value systems. Where to next? We hope you will join the discussion!

**Katina Michael**

*Associate Dean – International, University of Wollongong, NSW Australia*

*University of Wollongong*

*<http://ro.uow.edu.au/kmichael>*

*Technical Program Committee Chair – ISTAS 2013*

*TEDx: <http://www.youtube.com/watch?v=fnghvVR5Evc>*

## Welcome Message from The IEEE SSIT President



The Society on Social Implications of Technology (SSIT) of the Institute of Electrical and Electronics Engineers (IEEE) focuses on the social implications and ethical considerations of new and emerging technologies. SSIT publishes a quarterly journal, *IEEE Technology and Society Magazine*, sponsors periodic conferences, and has chapters and members around the world.

We are thrilled to present ISTAS'13 – Smart World. Wearable technology is changing the way we all interact with not only the world around us, but each other as well. Technology has always changed Society – and it's up to us to decide what we want that change to be. Over the next 3 days, we will have the opportunity to hear from brilliant speakers, discuss new technologies, and consider how they will impact society. Thank you for being part of this event.

**Laura Jacob**  
*IEEE SSIT President*

## Welcome Message from The Publicity Chairs



**Alexander Hayes**

From the outset, publicity for ISTAS13 utilised social media and key IEEE stakeholders to guarantee exposure and attract patronage, delegates and exhibitors to this important event. The role of Publicity Chair has been equally actioned by Alexander Hayes University of Wollongong and Susannah Sabine, IEEE SSIT both members of the Organising Committee.

Publicity for this event was made easy by the topical nature of the program, the range of emerging technologies covered and the quality of the presenters and Program Committee. This strength of material meant that the Publicity Chairs in conjunction with the Organising Committee chose to utilise existing personal and professional networks as well as existing media contacts to realise an efficient marketing campaign with multiple publicity sub-campaigns.



**Susannah Sabine**

The event website provided Publicity Chairs and other Organising Committee members the ability to highlight trends and emerging stories via the event blog with a transition to Google+ Communities widening the scope of interaction with presenters, delegates and the wider international audience. Numerous interviews with the General Chair, Program Chair and Publicity Chair, as well as University of Toronto and University of Wollongong press releases ensured that international engagement and connections with affiliated IEEE events broadened the events awareness base.

The diversity of the Program is testament to the esteem with which the Program Chair, Associate Professor Katina Michael is held within the international community providing many channels and communities with which to publicise the event. Volunteers contributed to local Toronto media coverage and the scope of publicity for the event has accelerated markedly in the last month of operations leading up to the event.

**Alexander Hayes**  
*Student Member, IEEE SSIT*  
*Publicity Chair ISTAS13*

**Susannah Sabine**  
*Affiliate Member, IEEE SSIT*  
*Publicity Co-Chair ISTAS13,*

## Welcome Message from The Exhibitor/Patron Chair



IEEE International Symposium on Technology and Society is bringing together top thinkers, researchers, entrepreneurs and business professionals who are engaged in the investigation, understanding and development of smart environments. These diverse endeavours surely share a common ground, and yet the conference promises insight through the elaboration of ideas by a multiplicity of backgrounds. As Patron and Exhibitor Chair, I am thrilled to welcome the great companies that are bringing their unique perspectives from the world of business and entrepreneurship; their support and presence are so valuable in enriching the atmosphere of the conference. Thank you!

IEEE ISTAS 2013 is a unique event at this moment in man kind's technological evolution. I look forward to sharing, learning and discovering with everyone in attendance.

**Russell Verbeeten**

*Internet Researcher + Product Developer  
Patron and Exhibitor Chair, IEEE ISTAS 2013*

## **Organising Committee**

**Steve Mann**

*ISTAS'13 General Chair  
University of Toronto, Canada*

**Ryan E. Janzen**

*Organizing Chair  
University of Toronto, Canada*

**Doug Nix**

*Sponsor Chair  
Compliance InSight Consulting, Kitchener  
Ontario, Canada*

**Russel Verbeeten**

*Patron Chair and Exhibit Chair  
University of Toronto, Canada*

**Alexander Hayes**

*Publicity Chair and Event Website Developer  
School of Information Systems & Technology  
University of Wollongong, Australia*

**Susannah Sabine**

*Co-Publicity Chair and Event Website Developer  
Member IEEE SSIT, Australian National Data Service  
Canberra, Australia*

## Technical Program Committee

### **Katina Michael**

*ISTAS'13 Program Chair*

*Associate Professor, University of Wollongong, NSW, Australia*

*IEEE Technology & Society Magazine, Editor-in-Chief (2012–2013), Senior member IEEE*

### **Roba Abbas**

*ISTAS13 Track Chair*

*Research Associate, University of Wollongong, Australia*

### **Rajit Gadh**

*Professor at the Henry Samueli School of Engineering and Applied Science at UCLA*

*Founding Director of the UCLA Smart Grid Energy Research Center or SMERC*

*Founder and Director of the Wireless Internet for Mobile Enterprise Consortium or WINMEC*

### **Eleni Kosta**

*Assistant Professor of Technology Regulation, Tilburg Institute for Law, Technology and Society (TILT),*

*Tilburg University, The Netherlands*

### **Luis Kun**

*Professor of National Security Affairs, Center for Hemispheric Defense Studies (CHDS)*

### **Gary T. Marx**

*Professor Emeritus, M.I.T.*

### **Daniel Nagel**

*Member, IT Law Department of BRP Renaud & Partner*

### **Narciso Cerpa**

*Associate Professor, Computer Science Department, Faculty of Engineering,*

*“Universidad de Talca”, Chile*

### **Douglas L. Baldwin**

### **Roger Clarke**

*Chair, Australian Privacy Foundation, Adjunct Professor, Australian National University*

### **Clive Harfield**

*Associate Investigator, Australian Research Council Centre for Excellence in Policing and Security*

*Visiting Fellow, College of Law and National Europe Centre, Australian National University 2007*

*Fulbright Fellow, Georgetown University Washington DC, 2001*

### **Christine Perakslis**

*Associate Professor, MBA Program, Johnson & Wales University, USA*

### **Herman T. Tavani**

*Professor Emeritus of Philosophy, Rivier University, Ph.D., Temple University*

## Technical Program Committee

### **Kenneth D. Pimple**

*Associate Scholar, Director of Teaching Research Ethics Programs, Poynter Center for the Study of Ethics and American Institutions, Indiana University Bloomington*

### **Michael Eldred**

*Ph.D. (Philosophy), National Academy of Science and Engineering*

### **Anas Aloudat**

*Assistant Professor of Information Systems & Technology, Department of Management Information Systems, Faculty of Business, University of Jordan, Amman, Jordan*

### **Kenneth R. Foster**

*Professor, Department of Bioengineering, University of Pennsylvania*

### **Rob Manson**

*Managing Director, MOBLabs*

### **Scott O'Brien**

*Co-founder, CMO of Explore Engage*

### **M. G. Michael**

*Honorary Associate Professor, School of Information Systems and Technology, University of Wollongong*

### **Jim Isaak**

*Southern New Hampshire University*

### **Vaibhav Garg**

*Post doc., Computer Science, Drexel University*

### **Jean-Gabrielle Ganascia**

*Professor of Computer Science, Paris VI University*

### **Emil M. Petriu**

*Professor and University Research Chair, School of Electrical Engineering and Computer Science, University of Ottawa, Ottawa, Ontario, Canada*

### **Xi Chen**

*Ph.D., Associate Professor, Nanjing University, Nanjing, Jiangsu, China  
IEEE Consumer Electronics Nanjing Chapter Chair*

### **Pete Wassel**

*Chief Executive Officer, Chairman of the Board, Augmate Corporation*

### **Katherine Albrecht**

*Founder and Director of CASPIAN Consumer Privacy,  
Co-Author of Spychips: How Major Corporations and Government Plan to Track Your Every Move with RFID,  
Host of the Daily, Nationally Syndicated Dr. Katherine Albrecht Radio Show*

### **Simon Bronnitt**

*Director – CEPS, Professor Bronnitt is the Director of CEPS – The Australian, Research Council (ARC)  
Centre of Excellence in Policing and Security.*

### **G. Q. Huang**

*Department of Industrial and Manufacturing Systems Engineering, The University of Hong Kong*

### **John Artz**

*Associate Professor, The George Washington University, Washington, DC, USA*

## Technical Program Committee

### **Marcus Wigan**

*Professorial Fellow, Principal, Oxford Systematics*

*Emeritus Professor, Transport and Information Systems, Edinburgh Napier University*

*Visiting Professor, Imperial College London*

*Partner GAMUT Faculty of Architecture Building and Planning, The University of Melbourne*

*Adjunct Professor, ICT Faculty, Swinburne University of Technology*

*Professorial Fellow Melbourne Sustainable Society Institute, The University of Melbourne, Victoria, Australia*

### **George Giaglis**

*Vice Rector (Finance and Development), Athens University of Economics and Business, Greece*

*Professor of Electronic Business, Department of Management Science and Technology, Athens*

*University of Economics and Business, Greece*

*Athens University, Athens, Greece*

### **Pascal Perez**

*Inaugural Professor of Infrastructure Modelling & Simulation SMART, Infrastructure Facility,*

*University of Wollongong, Australia*

### **Amal Graafstra**

*Founder of DangerousThings.com*

### **Nikola Serbedzija**

*Professor, Fraunhofer FIRST, Berlin, Germany*

### **Mark Gasson**

*Visiting Research Fellow, University of Reading*

### **Ulrike Gretzel**

*Associate Professor, Director, Laboratory for Intelligent Systems in Tourism*

*Institute for Innovation in Business and Social Research, University of Wollongong, Australia*

### **George Roussos**

*Reader In Pervasive Computing, Birkbeck College, University of London*

### **Juanita Fernando**

*Dr, Faculty of Medicine, Nursing & Health Sciences, School of Monash University*

### **Laurence F. Johnson**

*CEO, New Media Consortium*

### **Michael Kyobe**

*University of Cape Town, Cape Town, South Africa*

### **Axel Kupper**

*Telekom Innovation Laboratories, Deutsche Telekom AG & Technische Universität Berlin*

### **Avner Levin**

*Associate Professor, Ted Rogers School of Management, Chair of Law & Business Departments,*

*Ryerson University, Toronto, Canada*

### **Andrew Adams**

*Professor of Information Ethics, Meiji University, Tokyo, Japan*

*Deputy Director, Centre for Business Information Ethics, Meiji University, Japan*

*Chair, ACM SIGCAS*

*Visiting Professor, School of Systems Engineering, University of Reading, UK*

### **Joseph Savirimuthu**

*Liverpool Law School, University of Liverpool*

*Coordinator of Law, Autonomous Systems and Big Data Network Project*

## International Reviewers

### **Luis Kun**

*Professor of National Security Affairs  
Center for Hemispheric Defense Studies (CHDS)  
National Defence University*

### **Roba Abbas**

*ISTAS13 Track Chair, Research Associate  
University of Wollongong, Australia*

### **Thad Starner**

*Professor of Computing, Georgia Institute of Technology*

### **Rajit Gadh**

*Professor at the Henry Samueli School of Engineering and Applied Science at UCLA,  
Founding Director of the UCLA Smart Grid Energy Research Center (SMERC),  
Founder and Director of the Wireless Internet for Mobile Enterprise Consortium or WINMEC*

### **Eleni Kosta**

*Assistant Professor of Technology Regulation, Tilburg Institute for Law,  
Technology and Society (TILT) – Tilburg University*

### **George Giaglis**

*Professor of Economics and Business  
ISTLab Wireless Research Center, Athens University*

### **Efpraxia D. Zamani**

*ISTLab Wireless Research Center, Athens University*

### **Jonas Unger**

*Ph.D. Jonas Unger, VITA, Linköping University  
<http://webstaff.itn.liu.se/~jonun/web/Home.php>*

### **Gary T. Marx**

*Professor Emeritus, M.I.T.*

### **Daniel Nagel**

*Member, IT Law Department of BRP Renaud & Partner*

### **Narciso Cerpa**

*Associate Professor, Computer Science Department, Faculty of Engineering, "Universidad de Talca", Chile*

### **Rafal Mantiuk**

*Bangor University  
Research Institute of Visual Computing  
<http://pages.bangor.ac.uk/~eesa0c/>*

### **Douglas L. Baldwin**

*Founded the Special Needs Vision Clinic*

## International Reviewers

### **Roger Clarke**

*Chair, Australian Privacy Foundation, Adjunct Professor, Australian National University*

### **Kenneth D. Pimple**

*Associate Scholar, Director of Teaching Research Ethics Programs,  
Poynter Center for the Study of Ethics and American Institutions, Indiana University Bloomington*

### **Michael Eldred**

*Phenomenological Ethicist, National Academy of Science and Engineering, Berlin*

### **Anas Aloudat**

*Assistant Professor of Information Systems & Technology, Department of Management Information Systems,  
Faculty of Business, University of Jordan, Amman, Jordan*

### **Kenneth R. Foster**

*Professor, Department of Bioengineering, University of Pennsylvania*

### **Geoff Huston**

<http://www.apnic.net/publications/research-and-insights/geoff-huston>

### **Rob Manson**

*Managing Director, MOBLabs  
<http://www.buildar.com>*

### **Scott O'Brien**

*Co-founder, CMO of Explore Engage*

### **Vaibhav Garg**

*Post doc., Computer Science, Drexel University*

### **Jean-Gabrielle Ganascia**

*Professor of Computer Science, Paris VI University.*

### **Emil M. Petriu**

*Professor and University Research Chair, School of Electrical Engineering and Computer Science,  
University of Ottawa, Ottawa, Ontario, Canada*

### **Xi Chen**

*Ph.D., Associate Professor, Nanjing University, Nanjing, Jiangsu, China,  
IEEE Consumer Electronics Nanjing Chapter Chair*

### **Katherine Albrecht**

*Founder and Director of CASPIAN Consumer Privacy*

### **Simon Bronnitt**

*Director – CEPS, Professor Bronnitt is the Director of CEPS – the Australian Research Council (ARC)  
Centre of Excellence in Policing and Security*

### **G. Q. Huang**

*Department of Industrial and Manufacturing Systems Engineering, The University of Hong Kong*

### **John Artz**

*Associate Professor, The George Washington University, Washington, DC, USA*

## International Reviewers

### **Marc Wigan**

*Professorial Fellow, Principal, Oxford Systematics, Emeritus Professor, Transport and Information Systems, Edinburgh Napier University, Visiting Professor, Imperial College London, Partner GAMUT Faculty of Architecture Building and Planning, The University of Melbourne, Adjunct Professor, ICT Faculty, Swinburne University of Technology, Professorial Fellow Melbourne Sustainable Society Institute, The University of Melbourne, Victoria, Australia*

### **George Giaglis**

*Vice Rector (Finance and Development), Athens University of Economics and Business, Greece, Professor of Electronic Business, Department of Management Science and Technology, Athens University of Economics and Business, Greece, Athens University, Athens, Greece*

### **Geoff Huston**

*Chief Scientist at APNIC*  
<http://www.apnic.net/publications/research-and-insights/geoff-huston>

### **Pascal Perez**

*Inaugural Professor of Infrastructure Modelling & Simulation, SMART Infrastructure Facility, University of Wollongong, Australia*

### **Carson Reynolds**

*Assistant Professor, Department of Creative Informatics, University of Tokyo*

### **Amal Grafstra**

*RFID Toys Author*

### **Nikola Serbedzija**

*Fraunhofer FOKUS*

### **Mark Gasson**

*Visiting Research Fellow, University of Reading*

### **Tom Goldfinch**

*Faculty of Engineering, University of Wollongong*

### **Ulrike Gretzel**

*Associate Professor, Director, Laboratory for Intelligent Systems in Tourism, Institute for Innovation in Business and Social Research, University of Wollongong*

### **Stefan Gustavson**

*Linköping Universitat, Sweden*  
<http://webstaff.itn.liu.se/~stegu76/>

### **George Roussos**

*Reader in Pervasive Computing, Birkbeck College, University of London*

### **Juanita Fernando**

*Faculty of Medicine, Nursing and Health Sciences, Monash University*

### **Michael Kyobe**

*Deputy Dean Responsible for Research, Commerce Faculty, University of Cape Town, Cape Town, South Africa*

### **Andrew Adams**

*Professor of Information Ethics*  
*Meiji University, Tokyo, Japan*

## *International Reviewers*

**Tamara Peyton**

*Ph.D. Student, Pennsylvania State University*

**H. Patricia McKenna**

*Founder and President of AmbientEase*

**Joseph Savirimuthu**

*Liverpool Law School, University of Liverpool*

**Anol Bhattacharjee**

*Professor of Information Systems*

*Dean's Fellow, University of South Florida*

**Dee Weikle**

*Assistant Professor, Eastern Mennonite University*

## Volunteers

### **Daniel Chen**

*M.Sc. Computer Science*

Daniel is a user experience designer based in Toronto with several years experience designing simple and elegant user experiences for companies in various sectors including banking (the Canadian Imperial Bank of Commerce, CIBC), advertising (BBDO Proximity, Leo Burnett), social media marketing (Social Dynamics Interactive) and e-commerce (Novator).

Daniel graduated from Engineering Science (Computer Engineering Option) at the University of Toronto, where he regularly worked at the EyeTap Personal Imaging (ePI) Lab under Prof. Steve Mann. After finishing his undergrad, Daniel worked in Korea for Samsung Electronics at the Samsung Advanced Institute of Technology.

Daniel finished his Master's degree in Computer Science at Queen's University under the supervision of Prof. Roel Vertegaal at the Human Media Lab.

### **M. S. Ali**

*Founding Patron Chair*

*Ph.D., Industrial Engineering*

Ali completed his Ph.D. at the University of Toronto (Canada) in 2012 in the area of information retrieval. His research investigated the application of classical IR measures to the evaluation of modern search systems where information is often contained within human-generated, non-linear data structures such as social graphs, blogs, and XML repositories.

His research was awarded the Best Interdisciplinary Paper Runner-up at CIKM 2008. He was the recipient of a Bell University Labs scholarship in 2009. He currently works as a data scientist at Keyora, Inc. in Oakville, Ontario.

### **Michael Chai**

*IEEE Member, Vice Chair Professional Development*

*Co-Chair, International Conference for Upcoming Engineers (ICUE 2013)*

Institute of Electrical and Electronics Engineers University of Toronto Student Branch.

Michael is an Engineering student majoring in Energy Systems at the University of Toronto (UofT). He is currently working as an Electrical Engineering Intern at Toronto Hydro. He is actively involved on campus with various student clubs, especially with the IEEE University of Toronto Student Branch (IEEE UofT).

Michael believes that every engineer deserves a golden opportunity to showcase their brilliant ideas. Under his co-leadership, IEEE UofT is hosting ICUE 2013, one of Canada's largest Undergraduate Conference, on May 6th 2013. ICUE 2013 features a Design Competition and Presentations from top Entrepreneurs in Canada. ([ieeetoronto.edu/icue2013](http://ieeetoronto.edu/icue2013))

Michael's goal is to building an active IEEE community at the Undergraduate Level to better promote Personal, Professional and Leadership Development for all students.

**Chirag Variawa**

*Founding Industry Liaison Chair*

Chirag Variawa is an accelerated-stream Ph.D. Candidate in the Department of Mechanical and Industrial Engineering at the University of Toronto.

He earned his BAsC in Materials Science Engineering in 2009 from the same institution. Chirag is a well-published author of over 12 scholarly articles and a speaker for an invited talk in Beijing, China.

He is the first Graduate Student member of the University of Toronto Governing Council elected from Engineering. His multi-disciplinary research uses principles from artificial intelligence, computational linguistics, higher education and aspects of neuroscience to investigate the design of engineering learning environments.

**Alex Chen**

*University of Toronto*

Alex Chen recently finished his undergraduate degree in Computer Engineering from the University of Toronto. His research focus is on wearable computers and machine learning. He will start his masters degree with Professor Steve Mann in the following academic year.

**Valmiki Rampersad**

*University of Toronto*

Valmiki Rampersad graduated from the University of Toronto with a BAsC. in Computer Engineering.

He is currently pursuing his MASc. under the supervision of Professor Steve Mann.

Valmiki's areas of research are in, wearable computing and, signal and image processing.

**Jason Huang**

*M.ASc Candidate, University of Toronto*

Jason is currently studying in the University of Toronto as a M.ASc candidate, under the supervision of Professor Steve Mann.

Research of Interest: High Dynamic Range (HDR) image processing running on GPGPU.

**Wallace Yang**

*Floor Manager – ISTAS13*

Wallace Yang studied Electrical Engineering at the University of Toronto.

He is currently developing image-processing algorithms to analyze videos of the heart at the Heart and Stroke/Richard Lewar Center of Excellence.

## Conference General Information

### Theme – “Smartworld”

#### Living in a Smart World – People as Sensors

ISTAS'13 presenters and panellists will address the implications of living in **smartworlds** – smart grids, smart infrastructure, smart homes, smart cars, smart fridges, and with the advent of body-worn sensors like cameras, smart people.

The environment around us is becoming “smarter”. Soon there will be a camera in nearly every streetlight enabling better occupancy sensing, while many appliances and everyday products such as automatic flush toilets, and faucets are starting to use more sophisticated camera-based computer-vision technologies. **Meanwhile, what happens when people increasingly wear these same sensors?**

A smart world where people wear sensors such as cameras, physiological sensors (e.g. monitoring temperature, physiological characteristics), location data loggers, tokens, and other wearable and embeddable systems presents many direct benefits, especially for personal applications. However, these same “Wearable Computing” technologies and applications have the potential to become mechanisms of control by smart infrastructure monitoring those individuals that wear these sensors.

There are great socio-ethical implications that will stem from these technologies and fresh regulatory and legislative approaches are required to deal with this new environment.

This event promises to be the beginning of outcomes related to:

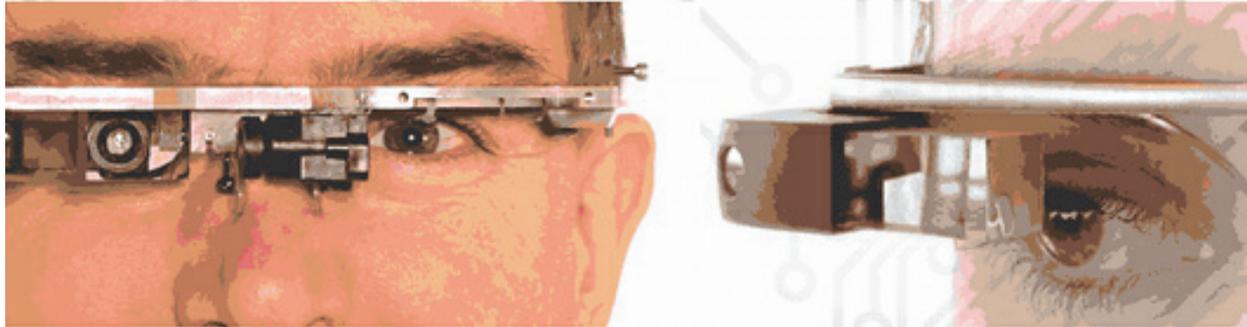
1. Consumer awareness
2. Usability
3. A defined industry cluster of new innovators
4. Regulatory demands for a variety of jurisdictions
5. User-centric engineering development ideas
6. Augmented Reality design
7. Creative computing
8. Mobile learning applications
9. Wearables as an assistive technology

“Smart people” interacting with smart infrastructure means that intelligence is driving decisions. In essence, technology becomes society.

**Professor Mann University of Toronto** will be speaking in the opening keynote panel with acclaimed Professor of MIT Media Arts and Sciences, Marvin Minsky who wrote the groundbreaking book *The Society of Mind* and has helped define the field of Artificial Intelligence (AI) among his major contributions.

General Chair of ISTAS13 and formerly a member of the MIT Media Lab under the guidance of Nicholas Negroponte in the 1990s Mann is long considered to be the Father of Wearable Computing and AR in this young field.

<http://veillance.me>



# ISTAS 13

## SmartWorld

June 27-29, 2013 University of Toronto  
**2013 IEEE International Symposium on Technology and Society**  
**Living in a Smart World - People as Sensors**

Internet-connected digital eyeglasses and similar smart technologies will soon be on the market, but their benefits and dangers are little understood.

Renowned experts in wearable technology, artificial intelligence, augmented reality and privacy will discuss both the potential and the pitfalls of these technologies at this groundbreaking conference at the University of Toronto. Speakers will include futurist, inventor and Director of Engineering, Google Inc. **Ray Kurzweil**, the 'father of artificial intelligence' **Marvin Minsky**, 'father of wearable computing' Professor **Steve Mann**, legendary computer scientist **Gordon Bell**, science fiction writer and futurist **David Brin** and American Civil Liberties Union (ACLU) president **Susan N. Herman**.

ISTAS'13 presenters and panellists will address the implications of living in **smartworlds** - smart grids, smart infrastructure, smart homes, smart cars, smart fridges, and with the advent of body-worn sensors like cameras, **smart people**. The environment around us is becoming "smarter". Soon there will be a camera in nearly every streetlight enabling better occupancy sensing, while many appliances and everyday products such as automatic flush toilets, and faucets are starting to use more sophisticated camera-based computer-vision technologies. **Meanwhile, what happens when people increasingly wear these same sensors?**

A smart world where people wear sensors such as cameras, physiological sensors (e.g. monitoring temperature, physiological characteristics), location data loggers, tokens, and other wearable and embeddable systems presents many direct benefits, especially for personal applications. However, these same "Wearable Computing" technologies and applications have the potential to become mechanisms of control by smart infrastructure monitoring those individuals that wear these sensors.

There are great socio-ethical implications that will stem from these technologies and fresh regulatory and legislative approaches are required to deal with this new environment. Come and join the exciting discussion!

For more information, visit [www.istas13.org](http://www.istas13.org)

**Sponsored by:**

The IEEE Society on Social Implications of Technology (SSIT)

General Chair..... Professor Steve Mann, P.Eng., University of Toronto  
Organising Chair.... Ryan Janzen, University of Toronto  
Program Chair..... Associate Professor Katina Michael, University of Wollongong



UNIVERSITY OF TORONTO  
FACULTY OF APPLIED SCIENCE + ENGINEERING

## Conference Venue and Location

The ISTAS13 conference will be housed across two venue points:

1. The Great Hall, Hart House, University of Toronto
2. The Bahen Centre, University of Toronto

### Bahen Centre

Bahen Centre for Information Technology (BCIT)

40 Saint George Street

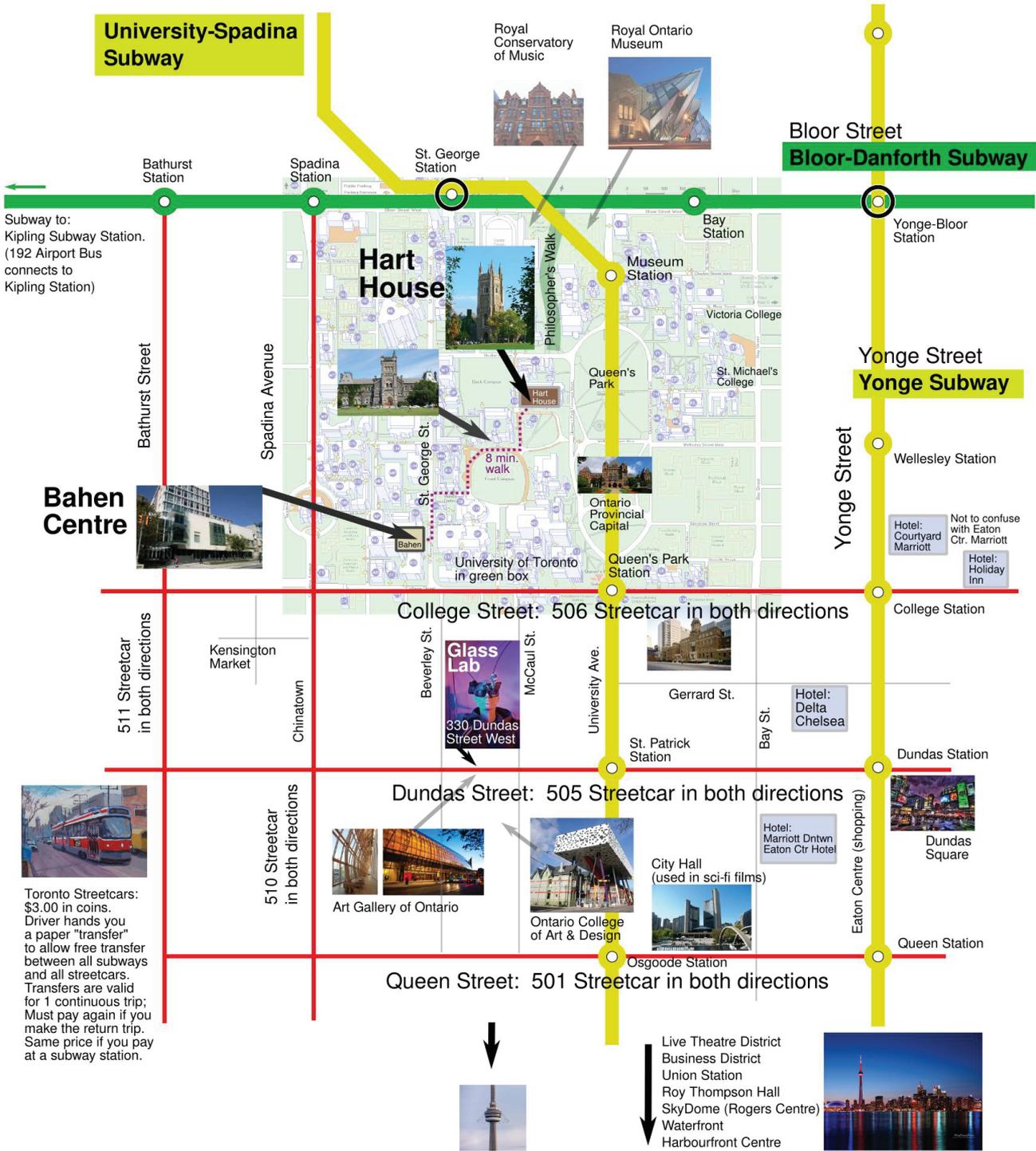
Toronto, ON M5S 2E4, Canada

+1 416-978-2011

### Toronto, Ontario CANADA



Welcome to Toronto: IEEE ISTAS 2013 SmartWorlds



## Conference Activities

### Program Summary

#### Main Events

On **June 27**, we begin proceedings at Hart House, historic center of culture at the University of Toronto, for the opening talks starting at 09:00 hrs.

On **June 28, 29**, we move to the Bahen Centre, a central hub for University of Toronto's Engineering Faculty, one of the leading engineering research institutions worldwide.

#### Additional Events in the Evening

\* **June 26**, Cyborg flashmob. 09:00 hrs at the Deconism Gallery, 330 Dundas St. West. (follow social media to track and join this event! #istas13 in Twitter)

\* **June 27**, Exclusive cocktails evening for Press/Exhibitors/Patrons/Keynote/Invited/Plenary Speakers. Hart House upstairs debates room, 19:00 hrs. Sponsored by Streamfolio.com

\* **June 28**, Conference Banquet: We all return to the ornate Great Hall of Hart House, for the main conference banquet, featuring Gordon Bell, of Microsoft Research. Banquet begins at 19:00 hrs.

\* **June 29**, Sousveillance Tour of Toronto: Relaxing tour of the city for all attendees; join us for a walking tour through the city, and join us for dinner together.



## Keynote Speeches

### Keynote Speech 1: Early in the 21st Century, Intelligence will Underlie Everything of Value

**Chair:** Katina Michael

**Date/Time:** Thursday, June 27, 2013 / 10:30–11:00 hrs

**Venue:** Hart House, historic center of culture at The University of Toronto



**Ray Kurzweil**  
KurzweilAI, United States

Ray Kurzweil has been described as “the restless genius” by the Wall Street Journal, and “the ultimate thinking machine” by Forbes. Inc. magazine ranked him #8 among entrepreneurs in the United States, calling him the “rightful heir to Thomas Edison,” and PBS included Ray as one of 16 “revolutionaries who made America,” along with other inventors of the past two centuries.

As one of the leading inventors of our time, Ray was the principal inventor of the first CCD flat-bed scanner, the first omni-font optical character recognition, the first print-to-speech reading machine for the blind, the first text-to-speech synthesizer, the first music synthesizer capable of recreating the grand piano and other orchestral instruments, and the first commercially marketed large-vocabulary speech recognition. Ray’s web site KurzweilAI.net has over two million readers.

Among Ray’s many honors, he is the recipient of the \$500,000 MIT-Lemelson Prize, the world’s largest for innovation. In 1999, he received the National Medal of Technology, the nation’s highest honor in technology, from President Clinton in a White House ceremony. And in 2002, he was inducted into the National Inventor’s Hall of Fame, established by the US Patent Office.

He has received nineteen honorary Doctorates and honors from three U.S. presidents.

Ray has written seven books, five of which have been national best sellers. *The Singularity is Near* and Ray’s latest book *How to Create a Mind* have been New York Times Bestsellers.

#### Abstract

At the onset of the 21st century, it will be an era in which the very nature of what it means to be human will be both enriched and challenged, as our species breaks the shackles of its genetic legacy, and achieves inconceivable heights of intelligence, material progress, and longevity. The paradigm shift rate is now doubling every decade, so the twenty-first century will see 20,000 years of progress at today’s rate. Computation, communication, biological technologies (for example, DNA sequencing), brain scanning, knowledge of the human brain, and human knowledge in general are all accelerating at an even faster pace, generally doubling price-performance, capacity, and bandwidth every year. Three-dimensional molecular computing will provide the hardware for human-level “strong” AI well before 2030. The more important software insights will be gained in part from the reverse-engineering of the human brain, a process well under way. While the social and philosophical ramifications of these changes will be profound, and the threats they pose considerable, we will ultimately merge with our machines, live indefinitely, and be a billion times more intelligent...all within the next three to four decades.

*Keywords:* Intelligence, Innovation, Brain, Society, Philosophy, Computation, Communication, Biology, Human.

## Keynote Speech 2: The Society of Mind

**Chair:** Jeremy Pitt

**Date/Time:** Thursday, June 27, 2013 / 11:35–12:05 hrs

**Venue:** Hart House, historic center of culture at The University of Toronto



### **Marvin Minsky**

*Professor of Media Arts & Science*

*Professor of E.E.C.S, MIT*

**Marvin Minsky** has made many contributions to AI, cognitive psychology, mathematics, computational linguistics, robotics, and optics. In recent years he has worked chiefly on imparting to machines the human capacity for commonsense reasoning. His conception of human intellectual structure and function is presented in two books: *The Emotion Machine* and *The Society of Mind* (which is also the title of the course he teaches at MIT).

He received the BA and Ph.D. in mathematics at Harvard (1950) and Princeton (1954). In 1951 he built the SNARC, the first neural network simulator. His other inventions include mechanical arms, hands and other robotic devices, the Confocal Scanning Microscope, the “Muse” synthesizer for musical variations (with E. Fredkin), and one of the first LOGO “turtles”. A member of the NAS, NAE and Argentine NAS, he has received the ACM Turing Award, the MIT Killian Award, the Japan Prize, the IJCAI Research Excellence Award, the Rank Prize and the Robert Wood Prize for Optoelectronics, and the Benjamin Franklin Medal.

### **Abstract**

Marvin Minsky – one of the fathers of computer science and cofounder of the Artificial Intelligence Laboratory at MIT – gives a revolutionary answer to the age-old question: “How does the mind work?” Minsky brilliantly portrays the mind as a “society” of tiny components that are themselves mindless. Mirroring his theory, Minsky boldly casts *The Society of Mind* as an intellectual puzzle whose pieces are assembled along the way. Each chapter – on a self-contained page – corresponds to a piece in the puzzle. As the pages turn, a unified theory of the mind emerges, like a mosaic. Ingenious, amusing, and easy to read, *The Society of Mind* is an adventure in imagination.

*Keywords:* Society, Mind, Artificial Intelligence.

### **Keynote Speech 3: Veillance and Reciprocal Transparency: Surveillance versus Sousveillance, AR Glass, Lifelogging, and Wearable Computing**

**Chair:** Katina Michael

**Date/Time:** Thursday, June 27, 2013 / 10:00–10:30 hrs

**Venue:** Hart House, historic center of culture at The University of Toronto



**Steve Mann**

*ISTAS'13 General Chair*

*Tenured Professor,*

*Department of Electrical and Computer Engineering*

*Faculty of Arts and Science, and Faculty of Forestry,*

*University of Toronto, Canada*

Mann holds degrees from the Massachusetts Institute of Technology (Ph.D. in Media Arts and Sciences '97) and McMaster University, where he was also inducted into the McMaster University Alumni Hall of Fame, Alumni Gallery, 2004, in recognition of his career as an inventor and teacher. While at MIT, in then

Director Nicholas Negroponte's words he "brought the seed" that founded the Wearable Computing group in the Media Lab.

In 2004 he was named the recipient of the 2004 Leonardo Award for Excellence for his article "Existential Technology," published in Leonardo 36:1.

#### **Abstract**

This paper explores the interplay between surveillance cameras (cameras affixed to large-entities such as buildings) and sousveillance cameras (cameras affixed to small entities such as individual people), laying contextual groundwork for the social implications of Augmented/Augmediated Reality, Digital Eye Glass, and the wearable camera as a vision and visual memory aid in everyday life. We now live in a society in which we have both "the few watching the many" (surveillance), AND "the many watching the few" (sousveillance). Widespread sousveillance will cause a transition from our one-sided surveillance society back to a situation akin to olden times when the sheriff could see what everyone was doing AND everyone could see what the sheriff was doing. We name this neutral form of watching "veillance" – from the French word "veiller" which means "to watch". Veillance is a broad concept that includes both surveillance (oversight) and sousveillance (undersight), as well as dataveillance, uberveillance, etc. It follows that: (1) sousveillance (undersight) is necessary to a healthy, fair, and balanced society whenever surveillance (oversight) is already being used; and (2) sousveillance has numerous moral, ethical, socioeconomic, humanistic/humanitarian, and practical justifications that will guarantee its widespread adoption, despite opposing sociopolitical forces.

*Keywords:* Surveillance, Sousveillance, Veillance, Wearable Cameras, Personal Imaging, Intelligent Image Processing, Wearable Computing, Lifelogging, Augmediated Reality, Augmented Reality, Technology and Society, Photography, Visual Memory, Prosthetic, Digital Eye Glass, FreeGlass, MannGlass, MannGlas, Surveillance Society, Surveillance Hypocrisy, Integrity, Surveillance hypocrisy versus sousveillance integrity.

## Keynote Speech 4: The Experience and Joy of Becoming Immortal

**Date/Time:** Friday, June 28, 2013 / 19:00 hrs onwards

**Venue:** Room Two



**Gordon Bell**  
*ISTAS'13 Banquet Dinner*  
*Principal Researcher*  
*Microsoft*

**Gordon** is a Principal Researcher at Microsoft working on lifelogging, having spent 23 years at Digital Equipment Corporation as Vice President of R&D, where he was responsible for the first mini- and time-sharing computers and the development of DEC's VAX.

As the first, NSF Ass't Director for Computing (CISE), he led the National Research and Education Network panel that became the Internet, and was an author of the High Performance Computer and Communications Initiative. Bell is the author of books and papers on computer architecture, startup companies, and lifelogging.

He is a member or Fellow of the American Academy of Arts and Sciences, Association of Computing Machinery, Institute of Electrical and Electronic Engineers, the National Academy of Engineering, National Academy of Science, the Australia Academy of Technological Sciences and Engineering and received The 1991 National Medal of Technology.

He is a founding trustee of the Computer History Museum, Mountain View, CA.

### Abstract

Fifteen years ago I embarked on a path to digitally encode my stuff – articles, books, communication, memorabilia, records of all kinds, photos, videos, etc. that led to experiencing what Vannevar Bush suggested in 1945 with Memex, and Gates elaborated on in 1995. “Lifelogging” describes the logging or recording of everything occurring in our lives – in effect a “transaction processing” system for a life. The Bell-Gemmell Lifelog is distinct from what Steve Mann and the community of lifebloggers or lifeloggers and bloggers do because it aims to be a complete record and like a diary there's no intent of sharing except in controlled scenarios. This is when the fun began as engineers and researchers – could we do it, would anyone else want it, and is it legal. These depend on enabling technologies: encoders e.g. scanners, SenseCams, heart monitors; the cost of storing; and the most of all the utility.

Over a decade ago, we described digital immortality and today, there's a web site that having mined data about an individual will twitter about it forever in a “one way fashion” that goes beyond my use of a chatbot to encode myself. Capturing every heart beat would happen too – my pacemaker does this, it records each beat's rate, not when it happened. “Extreme lifelogging” with constant image or video capture would be common place by 2020. For true recall, the audio record where most of life's bits are is needed – but that's mostly illegal, now. Predictably, audio recording may be commonplace as we shatter norms of what we once thought were private.

Lifelogging has become commonplace with o(100) companies offering all sorts of content capture from one's sentiments, reputation and stuff, to health and well being. The questions seem to be constant: why would you ever save everything? (to find something else); what about the constancy of the media – we called this the “Dear Appy, I thought we were committed. Signed, Lost data.” problem; when do you have time to look at yourself – isn't this a tool for narcissists; why do you hold something versus make sure you delete it if it could possibly be unpleasant or its absence be used to conjure up something creative; surely, you don't believe in the creation of immortality.

*Keywords:* Lifelogging, Bell-Gemmell Lifelog, SenseCams, Heart monitors, Image Capture, Video Capture, Legality, Norms, Immortality.

## Keynote Speech 5: Light: The Essence of Civilization

**Chair:** Chris Hables Gray

**Date/Time:** Saturday, June 29, 2013 / 09:00–09:30 hrs

**Venue:** Room One



**David Brin**  
*Futurist, United States*

**David Brin** is a scientist, inventor, and New York Times bestselling author. With books translated into 25 languages, he has won multiple Hugo, Nebula, and other awards. A film directed by Kevin Costner was based on David's novel *The Postman*. Other works have been optioned by Paramount and Warner Bros. David's science-fictional Uplift Saga explores genetic engineering of higher animals, like dolphins, to speak. His new novel from Tor Books is *Existence*.

As a scientist/futurist, David is seen frequently on television shows such as *The ArchiTechs*, *Universe*, and *Life After People* (most popular show ever on the History Channel) – with many appearances on PBS, BBC and NPR. An inventor with many patents, he is in-demand to speak about future trends, keynoting for IBM, Google, Procter & Gamble, SAP, Microsoft, Qualcomm, the Mauldin Group, and Casey Research, all the way to think tanks, Homeland Security, and the CIA. (<http://www.davidbrin.com/speaker.html>)

With degrees from Caltech and the University of California-San Diego, Dr. Brin serves on advisory panels ranging from astronomy, NASA innovative concepts, nanotech, and SETI to national defense and technological ethics. His nonfiction book *The Transparent Society* explores the dangers of secrecy and loss of privacy in our modern world. It garnered the prestigious Freedom of Speech Prize from the American Library Association. (<http://www.davidbrin.com>)

### Abstract

Will transparency end privacy? The question reflects zero-sum thinking. But transparency and omniveillance are the only conditions under which some personal privacy may be preserved, along with freedom and a creative economy. Light and reciprocal accountability foster healthy science, democracy, markets and justice, the four great arenas underlying the enlightenment miracle. Can we find pragmatic ways to ensure they continue to thrive, while empowering individuals to say (and enforce) “leave me alone”?

*Keywords:* Transparency, Omniveillance, Privacy, Freedom, Democracy.

## Invited Speeches

### Invited Speech 1: Mobile Music Touch: Passive Haptic Learning and Rehabilitation

**Chair:** Linda Theron

**Date/Time:** Thursday, June 27, 2013 / 15:35–16:05 hrs

**Venue:** Hart House, historic center of culture at The University of Toronto



**Thad Starner**

*Professor, Georgia Institute of Technology  
Director of the Contextual Computing Group*

Thad Starner is a wearable computing pioneer and a Professor in the School of Interactive Computing at the Georgia Institute of Technology. He is also a Technical Lead on Google's Glass, a self-contained wearable computer.

Thad received a Ph.D. from the MIT Media Laboratory, where he founded the MIT Wearable Computing Project. Starner was perhaps the first to integrate a wearable computer into his everyday life as a personal assistant, and he coined the term "augmented reality" in 1990 to describe the types of interfaces he envisioned at the time. His groups' prototypes on mobile context-based search, gesture-based interfaces, mobile MP3 players, and mobile instant messaging foreshadowed now commonplace devices and services.

Thad has authored over 150 peer-reviewed scientific publications with over 100 co-authors on mobile Human Computer Interaction (HCI), machine learning, energy harvesting for mobile devices, and gesture recognition. He is listed as an inventor on over 80 United States patents awarded or in process. Thad is a founder of the annual ACM/IEEE International Symposium on Wearable Computers, and his work has been discussed in many forums including CNN, NPR, the BBC, CBS's 60 Minutes, ABC's 48 Hours, the New York Times, and the Wall Street Journal.

#### Abstract

Wearable computers have great potential to improve users' health and ability to learn. An unusual example is our Mobile Music Touch (MMT) glove which allows users to learn to play piano melodies without focusing on the lesson. The song to be learned is loaded on to a mobile phone, which plays the song repeatedly in the user's earphones. As each note is played, the glove taps the finger corresponding to the appropriate key on a piano keyboard. The user learns the "muscle memory" of the song even though he is attending another task.

Our recent study suggests that MMT improves hand sensation for people with tetraplegia due to partial spinal cord injury. Our participants used the glove for eight weeks to learn piano melodies and showed significant hand sensation improvements compared to control. Our participants were over a year past injury, when improvements are considered to taper off and insurance often no longer covers rehabilitation services. MMT may provide a cost effective means for continuing rehabilitation while the user is mobile and with minimal intrusion on the wearer's daily activities.

*Keywords:* Muscle memory, Music, Mobile music touch, Wearable computing, Health, Learning.

## Invited Speech 2: Privacy by Design and Wearable Computing

**Chair:** Douglas Baldwin

**Date/Time:** Friday, June 28, 2013 / 09:30–10:00 hrs

**Venue:** Room One



**Ann Cavoukian**

*Information and Privacy Commissioner, Ontario, Canada*

In November 2011, **Dr. Cavoukian** was ranked by Women of Influence Inc. as one of the top 25 Women of Influence recognizing her contribution to the Canadian and global economy.

Dr. Cavoukian was honoured with the prestigious Kristian Beckman Award in 2011 for her pioneering work on Privacy by Design and privacy protection in modern international environments.

In the same year, Dr. Cavoukian was also named by Intelligent Utility Magazine as one of the Top 11 Movers and Shakers for the Global Smart Grid industry, received the SC Canada Privacy Professional of the Year Award and was honoured by the University of Alberta Information Access and Protection of Privacy Program for her positive contribution to the field of privacy.

Dr. Ann Cavoukian is recognized as one of the leading privacy experts in the world. Her concept of Privacy by Design seeks to proactively embed privacy into the design specifications of information technology and accountable business practices, thereby achieving the strongest protection possible.

In October 2010, regulators at the annual International Data Protection and Privacy Commissioners in Jerusalem, Israel unanimously passed a landmark Resolution recognizing Privacy by Design as an essential component of fundamental privacy protection.

This was followed by the U.S. Federal Trade Commission's inclusion of Privacy by Design as one of its three recommended practices for protecting online privacy – a major validation of its significance. In November 2011, Dr. Cavoukian was ranked by Women of Influence Inc. as one of the top 25 Women of Influence recognizing her contribution to the Canadian and global economy.

### Abstract

Commissioner Cavoukian's presentation is premised on the position that we can and must have both effective law enforcement and a robust right to personal privacy, including with respect to drone-based surveillance.

Governments have long used technology to help prevent serious harm and prosecute wrongdoing. Since September 11th, however, we have seen an increase in the state's capacity for surveillance, including of law abiding citizens.

Democracy posits that the individual is the source of the state's legitimacy and as such the state must be transparent to the citizen so the citizen can hold it to account. On the other hand, the citizen requires non-transparency or privacy from the state so he or she can enjoy dignity and autonomy. Thankfully, even as millions of smart and cellphone wielding social media citizens are co-creating new more open societies, the demand for privacy refuses to die.

In short, the information age may bring an end to practical obscurity, for example, with respect to our activities in public spaces, but our embrace of new technologies does not in any way signal an end to our right to privacy. Privacy is being transformed with the rise of PbD and the evolution of our right to informational privacy.

### *Invited Speeches*

The right to informational privacy is the right to exercise a significant measure of control over the collection, use and disclosure of one's own personal information. In the context of state surveillance, the right to informational privacy is and must continue to be protected by both: (i) the implementation of PbD principles in the design and operation of legitimate state deployed surveillance; and (ii) insistence on legal rules and norms. We can and must have both – strong privacy protection, embedded into innovative advances in technology.

*Keywords:* PbD, Privacy by design, Wearable computing, Privacy.

### Invited Speech 3: Beyond Sunglasses and Spray Paint: A Taxonomy of Surveillance Countermeasures

**Chair:** Janet Rochester

**Date/Time:** Saturday, June 29, 2013 / 11:30–12:00 hrs

**Venue:** Room One



**Colonel Lisa A. Shay**

*Electrical Engineering Program Director  
Department of Electrical Engineering and Computer Science  
US Military Academy*

Lisa A. Shay is the Electrical Engineering Program Director in the Department of Electrical Engineering and Computer Science at the US Military Academy at West Point. She holds a B.Sc. from the US Military Academy, an M.Sc. from Cambridge University, and a Ph.D. from Rensselaer Polytechnic Institute, all in Electrical Engineering. She is a Senior Member of the Institute of Electrical and Electronic Engineers, a member of the American Radio Relay League, and a licensed professional engineer.

Her academic interests include neural networks and wireless data communications systems, and power systems. Her research interests range from privacy and security issues related to ubiquitous sensors, to wireless network design, to engineering pedagogy. She was featured in an IEEE Spectrum's Techwise Conversations with Steven Cherry, "License Plates, Cameras, and Our Vanishing Privacy".

#### Abstract

The rapid decline in size and cost of networked sensors combined with increased incentives for use including monitoring physical fitness, improving public safety, increasing security, and adding convenience is causing the physical and online worlds to become heavily instrumented. Some welcome such developments, but others seek to retain privacy, often by focusing on countering the sensors themselves. Scholars have begun to consider surveillance countermeasures as a stand-alone area of research. However, a scholarly taxonomy useful for critical analysis and systematic countermeasure development is lacking. In this paper we provide such a taxonomy illustrated with example countermeasures that have been successfully employed.

*Keywords:* Panopticon, Ubervveillance, Veillance, Surveillance, Privacy, Countermeasures.

## Invited Speech 4: Ready to Wear (or Not): Examining the Rhetorical Impact of Proposed Wearable Devices

**Chair:** Janet Rochester

**Date/Time:** Saturday, June 29, 2013 / 12:00–12:30 hrs

**Venue:** Room One



**Isabel Pedersen**

*Canada Research Chair in Digital Life, Media, and Culture  
Associate Professor, University of Ontario Institute of Technology*

**Pedersen** explores how wearable computer devices and gadgets worn on the body shift reality for the wearer, and alter the ways that people interact with others and participate in digital culture. She is interested in how society is persuaded to adopt these gadgets as they are embodied in vast discursive contexts such as popular film, traditional mythology, social media outlets, government ideologies, posthuman and transhuman beliefs, and inventors' writing.

She concentrates on inventions promised for the future as these predictions also bear consequences for humanity in the present. Currently, she holds a Social Sciences and Humanities Research Council (SSHRC) standard grant for her research under the title *Wearable Mobile Augmented*. Her Book *Ready to Wear: A Rhetoric of Wearable Computers and Reality-Shifting Media* will be released in 2013.

### Abstract

Future, wearable, digital devices are constantly emerging and celebrated in the mainstream news media. We are gradually embracing the idea that our future digital life will involve watch computers, heads-up displays, brain-computer interfaces, body sensors, and digital tattoos, to name a few examples. In keeping with the Google Glass phenomenon, these devices are often talked about long before they are available for purchase or use. In a sense, digital media are invented, designed, adopted and even celebrated before society is able to understand their impact on lives, culture, art, privacy, and social practices. More so, society clings to the belief that their emergence is imminent, creating an aura that impedes our assessment of them. Based on an ongoing project that uses digital rhetoric and digital humanities methodologies to explore wearables and their invention, this paper argues that emergent technology can spawn dehumanizing representations while it strives for the opposite, more human-centric interaction with computers. As we design digital devices to augment our physical existence, how are we altering the way people conceptualize so many other aspects of humanity such as creativity, analytical reasoning, nostalgia, imagination, and privacy. When mainstream media celebrate technology such as Google Glass and so many other new wearable devices, we need to take a much closer look at how they frame us, our culture, our society. This research uses a humanities model to uncover assumptions made in the language of invention in order to reveal how humans are conceptualized and misconceptualized. As future-proposed technology marches on, we need to understand the concepts driving the devices that inventors create, but also the social structuring and identity-building that humans endure in this process.

*Keywords:* New media, Wearables, Rhetoric, Invention, Public, Adoption, Digital humanities.

## Invited Speech 5: Lifelog Semantics from Wearable Computing

**Chair:** Simon Randall

**Date/Time:** Thursday, June 27, 2013 / 13:30–14:00 hrs

**Venue:** Hart House, historic center of culture at The University of Toronto



**Cathal Gurrin**

*Doctor and Lecturer, School of Computing, at Dublin City University*

*Visiting Researcher at the University of Tromsø*

*Director of the Human Media Archives Research Group*

*Collaborating Investigator, CLARITY Centre for Sensor Web Technologies*

Cathal's research interest is in information retrieval (IR), though he has a particular interest in how people access information from mobile devices (MHCIR). Cathal has an ongoing interest in Human Digital Memories and has gathered a digital memory since 2006 (incl. over 9 million sensecam images). Cathal is also interested in sensing the environment and the person through my involvement with CLARITY as a named collaborator and has an interest in a topic called CIR (Cognitive Information Retrieval). In addition, he still maintains an interest in Information Seeking on the WWW, which was the topic of his Ph.D..

### Abstract

Our daily life started becoming digital over a decade ago. Now much of what we do is digitally recorded and accessible and this trend is accelerating, with the potential to bring astonishing benefits. Sensing and digitising life experience requires wearable and ambient sensors to continually sample life experience, whether through photos of what we see, videos of what we experience, audio recording of what we hear, or the sensor capture of our real-world interactions (e.g. locations, people, actions, motivations, etc.). In our research we are using wearable sensing to construct a surrogate memory, that can operate in synergy with our own organic memories. Such lifelogs, or personal life archives, are set to revolutionise our personal lives, healthcare, learning and productivity. Since the inspiring essay 'As We May Think' by Vannevar Bush in the 1940s, the concept of a Personal Life Archive (the memex) has been imagined, yet only now, with the convergence of technical progress in three fields; data sensing, data storage and information retrieval/data mining, are we in a position to finally realize Bush's vision.

Lifelogging requires a multidisciplinary approach to develop useful holistic solutions. From capture of life experience to presentation and summarisation for multimodal access. This is not simply a computer science problem, but requires the input from cognitive scientists, software framework architects, healthcare and human performance professionals, interaction designers, engineers and a host of other disciplines. There are numerous literatures suggesting that such lifelogging requires synergy with, not substitution of, human memory. In this talk I will describe the challenges and potential advances that lay ahead in personal life archives which are both exciting and ambitious, requiring a cross disciplinary approach to achieve their full potential. I will present the current generation of solutions that have been developed and look ahead to the next generation and motivate these based on my own experience of gathering a seven year lifelogging archive, numbering tens of millions of sensor readings.

Dr. Cathal Gurrin is a lecturer at Dublin City University, Ireland and a visiting researcher at the University of Tromsø, Norway. His research interests focus on all aspects of lifelogging, he has been actively logging life experience using a Sensecam for seven years and has published extensively in the area.

*Keywords:* Human digital memories, Sensing the environment, Information retrieval, SenseCam, Cognitive Information Retrieval (CIR).

## Invited Speech 6: Wearable Computing and Security Implications

**Chair:** Simon Randall

**Date/Time:** Thursday, June 27, 2013 / 14:30–15:00 hrs

**Venue:** Hart House, historic center of culture at The University of Toronto



**Monique Morrow**

*Distinguished Consulting Engineer, Cisco  
Research and Advanced Development Group*

**Morrow** has over 20 years experience in IP internetworking that includes design, implementation of complex customer projects and service development for service providers. Monique has worked for both enterprise and service provider companies in the United States and in Europe. Monique led the Engineering Project team for one of the first European MPLS-VPN deployments in 1999 for a European service provider.

Monique was recognized for her 15 years achievement in MPLS at the MPLS Conference 2012 on October 29 2012. Monique has presented at numerous distinguished industry conferences on the topic of MPLS and Cloud Computing. At present, she is focused on the topics of the Internet of Things / Machine-to-Machine Communications / E-Health and Cloud Computing.

Her interest and expertise in the topic of MPLS, prompted her to co-author several well-respected books; and other publications. Monique is passionate about Girls in ICT and has been active at the ITU on this topic.

### Abstract

We are riding on a technology avalanche with the surge in wearable devices, such as those designed for personal health tracking. Healthcare is becoming borderless and less location-centric. Social care will blend with health care enterprises. Medical and embedded device profiles must account for the role played in the community, for example, in healthcare, whether in the home, pharmacy, or hospital. These devices will effectively be managed and used by different players, i.e., the reverse of multi-tenancy. Different “domains” will need to access the wearable device: the patient, the doctor, the hospital, etc. which creates challenges both in identity management and access control. The computing platform needs to ensure that the standard cryptographic security practices can be enabled without compromising usability, and time latencies for data content delivery.

Over the last decade, cyber threats have evolved significantly. Today’s threats are more sophisticated and more targeted than ever. Early threats like viruses and worms were relatively easy to detect because they were “noisy” – easy to spot on the network because they generated lots of traffic. Anti-virus, firewalls, and intrusion detection and prevention are good defences against these kinds of threats. But over time, the people who created these threats adjusted their strategies, unleashing a whole new breed of stealthy malware. This in turn led to the rise of sophisticated botnets. Today, we’ve adapted too, and now we combat these threats using technologies like reputation scores, Data Loss Prevention (DLP) and application-aware firewalls.

But the emerging persistent threats are a whole new breed of security threat we have never seen before. These attacks are often custom crafted, sometimes even for just a single target. There are typically no signatures for these kinds of attacks. Some of them are exploiting vulnerabilities never seen before. Whilst we have contemplated security from a networking systems perspective, there are questions to pose when human beings are central to that system as is the case with wearable computing. There are trade-offs between personal convenience and personal risk. Can we formulate a so called Wearable Security Framework model that identifies the threats and responses that are contextual? This presentation will provoke discussion round the issue of security and wearable devices and a call to action.

*Keywords:* Wearable devices, Personal convenience, Personal risk, Security framework.

## Invited Speech 7: Sociocultural Conventions, Sensitiveness and Learning in the (So-called) Smart World

**Chair:** Peter Bugaj

**Date:** Friday, June 28, 2013 / 11:30–12:00 hrs

**Venue:** Room Three



**Teemu Leinonen**

*Associate Professor, Aalto University, Helsinki  
New Media Design & Learning  
Learning Environments Research Group  
Media Lab, Department of Media*

Since 1998, **Teemu** has led the Learning Environments research group (<http://legroup.uiah.fi>) of the Media Lab (<http://mlab.taik.fi>), Aalto University School of Art and Design Helsinki (<http://taik.aalto.fi>). The research group has coordinated research and development project, funded by The European Commission in the Information Society Technologies (IST) framework, UNESCO, the Nordic Council of

Ministers, and the National Technology Agency of Finland (TEKES). In 2008-2009 Teemu was the acting head of department of the the Media Lab (<http://mlab.taik.fi>).

Teemu's and his research group's approach to research and design of New Media and learning is theory-based but design-oriented. The research group is internationally recognized from its open source virtual learning environment for knowledge building, called Fle3 (<http://fle3.uiah.fi>) and, a web community and platform for finding, authoring and sharing open and free learning resources, called LeMill (<http://lemill.net>).

### Abstract

Aspects of culture – such as language, ethics, norms, customs, and social structures – have a great impact on the ways we see and approach new technologies. People appreciate their culture and its social conventions. They are the glue that keeps communities united. They make us feel alive and safe.

Researchers and designers largely don't like cultures and their social conventions; as building on something existing is not considered to be innovative. Researchers are expected to do research that will change the world. Most people are, however, relatively happy with their existing life and not willing to change.

When considering new technologies we should pay special attention to cultural sensitiveness. New technologies are acceptable only when they are designed to serve existing sociocultural contexts. Being sensitive with cultural aspects asks us to recognize people's dignity by understanding and empathizing them.

In addition of being culturally sensitive we must recognize that cultures are not static. They do change with time. Learning where people are critically thinking, analyzing and taking goal-driven action leads to change. Smart people develop and take in use new cultural conventions. They can ignore them or destruct them depending on their own judgment. The so-called smartworld needs smart people: sensitive and learned ones.

*Keywords:* New media, Learning, Smart world, Culture, Critical thinking.

## Invited Speech 8: “You are Your Data”: Digital Self-Tracking and Algorithmic Subjectivity

**Chair:** Chris Hables Gray

**Date/Time:** Saturday, June 29, 2013 / 09:30–10:00 hrs

**Venue:** Room One



**Natasha Dow Schull**

*Associate Professor, Massachusetts Institute of Technology  
Program in Science, Technology, and Society*

Natasha Dow Schull is a cultural anthropologist and associate professor at MIT’s Program in Science, Technology, and Society.

Her new book, *ADDICTION BY DESIGN: Machine Gambling in Las Vegas* (Princeton University Press 2012), draws on extended research among compulsive gamblers and the designers of the slot machines they play to explore the relationship between technology design and the experience of addiction. Her current, ongoing research concerns the emerging field of digital self-tracking and the new modes of introspection, experimentation, and self-governance it engenders. Schull’s research has been funded by the National Science Foundation, the Alfred P. Sloan Foundation, and the Woodrow Wilson Foundation, and the Robert Wood Johnson Foundation, among other sources.

### Abstract

Big data has inspired much reflection on the ways in which people are tracked by governments and corporations, and how such tracking might threaten personal identity, liberty and privacy. My project takes a different angle on big data by exploring the phenomenon of self-tracking. While people have long used technology to record and reflect upon their emotional states, bodily processes, habits, and use of time, the present historical moment is witnessing a dramatic increase in the practice and scope of self-tracking as individuals are offered a range of relatively affordable devices with which to measure, assess, and modulate themselves. Simple analog technologies like weighing scales and wristwatches are being replaced by digital and mobile technologies that can collect and analyze massive amounts of data – often in real time, requiring no direct input or even awareness from users. As digital self-tracking of this nature increasingly becomes a part of everyday life, how does it alter self-understanding, self-care, and self-governance? Drawing on ethnographic research conducted among participants in the Quantified Self (QS) movement, I will argue that the computational and phenomenological affordances of self-tracking tools and systems facilitate what might be described as “algorithmic selfhood,” a mode of being caught between a drive for self-mastery and an abdication of insight, analysis, and management to external technology.

*Keywords:* Self-tracking, Personal analytics, Quantified self, Algorithmic subject.

## Invited Speech 9: Formal Models of Social Processes: Towards a New Science of Institutions

**Chair:** Janet Rochester

**Date/Time:** Saturday, June 29, 2013 / 11:00–11:30 hrs

**Venue:** Room One



**Jeremy Pitt**

*Imperial College, London UK*

*Deputy Head of the Intelligent Systems and Networks Group*

The research programme focuses on a broad range of interests in Intelligent Systems, spanning human-network interaction (in particular the use of Affective Computing in this context), multi-agent systems (specifically norm-governed and socio-cognitive agent societies), and ad hoc networks (including self-organisation and Quality-of-Service (QoS) provisioning).

Involved in many European projects developing intelligent agent and multi-agent systems, and in particular was Project Manager of the IST project ALFEBIITE (IST-1999-10298) from 2000–2004. From 1998–2002 was involved in the FIPA agent standardisation initiative. Currently involved in research collaborations with partners in Japan and India.

Teaching includes a first year course on Scientific Computing, third year courses on Artificial Intelligence and Human-Computer Interaction, and the Summer Group Projects for the Information System Engineering (ISE) stream, where students develop a multi-agent e-commerce system.

### Abstract

The UK's Royal Commission on Environmental Pollution recommended that a new type of adaptive institution is required to address global challenges like sustainability and climate change. Starting from Elinor Ostrom's principles of enduring self-governing institutions for sustainable common-pool resource management, we have been developing a computational model of self-organising electronic institutions for fair and efficient resource allocation in distributed computer systems and networks. In this talk, we consider how to extend this work to embrace socio-technical systems, to provide the foundations for this new type of adaptive institution. In particular, we emphasise the inter-leaving of the artificial society of sensors and devices with the natural society of people and organisations. It is argued that this interleaving can be used to address problems of path dependency and 'institution lag' (the environment changes faster than the institution is able to respond), but also leveraged for benefits in terms of social innovation and community resilience. We discuss how this approach can be used to treat 'big data' as a knowledge commons, providing a common and integrated framework for both information management and critical infrastructure management. From there, we map out a broader and ambitious programme of research: a new science of institutions based on formal models of social processes (of which we consider three: collective awareness, planned emergence and computational justice) and its potentially transformative impact on society.

*Keywords:* Social processes, Socio-technical systems, Collective awareness, Big data, Knowledge commons, Planned emergence, Computational justice.

## Invited Speech 10: Connecting Memory Extensions to Internal Memory

**Chair:** Linda Theron

**Date:** Thursday, June 27, 2013 / 16:35–17:05 hrs

**Venue:** Hart House, historic center of culture at The University of Toronto



**Jean-Gabriel Ganascia**

*Professor University Pierre and Marie Curie, Paris, France*

*LIP6 Laboratory, ACASA Group Leader*

*Member of the COMETS (Ethical Committee of the CNRS)*

Initially focused on Knowledge Acquisition and Machine Learning, his scientific interests have evolved to encompass Cognitive Modeling, Digital Humanities and the design of Intelligent Agents. More recently, he has worked on electronic memory extensions and on the improvements of electronic reading facilities. This has led to researches on literary analysis (genetic criticism, stylistic analysis, study of intertextuality), Scientific Discovery (modeling theories in physical sciences and medicine), musicology and music (detection of recurrent patterns, simulation of improvisations), multi-media, intelligent TV, recommender systems and privacy protection in social networks.

For the last few years, he has also worked on the ethics and political philosophy of the information society. In particular, he has explored the ethical and political structure of our contemporary society by extending the Bentham's Panopticon, which has been designed for surveillance, to virtual architectures that facilitate "sousveillance" where everybody can watch everybody.

### Abstract

With the considerable improvement of sensors, storage devices and communication techniques, the quantity of "everywhere and anytime" available information reaches a point previously unheard of. Everybody has access, day and night, to the content of the major libraries in the world, including the Library of Congress, the British Library, etc. It also becomes possible for anyone to record almost all the important events of his/her life with devices like the Steve Mann's EyeTap or the Google Glass, and then to build his/her personal individual archives. However, with the considerable augmentation of external storage devices, it becomes more and more difficult to retrieve personal information: we need to remember our remembering, to be able to access it. With the notion of "Memory Islands", we propose here to help us to find our way in our remembering by automatically generating artificial cartographies of our memories. This approach is based on the old "arts of memory" that were practiced in the Antiquity and the Middle Age to enhance the individual memories by the placement of things to memorize in architectural spaces. Nevertheless, "Memory Islands" make also use of modern knowledge representation and cartographic techniques, which allows navigating through artificial landscape of our imagination. So doing, we claim that they let connect the electronic storage devices, which constitute external memory extensions, to our own internal memories.

*Keywords:* Memory extensions, Internal memory, Archives, Memories, Memory Islands.

## Invited Speech 11: Wearable Monitors on Babies: Big Data Saving Little People

**Chair:** Cara Morris

**Date/Time:** Saturday, June 29, 2013 / 14:00–14:30 hrs

**Venue:** Room One



**Carolyn McGregor**

*Canada Research Chair in Health Informatics and Professor  
University of Ontario Institute of Technology*

**Professor Carolyn McGregor** is the Canada Research Chair in Health Informatics and Associate Dean of Research in the Faculty of Business and Information Technology at the University of Ontario Institute of Technology, Canada.

She received her Ph.D. degree in Computer Science from the University of Technology, Sydney and was a finalist for the Chancellor’s award. Dr. McGregor has led pioneering research in Big Data, analytics, event stream processing, temporal data stream data mining, business process modelling, patient journey modelling and cloud computing. Prior to her arrival in Canada in 2007, in the early 1990s she led the implementation of the first Executive Information Systems for one of the largest banks and the largest retailer in Australia.

These were two of the earliest business analytics software implementations in Australia. She now progresses her research within the context of health and medicine for advanced support for clinical management and research. Dr McGregor is an international leading researcher in the area of critical care health informatics and in particular the use of Big Data in neonatal health informatics for which she has specialised for over 13 years. To date in her career, she has been awarded over \$10 million in research, consultancy and infrastructure funding.

She has led the establishment of two IT start-up companies internationally. She has extensive collaborative relationships with healthcare organisations, researchers and industry in several countries around the world including Canada, Australia, USA, China and Ireland. She is the Canadian representative for the IEEE Engineering in Medicine and Biology Society (EMBS) and was the inaugural IEEE EMBS representative for IEEE Women in Engineering. In 2011 she was one of four international researchers featured in the IBM Centennial “Wild Ducks” video.

She has received several awards for her research publications. In 2012 she was recognised as the senior co-author of the 3rd most cited publication since 2007 for the Artificial Intelligence in Medicine journal. She is regularly called upon by the media as an international specialist in health informatics and Big Data and was recently featured in Computerworld, ITWorld, Backbone, Health Research & Innovation – [www.innovation.ca](http://www.innovation.ca)

### Abstract

Today, 8% of Canadian babies are born premature and internationally the average is 10%. These early births, are responsible for three quarters of all infant deaths in Canada. Premature infants, together with ill term infants, are cared for in Neonatal Intensive Care Units (NICUs) which contain state of the art medical equipment to monitor and provide life support, resulting in a significant Big Data environment. In addition, graduates of neonatal intensive care may be discharged with medical devices to support continued monitoring as ambulatory patients in and outside the home setting. In both NICU and ambulatory contexts wearable patient monitoring has many social implications. This research presents an assessment of the social implications of Big Data solutions for critical care within the context of the Artemis project that is enabling Big Data solutions for: 1) Real-time processing of complex intensive care physiological signals for new and earlier condition onset detection; 2) new approaches to physiological data analysis to support clinical research; and 3) cloud computing/services computing to provide rural and remote communities with greater options for advanced critical care within their own community healthcare facilities.

*Keywords:* Wearable monitors, Newborn infants, Babies, Big data, eHealth, Telehealth, Patient monitoring, NICUs.

## Invited Speech 12: Bio-Inspired Solutions for Intelligent Android Perception and Control

**Chair:** Linda Theron

**Date/Time:** Thursday, June 27, 2013 / 16:05–16:35 hrs

**Venue:** Hart House, historic center of culture at The University of Toronto



**Emil M. Petriu**

*Professor and University Research Chair  
School of Electrical Engineering and Computer Science  
University of Ottawa, Ottawa, Ontario, Canada*

**Petriu** is a Fellow of the Institute of Electrical and Electronics Engineers (FIEEE), Fellow in the Canadian Academy of Engineering (FCAE) and Fellow of the Engineering Institute of Canada (FEIC).

Under a series of research grants and contracts from Canadian and Ontario funding agencies, the Canadian Space Agency, and industry, he developed bio-inspired random-pulse neural network hardware architectures, new tactile sensors and haptic human-computer interfaces, computer vision and multi-sensor fusion techniques for healthcare, security, industrial and space robotics applications. His current research interests include fuzzy systems, neural networks, biology inspired robotics, and symbiotic human-computer interaction.

He received the 2003 IEEE Instrumentation and Measurement Society Technical Award “for contributions to imaging processing systems, robotics, virtual reality and applications of artificial intelligence, fuzzy logic and neural networks”. He was a co-recipient of the 2003 IEEE Donald G. Fink Prize Paper Award, the unique paper award presented by IEEE in that year. He was an Honorary Keynote Speaker at the 2009 IEEE Int. Conf. on Systems, Man, and Cybernetics, San Antonio, TX, USA.

### Abstract

After more than half of century of manufacturing-oriented robotics, robots are now evolving and expanding into new applications involving a human-style interaction with people in unstructured environments. Such an endeavour requires a different set of skills for the new generation of robots, which are expected to exhibit an increased ability to intelligently connect perception to action. Due to their expected omnipresence in the lives of people, the new-generation robots should be sensitive to the attitudes and expectations of normal people. They should be endowed with more efficient interaction capabilities allowing for a higher degree of flexibility and autonomy in order to make appropriate decisions in routine and emergency situations. In order to naturally blend within human society, the new-generation robots should not only look as humans, but should also behave as much as possible as humans. They are in a way expected to be, as initially imagined by Čapek in his R.U.R. Rossum’s Universal Robots play, anthropomorphic artefacts, androids, enabled to think on their own and governed by Asimov’s laws of robotics hardwired into every robot’s positronic brain.

While for a long time, engineers have built upon mathematics, physics and chemistry in order to develop an ever growing variety of industrial artefacts and machines, this approach cannot anymore rise to the challenge of designing these androids.

The time has now arrived to add biology and more specifically, human anatomy, physiology and psychology to the scientific sources of knowledge to develop a new, bio-inspired, generation of intelligent androids. Advocating this emergent trend, this presentation will discuss a number of relevant issues such as bio-inspired robot sensors and neural networks, human-robot interaction techniques for symbiotic partnership, as well as moral, ethical, theological, legal, and social challenges in a soon-to-be cyborg-society world.

*Keywords:* Intelligent android, Perception, Control, Solution, Bio-Inspired.

## Invited Speech 13: The 3 Laws of Augmented Reality Design: How to Design Augmented Reality Application that Add Value and Delight Users

**Chair:** Günter Alce

**Date/Time:** Friday, June 28, 2013 / 13:30–14:00 hrs

**Venue:** Room One



**Ori Inbar**  
CEO, [AugmentedReality.org](http://AugmentedReality.org)

AugmentedReality.org is a global not-for-profit organization dedicated to advancing and promoting the true potential of augmented reality. As trusted partner of its members and supporters, AR.org facilitates and catalyzes the global and regional transformation of the AR industry. AR.org also owns and produces the largest international event for augmented reality and the global forum for AR innovation: Augmented World Expo (formerly Augmented Reality Event). All profits from the event are reinvested into AR.org's industry services.

**Ori Inbar** is the Founder and CEO of Augmented Reality.ORG, a global non-for-profit organization dedicated to advancing augmented reality (AR), and the producer of Augmented World Expo – the world's largest event dedicated exclusively to the AR industry. In 2009, Ori was the co-founder and CEO of Ogmento, one of the first venture-backed companies conceived to develop and publish augmented reality games – games that are played in the real world. Ori is a recognized speaker in industry events and a sought-after advisor for AR initiatives.

### Abstract

In this talk I will review a collection of AR experiences and test them against Lex Ardez' "3 laws of augmented reality design":

1. Augmentation must emerge from the real world and/or relate to it,
2. Augmentation must not distract from reality, but rather make you more aware of it,
3. Augmented interaction must deliver a superior experience to alternatives, or better yet – there's no alternative.

These rules are very logical and simple and yet most AR implementations fail to meet these laws. When it comes to defining an AR experience, the #3 is the most important: do not implement AR only for a cool factor; if a traditional interaction technique (on computers, mobile devices etc.) does a good job – do not try to do recreate it with AR. Look for the specific experiences that can only be achieved with AR, even if it's very niche, then hire designers that are willing to experiment, try and fail until they find the right formula. In most cases the simpler experience is the better experience.

The talk is based on my experience in the last 6 years building AR applications and reviewing practically every AR app that was published in that time frame. I have seen many applications that have a wow factor that lasts for 2 minutes – but most applications are not used more than once. Designers and producers need to look at it in a very different way than traditional user experiences. It's important to understand that AR is about digitizing our interacting with the physical world. It should not be viewed as a traditional form of Human Machine Interaction (HMI). But rather be thought of as Human-World-Interaction, which requires a new thinking, new rules, and new experiences.

I believe that in the next few years we'll see AR becoming an integral part of any aspect of our work and life. And it will completely change the way we interact with people, places and things. Of course traditional approaches (PCs, mobile touch) will still be best for certain things – and AR shouldn't be forced for things that it's not intended for – but it'll create new categories of things that we can't even imagine. AR has the power to enable us to do things and feel things we couldn't otherwise. It can help us learn, and master skills instantly. AR Technology has reached a "good enough" level; it is up to designers to bring it to the masses in a meaningful way.

*Keywords:* Augmented, Reality, Design, Applications, Laws, Human machine interaction.

## Invited Speech 14: Autonomous Systems for Smarties

**Chair:** Pete Wassell

**Date/Time:** Saturday, June 29, 2013 / 17:00–17:30 hrs

**Venue:** Room One



**Nikola Serbedzija**

*Fraunhofer FIRST, Berlin Reflect Project  
Fraunhofer, Germany*

**Nikola** works at Fraunhofer FOKUS where he is responsible for new research activities and innovative technology. He was a visiting professor at University of Technology Sydney (1999–2000) and at University of Arts, Berlin (2000–2008).

His major research areas are: Adaptive Control, Pervasive Adaptation, Ubiquitous Computing, Middleware Architectures, and Internet Programming, mostly applied within embedded and real-time systems, ambient assistance and empathic systems.

As a principle designer he led the developments of a number of practical systems in vehicular, in- and out-door infrastructures and e-commerce domains. He is currently involved in a large EU project dealing with autonomous control [ASCENS project: <http://www.ascens-ist.eu/>].

### Abstract

Managing software intensive systems that run in highly dynamic environments, where physical and social context, operational and functional requirements and workloads are continuously changing is a grand challenge in software engineering. In search for adequate technical solutions autonomic, knowledge-based and adaptive behavior have emerged as necessary characteristics of smart technology. Here, an approach to engineer smart systems is described, showing how to achieve awareness, adaptation and autonomous functioning of technical systems. The approach is based on decomposition of a complex system in service components – functionally simple building blocks blended with local knowledge attributes. The components behavior that satisfies local goals allows for a local autonomy. The internal components' knowledge – representing local awareness – is used to dynamically construct ensembles of service components. Ensembles capture collective behavior by grouping service components in many-to-many manner, according to their communication and operational/functional needs meeting global goals, thus yielding autonomous behavior at a collective level. Linguistic constructs and software methods and tools supporting modeling, validation, development and deployment of autonomous systems are presented and illustrated by practical examples. After having shown how autonomous systems can be built, their pragmatic deployment is considered by addressing the following questions: to what extent the presents systems are really autonomous; how autonomous we want them to be; can we control the level of autonomy; are we loosing our own autonomy in favour of technical systems' autonomy; what are the application domains that require autonomous systems and in which domains we do not want them. Last but not least the focus is shifted to the emerging issue of the impact that the development of smart technology can have on individuals and society in general.

*Keywords:* Adaptive mechanisms, Autonomous systems, Software engineering, Technology impact, Social implications.

## Invited Speech 15: Electronic Textile Interfaces

**Chair:** Chris Dancy

**Date/Time:** Friday, June 28, 2013 / 14:00–14:30 hrs

**Venue:** Room Two



**Clint Zeagler**

*Georgia Institute of Technology, United States*

While teaching textiles and fashion design studio classes at Savannah College of Art & Design, Zeagler realized his true passion lies in bridging the gap between the disciplines of design and Human Centered Computing.

A diverse background in fashion, industrial design and textiles drives his research on electronic textiles and on-body interfaces with the Contextual Computing Group of the GVI center of Georgia Tech. As a Research Scientist I for the Georgia Tech School of Industrial Design he teaches courses on Wearable Product Design and an ID section of Mobile and Ubiquitous Computing (MUC). Zeagler enjoys working with corporations such as HP/Palm and Google to bring real world experience into the classroom. He recently acquired a Georgia Space Consortium grant to fund MUC student projects on wearable computing for space – a wonderful opportunity for undergraduate students.

He is also a member of the NASA Wearable Technology Cluster a group of scientists and academics working together to give advice to those in NASA working on wearable computing or electronic textile projects. A deep understanding of the garment production process fosters innovation in his research. Zeagler's company Pecan Pie Couture hand dyes, embroiders, and screen-prints textiles and garments. Building upon that skillset, his recent research led to the creation of the proprietary Electronic Textile Interface Swatch Book ESwatchBook in collaboration with Thad Starner.

This innovative tool was made possible by an internal Georgia Tech grant that he co-authored with Thad Starner and Craig Forrest, which allowed GA Tech to purchase sewing and embroidery equipment for the GVI Prototyping Lab. The ESwatchBook is designed to help facilitate discussions between the skill and craft-based design disciplines (i.e. fashion) and more technical disciplines (i.e. computer science). To put the ESwatchBook's capabilities to the test, he developed a series of workshops at multiple colleges with the purpose of bringing together designers with engineers / technology specialists.

The workshops were funded by a National Endowment for the Arts grant, which he co-authored.

### Abstract

Can we use the fabric and embellishments that create the garments we wear to also operate and control the electronic devices we carry with us? Why hasn't technology found its way into our garments, which are both wearable and ubiquitous? What uses could shine as exemplary applications to validate the benefits of textile interfaces, and what hurdles do we need to overcome to help make textile interfaces useful alternatives? Georgia Tech's contextual computing group in collaboration with Georgia Tech's School of industrial Design is looking to answer these questions through workshops, user studies and prototype development. Specifically, I will discuss e-textile techniques we can use to create interfaces for on-body interactions. It is also important to understand the limitations and wash-ability of the conductive materials used to create electronic textile interfaces, and how to overcome these limitations by adjusting machinery and garment design. Through project examples I will showcase the different uses we have found for our electronic textile interfaces, and how they could have a broad and important impact. Finally, I will layout some important design considerations for creating your own electronic textile interfaces.

*Keywords:* Technology, Wearables, Fashion, Textile interfaces.

## Invited Speech 16: The Future is Un-Real

**Chair:** Gene Becker

**Date:** Friday, June 28, 2013 / 16:30–17:00 hrs

**Venue:** Room One



**Rob Manson**

*Managing Director, MOBLabs  
CEO & co-founder of buildAR.com*

**Rob Manson** is CEO & co-founder of buildAR.com, the world's leading Augmented Reality Content Management System.

Rob is an Invited Expert with the W3C and Chair of their Augmented Web Community Group. He is also one of the co-founders of ARStandards.org and an active evangelist within the global AR & standards communities.

Rob is regularly invited to speak on the topics of AR, continuous & blended user experiences, multi-device & mobile platforms and the future of the web.

### Abstract

“Augmented Reality”, “Diminished Reality”, “Virtual Reality”, “Mixed Reality”, “Mediated Reality”, “Augmediated Reality”, “Augmented Virtuality”, the now pervasive “Online Reality” and of course the good old “Offline or ‘Real’ Reality”! It seems like the future is fragmenting your sense of reality to the point where it may feel like you are “losing your grip on reality”. This presentation explores the different conceptual models that have been used to define the fundamental idea of “Reality”. It explores the structural changes that Pervasive Computing is creating and how they impact these definitions. It lays out the key perspectives on “where” reality may actually exist and how it is constructed. Then it paints a broad framework that integrates these different perspectives into one single model in an aim to make this complex and abstract discussion both simpler and more rigorous.

This discussion has broad implications for our sense of “Body Image”, “Personal Space”, “Empathy”, “Personal Relationships”, “Human Computer Interfaces” and the “limits of Neuroplasticity”.

The position you take here can set the boundaries for your views on “what it means to be a ‘real’ human”.

*Keywords:* Reality, Augmented reality, Pervasive computing, Diminished reality, Virtual reality, Mixed reality, Mediated reality, Augmediated reality, Augmented virtuality, Online reality, Offline reality, Wearable computing, Head mounted displays.

## Invited Speech 17: Augmented Reality and the Emergence of 'Point-of-Eye' in Visual Culture

**Chair:** Günter Alce

**Date/Time:** Friday, June 28, 2013 / 14:00–14:30 hrs

**Venue:** Room One



**Helen Papagiannis**

*Chief Innovation Officer (CIO), Infinity Augmented Reality Inc., New York City, USA*

Nearing completion of her doctoral degree, Helen has been working with Augmented Reality (AR) for nearly a decade with a focus on storytelling and creating compelling experiences in AR. Helen was named among the NEXT 100 Top Influencers of the Digital Media Industry in 2013, and was featured as an innovator in the book, “Augmented Reality: An Emerging Technologies Guide to AR”, published in 2013.

Prior to joining Infinity AR, she was a Senior Research Associate at York University’s Augmented Reality Lab in the Department of Film, Faculty of Fine Art.

Helen has presented her interactive work and Ph.D. research at global conferences and invited events including TEDx (Technology, Entertainment, Design), ISMAR (International Society for Mixed and Augmented Reality) and ISEA (International Symposium for Electronic Art).

Helen’s TEDx 2011 talk was featured among the Top 10 Talks on Augmented Reality and Gamified Life. Prior to her augmented life, Helen was a member of the internationally renowned Bruce Mau Design studio where she was project lead on “Massive Change: The Future of Global Design”, an internationally touring exhibition and best-selling book examining the new inventions, technologies, and events changing the world.

### Abstract

As a Ph.D. (A.B.D.) researcher, my practice has focused on Augmented Reality (AR) as a new creative medium, working towards identifying and contributing to a stylistic language of AR as it emerges. With no defined conventions, AR is still in its infancy, and as such, it is a critical time for artists, designers, filmmakers, and storytellers to help shape its creative future and cultural impact as a medium.

This talk will highlight ‘Point-of-View’, more specifically, ‘Point-of-Eye’, as a characteristic of AR eyewear that is beginning to impact and influence contemporary visual culture in the age of AR as a new medium, particularly as a trope in storytelling.

AR eyewear like Google’s “Glass” (2013) and Mann’s “Digital Eye Glass” (EyeTap) (1981) are worn in front of the human eye, serving as a camera to both record the viewer’s environment and superimpose computer-generated imagery atop the present environment. With the position of the camera, such devices present a direct ‘Point-of-Eye’ (PoE), as Mann calls it, providing the ability to see through someone else’s eyes.

In “The Cinema as a Model for the Genealogy of Media” (2002), Andre Gaudreault and Phillippe Marion state, “The history of early cinema leads us, successively, from the appearance of a technological process, the apparatus, to the emergence of an initial culture, that of ‘animated pictures’, and finally to the constitution of an established media institution” (14). AR is currently in a transition period from a technological process to the emergence of an initial AR culture, one of ‘superimposed pictures’, with PoE as a characteristic of the AR apparatus that will impact stylistic modes.

Gaudreault and Marion identify key players in this process as: the inventors responsible for the medium’s appearance, camera operators for its emergence, and the first film directors for its constitution. ‘Camera operators’ around the world are beginning to contribute to AR’s emergence as a medium, and through this process, towards an articulation of a media language of AR. Mann, described as the father of wearable computing, has

### *Invited Speeches*

been a 'camera operator' since the 90's. In 2013, Google Glass's early adopter program selected 8000 'camera operators' to explore these possibilities, with Kickstarter funded proposals since from directors for PoE film projects including both documentaries and dramas. What new stories will the AR apparatus enable? Like cinema before it, what novel genres, conventions, and tropes will emerge in this new medium towards its constitution?

*Keywords:* Augmented reality, Point-of-eye, Visual culture, Storytelling.

## Plenary Speeches

### Plenary Speech 1: Drones for Good

**Chair:** Susannah Sabine

**Date/Time:** Saturday, June 29, 2013 / 16:30–17:00 hrs

**Venue:** Room Two



**Matthew Schroyer**

*Founder, Professional Society of Drone Journalists (PSDJ)*  
*dronejournalism.org*

Schroyer has a Master's in journalism from the University of Illinois Urbana-Champaign, where he taught journalism and mapped crime and pollution as part of data journalism investigations. He was a contributor to CampusCrime.net, an interactive web site using computer assisted reporting practices to report on crime at UIUC, which won an Mark of Excellence award from the Society of Professional Journalists (SPJ).

Presently, he writes and conducts research for the National Science Foundation grant EnLiST, which offers entrepreneurial leadership training and professional development for K-12 STEM teachers. At EnLiST he studies how teaching and learning networks that bridge classrooms, schools, and districts can be used to effect positive changes. At the grant, he also develops the "Drones for Schools" program, and teaches students to design, fabricate and program unmanned aerial systems to monitor the environment.

He is the founder the Professional Society of Drone Journalists (PSDJ) at DroneJournalism.org, and co-founder of the transdisciplinary Drones For Good initiative.

#### Abstract

Unmanned aircraft systems, more commonly called "drones" in popular media, face tremendous hurdles to being accepted in everyday life. Due to sensationalist news coverage and a gap in technical knowledge amongst the public, the perception of this new technology is overwhelmingly negative. And yet, the difference between the robots used in war, and the ones being used over forest fires, farmlands, and wildlife habitats are worlds apart. This information imbalance has resulted in a surge of American states proposing legislation to limit the use of unmanned aircraft. Some legislation would require police departments to obtain search warrants before deploying unmanned aircraft, which many privacy advocates agree is necessary. However, over-broad legislation could stifle economic and technological innovation, and block this life-saving technology from being used.

The dangers to privacy and safety deserve consideration, but they must be debated alongside many benefits, which include disaster warning and mitigation, city planning, wildlife and resource management, journalism, and STEM education. This talk will include examples of how robotic aircraft have improved STEM education and allowed students to adopt engineering mindsets, and how this new technology can help meet the increasing demands to enhance engineering curriculum at the primary and secondary education levels. This presentation will examine how unmanned aircraft helped end illegal water contamination in a part of Texas, helped minimize exposure to dangerous levels of radiation in Japan, and provided intelligence to mitigate a natural disaster Malaysia. It will detail how UAS have been used to enhance journalism and journalism education, with an emphasis on the "drone" as a device to collect verifiable, geospatial data, instead of relying on hearsay and data from outside entities. Finally, with an eye to the future, this talk also will explore the potential for this technology to be integrated into "smart" cities and augmented reality.

*Keywords:* Drones, Good, Bad, Legislation, Benefits, Cases, Journalism, UAVs.

## Plenary Speech 2: If Technology is a Dissipative Structure, Bring It On Deserves a Closer Look

**Chair:** Chris Hables Gray

**Date/Time:** Saturday, June 29, 2013 / 10:00–10:30 hrs

**Venue:** Room One



**Jeff Robbins**  
Rutgers University

At Rutgers University, **Jeff Robbins** teaches upper level research writing courses on a wide spectrum of topics including “Technology”, “Order, Chaos, and the Universe”, “The Corporation”, and “Biosphere Politics”. He has a Bachelor’s Degree in Mechanical Engineering from Carnegie Mellon University and a Master’s / A.B.D. in Physics from the University of New Mexico. Before coming to Rutgers in 2002, his professional career ranged from research engineering on the Apollo Saturn V rocket to automated testing of electronic and fiber optic systems. His research interests stem from an ongoing concern for the, too often swept aside, bite backs of rising technical order.

In support of his concern, Jeff has moderated forums on the future of artificial intelligence, computers, and robotics, and media’s increasing role in childhood and adolescence. He has been invited to speak on the impacts of GPS navigation dependency, marketing to children, and high definition television. In addition to presentations at International Society for the Systems Sciences sponsored conferences, beginning with the 1985 Carnahan Conference held at the University of Kentucky, he has presented 10 papers at IEEE Society on Social Implications of Technology conferences and international symposiums.

His papers and articles have been published in *Technology and Society Magazine*, *The Journal of Cases on Information Technology*, and *The New Atlantis*. His essay, “Humanities’ tears” appears as a chapter in *Exact Methods in the Study of Language and Text*. “An Eastern Exposure on the West,” won the \$10,000 First Prize in a national essay competition. The prize was presented at the U.S. National Press Club. He recently completed a book manuscript with the working title *Shortcut: Technology and the Trap of Losing It For Not Using It*. His first book, *On Balance and Higher Education: A Gesture to the Second Law of Thermodynamics*, was published by Philosophical Library. It is available in 94 research libraries worldwide.

### Abstract

Pouring forth, faster and faster, from the hi-tech cauldron are products whose powers exceed even the wildest speculation of yesterday’s science fiction. Smartphones, one million apps and counting, 3D printers, GPS to find and be found, chip implants in body and brain, dark pools of high-speed trading algorithms, self-driving cars, self-learning robots, Internet in your glasses, designer crops, livestock, and athletes... While the knee-jerk response to smart and new is to bring it on, how do we know that backstage is an unseen agenda? An agenda whose means are us, whose ends are not. Of particular concern, as it bears on advancing technology, is a proposal by Eric Schneider and the late James Kay that life is a response to the thermodynamic imperative of dissipating gradients. Evolving life represents, in their words, “order emerging from disorder in the service of causing even more disorder.” Their claim meshes with 1989 IEEE “Technics, Culture, and Consequences” conference contributor Rod Swenson’s view that “the world is in the order production business” because an ordered system can dissipate existing order more efficiently than helter-skelter falling apart. Examples include Bénard Cells self-organizing to escalate temperature gradient destruction, devastation produced by the massive cyclonic order in a hurricane, the chaos, suffering and death producible by the technical order in weapons, or the more subtle dissipations of technology doing more and more of the work for us. If the “accelerating returns”, as Ray Kurzweil puts it, of hell for leather technical advance represents the leading edge of life as a dissipative structure, as order emerging from disorder in the service of causing even more disorder, are we included in the returns of technical order? Or are we among the recipients of more disorder? This paper takes a closer look.

## Plenary Speech 3: The Design of a Lifelogging Camera

**Chair:** Simon Randall

**Date/Time:** Thursday, June 27, 2013 / 14:00–14:30 hrs

**Venue:** Hart House, historic center of culture at The University of Toronto



**Martin Källström**  
CEO Memoto AB, Sweden

**Martin** is the founder and CEO of Memoto, the Stockholm startup developing the world's smallest lifelogging camera. He is an experienced entrepreneur and technologist, thinker and tinkerer. The past decade was a period of transformation for him. Since both his parents passed away in cancer and his two daughters came into his life, he realized how much value there is in the small everyday moments that ties our lives together. This realization paired with his view on life that anything is possible if you put your heart into it, was the igniting spark behind Memoto.

His previous company is Twingly, which was a revolution in the European blogosphere when it launched in 2006, bridging the gap between blogs and new media and the old, thought to be dead newspapers. The social media search engine now feeds social media data to many international media monitoring companies while still being a strong democratization platform by providing newspaper readers with the in-depth conversations from the blogosphere.

Martin's mantra in life is to strive to create value rather than success. With the launch of Memoto, thousands of people are now looking forward to see how their lives will be transformed by the advent of the world's smallest lifelogging camera.

### Abstract

Lifelogging has the potential of transforming our lives, both by acting as a mirror in which we can see a reflection of our lives for self improvement and to allow our memories to become searchable and shareable. Even the time we spend with people we love over time fades in our memories. A lifelogging camera should therefore be designed to comfortably be worn without it becoming an intruder in life's most precious moments.

How can we create a lifelogging camera that is comfortable to wear and give an honest and trustworthy impression? That is subtle enough to not be distracting but still not give the impression of being a spy camera? What options are available for the look and feel of a wearable camera and what kind of emotional response will different designs instill in people around the wearer?

Martin Källström from Memoto shares the design principles that have guided the development of the Memoto camera and share insights gained from both the development process and early beta testing. He will present the original vision and how it has changed over time as a result of the experiences made during development.

*Keywords:* Memoto, Lifelogging, Camera.

## Plenary Speech 4: Governmental and Private Video Surveillance

**Chair:** Pete Wassell

**Date/Time:** Saturday, June 29, 2013 / 15:30–16:00 hrs

**Venue:** Room One



**Susan N. Herman**  
*President of the ACLU*  
*Centennial Professor of Law, Brooklyn Law School*

**Susan N. Herman** was elected President of the American Civil Liberties Union in October 2008, after having served on the ACLU National Board of Directors for twenty years, as a member of the Executive Committee for sixteen years, and as General Counsel for ten years.

Herman holds a chair as Centennial Professor of Law at Brooklyn Law School, where she currently teaches courses in Constitutional Law and Criminal Procedure, and seminars on Law and Literature, and Terrorism and Civil Liberties. She writes extensively on constitutional and criminal procedure topics for scholarly and other publications, ranging from law reviews and books to periodicals and on-line publications. Recent publications include two books, *TERRORISM, GOVERNMENT, AND LAW: NATIONAL AUTHORITY AND LOCAL AUTONOMY IN THE WAR ON TERROR*, editor and co-author, with Paul Finkelman (Praeger Security International 2008) and *THE RIGHT TO A SPEEDY AND PUBLIC TRIAL* (Praeger 2006) (part of a series on the Constitution), and law review articles including *The USA PATRIOT Act and the Submajoritarian Fourth Amendment*, 41 HARV. CIV. RTS.-CIV. LIB. L. REV. 67 (2006).

Herman has discussed constitutional law issues on radio, including a variety of NPR shows; on television, including programs on PBS, CSPAN, NBC, MSNBC and a series of appearances on the Today in New York show; and in print media including Newsday and the New York Times. In addition, she has been a frequent speaker at academic conferences and continuing legal education events organized by groups such as the Federal Judicial Center, and the American Bar Association, lecturing and conducting workshops for various groups of judges and lawyers, and at non-legal events, including speeches at the U.S. Army War College and many other schools. She has also participated in Supreme Court litigation, writing and collaborating on *amicus curiae* briefs for the ACLU on a range of constitutional criminal procedure issues, and conducting Supreme Court moot courts, and in some federal lobbying efforts.

Herman received a B.A. from Barnard College as a philosophy major, and a J.D. from New York University School of Law, where she was a Note and Comment Editor on the N.Y.U. Law Review. Before entering teaching, Professor Herman was Pro Se Law Clerk for the United States Court of Appeals for the Second Circuit, and Staff Attorney and then Associate Director of Prisoners' Legal Services of New York.

### Abstract

The ACLU has long been concerned about the proliferation of governmental video surveillance. In New York City, NYCLU volunteers counted and mapped thousands of surveillance cameras in Manhattan alone. In California, a report disclosed that video cameras were becoming ubiquitous in 37 cities, and that no one was monitoring the use of the images obtained.

On the other hand, the ACLU supports the right of individuals to fight back against governmental misconduct by videotaping police activity, at demonstrations or during private encounters. Videotapes have helped to provide concrete evidence of police misconduct on many occasions, including the private videotape that recorded Los Angeles police officers brutalizing a man named Rodney King.

While privacy is becoming a rare and vulnerable commodity in these days of omnipresent cell phone cameras, we believe that there is greater reason to be concerned about governmental surveillance than about private sur-

## *Plenary Speeches*

veillance. In addition to threatening privacy, government-run surveillance radically changes the relationship between the individual and government. Video surveillance in public spaces can be added to GPS tracking, facial recognition techniques, radio frequency identification (RFID) tags, and vast databases to expose where anyone is and what they are doing at any given time.

Some ask why they should care if the government knows what they are doing if they are not committing any crimes. But because the government has the power to charge people with crimes and thereby deprive them of liberty, knowledge in the hands of the government becomes a unique form of power. People might become reluctant to engage in political protest or other activities the government might find suspect if they believe that a Big Brother government is always watching.

Whether we change our behavior if we believe our neighbors might be watching is an interesting question, but of a different order.

*Keywords:* Wearable computing, AR, Civil liberties, Privacy erosion, Evidence, Compliance, Regulation, Video surveillance, Governmental surveillance, Private surveillance, Chilling effect.

## Plenary Speech 5: The Need for User Centered Wearable Devices for the Blind

**Chair:** Douglas Baldwin

**Date/Time:** Friday, June 28, 2013 / 09:00–09:30 hrs

**Venue:** Room One



### **Daniel Kish**

*President, World Access for the Blind*

Daniel Kish is the lead founder and President of World Access for the Blind. This 501(c)(3) non-profit organization uniquely combines a self directed, no limits approach with expertise in perceptual development, positive psychology, person-centered instruction, and public education to develop and mobilize innovative, high impact strategies to facilitate self directed achievement by challenging all forms of blindness throughout the world.

Daniel holds Master's degrees in both Developmental Psychology and Special Education, emphasising perceptual development, family dynamics, and children at risk. He also holds two national certifications in Orientation and Mobility, COMS and NOMC. Daniel is the first totally blind individual to obtain both certifications. He has maintained employment in this capacity since 1996 as an itinerant instructor for many school districts, rehabilitation agencies, and private persons throughout the world. He believes in a strong interdisciplinary education model, making a point to work in close collaboration with all professionals and other supports in relation to each student.

Consequently, Daniel has collaborated extensively with very renowned therapists and specialists in the areas of neural science, communication, biomechanics, and perception. Given his unique combination of training, background, and associations, Daniel refers to himself as a Perceptual Mobility Specialist, emphasizing in his instructional practice the perceptual foundations underlying navigation and environmental interaction. Daniel has worked with over 500 blind students of all ages and backgrounds, and from many cultures. He has particular experience with deaf-blindness, autism, and perceptual processing disorders.

Though Daniel's main expertise lies in developing all aspects of human perception in sighted as well as blind people, he is perhaps best known for his expertise in echolocation. In this area he has conducted pilot research, and has completed one of the most comprehensive literature reviews detailing the nature and utility of echolocation in blind humans. From this research, in-depth collaborations with noted scientists and perception experts, and over ten thousand hours experience with students of all types and cultures, Daniel created the first systematic, comprehensive echolocation curriculum for advanced training. So advanced are the results of this training that Daniel has coined the term "FlashSonar" to underscore the advantages to his specific approach to the advanced instruction and use of active echolocation in contrast to traditional approaches to echolocation, which he believes to be rudimentary by comparison.

Daniel and some of his students have applied FlashSonar combined with other techniques to riding bicycles independently at moderate speeds through unfamiliar environments, and to participate effectively and independently in other complex activities such as skating, ball play, and solo wilderness travel. Through World Access for the Blind and its partners, Daniel is engaged in global efforts to share the advantages of perception based instruction and FlashSonar in the professional training and personal development of all blind people.

### **Abstract**

This talk focuses on outlining some of the challenges that modern technology presents disabled individuals. Blindness is emphasized as an example that exemplifies the issues faced. Blind people fall into a dichotomous category in which they both benefit greatly from the technological revolution, and are becoming even more

## *Plenary Speeches*

isolated and immobilized than ever before. Certainly, the industry at large as it moves forward with greater ideas is steadfastly focused on visual augmentation, with little to no interest in non-visual access. Consumer electronics from the most basic to the most complex which everyone takes for granted, and which are presumably making life easier for everyone (who can see), are fast presenting folks who cannot see with a more imposing barrier to everyday functioning than we've ever faced. For example, the simple act of TV watching has been revolutionized so far into the modern age as to be virtually off limits to the blind, as are an increasing number of household appliances and handheld devices. Specific examples of this will be provided, together with discussion about implications and solutions. One answer to be discussed is the design of a user centered wearable device usable by blind folks that will interface or access all manner of vision guided devices such as TV's and household appliances. The problem with the user centered gadget is that, no one seems to care about the development or implementation of such a thing. However, due to pervasive lack of special interest, the only way to move something like that forward is by making it somehow intriguing to the mainstream - something that everyone wants. Some thoughts about the characteristics of such a device will be provided, together with ideas about how to circumvent barriers to production and distribution.

*Keywords:* Wearables, User-centric devices, World access for the blind.

## Plenary Speech 6: Brain Computer Interfaces: Ethical and Policy Considerations

**Chair:** Alexander Hayes

**Date/Time:** Friday, June 28, 2013 / 11:30–12:00 hrs

**Venue:** Room Four



**Ellen M. McGee**  
*Ethics Consultant*

Ellen M. McGee is presently an ethics consultant, offering ethics education to organizations and institutions, and lecturing widely. She, also, serves as a speaker for the New York State Council on the Humanities.

She is a retired adjunct professor of philosophy at Long Island University, where she taught for over twenty-five years, having previously taught at Fordham University. She founded and directed the Long Island Center for Ethics, now The Institute for Education for Social Justice. She subsequently served as Associate for Bioethics at The

Long Island Center for Ethics where she coordinated the Nassau-Suffolk Health Care Ethics Network. Dr. McGee received a Ph.D. and M.A. in Philosophy from Fordham University, New York and a B.A. from Marymount College, Tarrytown, New York. She teaches medical ethics, computer ethics, social work ethics and philosophy at the undergraduate and graduate levels, and researches, lectures, and publishes in the areas of enhancement technologies, particularly implantable brain chips, and end-of-life care, suicide intervention, human rights, and reproductive issues.

Dr. McGee has been a member of both The Hospice Project and The Hospice and Alzheimer Project at the Hastings Center; she was a member of the Advisory Committee on Nursing Homes: New York State Partnership to Improve End-Of-Life Care, and has served on a Hospice Ethics Committee and both the IRB and Ethics Committees of area hospitals. She has appeared as an ethics consultant on the network news and radio and has developed, organized and presented many conferences including those on Enhancement Technologies, Good Dying, and Health Care for Diverse Communities.

Her articles and papers have been published in the Hastings Center Report, The American Journal of Bioethics, AJOB Neuroscience, and the Cambridge Quarterly of Healthcare Ethics; the article she coauthored in 1999 with Gerald Q. Maguire, Jr., on "Implantable Brain Chips? Time for Debate" has been anthologized and republished widely.

### Abstract

In the not so distant future, we will probably witness the emergence of humans who are essentially coupled with bioelectronic devices, science fiction's "cyborgs." Innovations in semiconductor devices, cognitive science, bio-electronics, nanotechnology and applied neural control technologies, are facilitating breakthroughs in these hybrids of humans and machines. Noteworthy ethical and legal concerns are raised by three future possibilities: 1) the prospect of using these technologies to improve and augment human capabilities, 2) the prospect of achieving a type of immortality through cloning of an individual and implanting the clone with a chip that contains the uploaded memories, emotions and knowledge of the clone's source, and 3) the chance that humankind, as we know it, may eventually be phased out, or become just a step in guided evolution. There is a need to address the risks inherent in these enhancement technologies, and to consider, from the standpoint of neuroethics, the issues of safety, informed consent, justice, privacy and autonomy, that brain computer interfaces raise. This talk proposes regulation through scientific societies, national guidelines, federal agencies and United Nation policies. Countries should consider establishing agencies to monitor enhancement technologies, along with the adoption of new governing principles and restructured requirements. Ultimately, the world community, through the United Nations, needs to address, via debate and treaty, the enhancement possibilities inherent in brain computer interfaces.

*Keywords:* Ethics, BCI, Wearables, Neuroethics, Justice, Privacy, Autonomy.

## Plenary Speech 7: Moving Surveillance Techniques to Sousveillance: Towards Equiveillance using Wearable Computing

**Chair:** Gene Becker

**Date/Time:** Friday, June 28, 2013 / 15:30–16:00 hrs

**Venue:** Room One



### **Corey Manders**

*Research Scientist, Institute for Infocomm Research, A\*STAR, Singapore*

Upon first glance, Corey's professional journey has been what most would consider an almost impossible dichotomy. As a former professional musician, his appreciation for the aesthetic is undeniable. As a Ph.D in computer engineering, his respect for the technical can't be taken for anything but remarkable either.

After earning his Bachelor of Fine Arts in music from York University in 1991, Corey spent the better part of a decade supporting himself as a musician. Creating and playing music while touring the world, as well as from inside the studio, he was able to realize a type of success in the arts that few are ever able to. However, while realizing one dream, he soon found that he had developed another.

In 1998, he found himself back in Toronto, but this time at the University of Toronto, and in a completely different field – technology. There he was able to study under several of the world's foremost experts in computer user interfaces and interaction, including Steve Mann, who is widely considered to be "the father of wearable computing".

Eventually, his educational experiences in computer science and engineering ultimately culminated in a Ph. D, and a new career in the tech world when he graduated in 2006.

In 2007 he joined the research team at the A\*STAR Institute for Infocomm Research in Singapore. There, he worked on numerous projects that studied and helped create new ways for people to interact with their technology. He has been published in dozen's of journals, and part of a team that designed and patented a system for the manipulation of 3-dimensional digital assets using physical movement.

Today, he brings his vast amount of tech knowledge and experience to his work. With his unique combination of computer engineering prowess, and passion for the arts, he's able to see things in ways that only a select few can.

### **Abstract**

To date, a large amount of research has been conducted using surveillance systems. In fact many conferences, journals, and research programmes are devoted entirely to this subject. However, sousveillance, "watching from below" (or capturing image data from the perspective of a live observer), being a newer area of investigation currently has much less associated work. Since both research topics involve image processing, many similarities exist. Thus, much of the work which is done in surveillance may be "ported" to sousveillance. One such example is that of colour constancy. In particular, a problem that occurs when using multiple cameras for surveillance and associated tracking, is that colours can vary widely across cameras. An object and it's associated data that appears in one view and one system, may present completely difference data in another camera and system. New techniques have been developed to attempt to unify colours between cameras and systems. The same problem exists in the area of sousveillance. For example, an object observed by one cyborg may appear differently to another cyborg. Given that in the situation of sousveillance, the camera control as well as the environment are largely in control of the wearcam operator/cyborg, colour constancy techniques which are used surveillance can actually be done more accurately in the case of sousveillance. This discussion will present one method of mapping an existing method of colour constancy for multiple surveillance cameras to colour constancy for a group of cyborgs.

*Keywords:* Surveillance, Sousveillance, Equiveillance, Cyborg, Color calibration, Color constancy, Cameras.

## Panels Session

### Mobile Health Panel

#### Healthcare & Public Health: Perspectives on Wearable Computing, Augmented Reality and the Veillances

**Chair:** Joseph Herkert

**Date/Time:** Friday, June 28, 2013 / 15:30–16:00 hrs

**Venue:** Room Two



**Luis Kun**

*Professor of National Security Affairs  
William Perry – Center for Hemispheric Defense Studies (CHDS)  
National Defense University  
Fort Lesley McNair Washington, DC 20319*

**Dr. Luis Kun** graduated from the Uruguayan Merchant Marine Academy. He got his BSEE, MSEE and Ph.D. in Biomedical Engineering from UCLA School of Engineering. Since 2003 Kun has been at the National Defense University, where he is a Professor of National Security Affairs at the Center for Hemispheric Defense Studies. He spent 14 years at IBM and later became the Director of Medical Systems Technology and Strategic Planning at Cedars Sinai Medical Center in Los Angeles. As senior IT advisor to the Agency for Health Care Policy and Research, Kun led HPCC and Telehealth efforts. As a Distinguished Fellow at the CDC, he wrote the IT vision as the Acting Chief Information Technology Officer for the National Immunization Program.

He lectures and writes extensively, in the intersection of Public Health, Healthcare, IT and Global Security and serves(d) in the Distinguished Visitor Program for the IEEE: Computer; Engineering in Medicine and Biology and the Society for Social Implications of Technology. A Fellow of the IEEE and the American Institute for Medical and Biological Engineering, Kun received AIMBE's first ever Fellow Advocate Award (2009). His (2002) IEEE-USA Citation of Honor reads "For exemplary contributions in the inception and implementation of a health care IT vision in the US." The Administrator's Award of Merit "For exceptional dedication and professional achievement that have greatly enhanced the recognition of AHCPR's research in the HPCC Program."

Universidad Favaloro from Argentina, named him "Profesor Honoris Causa" (2009). He received the Golden Core Member Award from the IEEE CS (2011).

#### Abstract

In the past decade during IEEE sponsored professional meetings the theme of "Global Health Transformation through true Interoperability" was brought to the forefront in the inaugural keynotes. Some technologies that started with the monitoring of hemodynamic variables of astronauts by NASA in the 60s were further developed by the Department of Defense for the purposes of treating their injured in the battlefield via Telemedicine. By August 5th, 1997 President Clinton signed the first piece of legislation that was allowing the concepts of home-care to be tried to measure cost and medical effectiveness. With the development of the Internet, the World Wide Web (WWW), social media, intelligent agents, mobile technology, sensors, and pieces of clothing containing them, a new generation of devices have been created offering new possibilities for improvements particularly in areas

such as assistance for living (for those suffering from chronic conditions), and more generally, homecare. The use of wearable computing and the use of augmented reality in the developed world, in particular, offer some unique opportunities to improve outcomes. In the 21st Century as Health Care and Public Health infrastructure intersect deeper into the many Information Technology (IT) subfields, abundant and formidable changes can occur that will allow society to shift current systems into some where wellness and disease prevention will be the focus. Many changes can affect positively medical outcomes which are cost effective as well as eliminate medical errors and patient safety for example. In these arenas, with the convergence of science, technology and with Information Technology acting as a catalyst for change, health care systems around the world are slowly shifting from “hospital based” ones into distributed systems that include: hospitals, clinics, homecare systems with treatment and management of chronic diseases for the elderly via Internet, etc. In order to achieve such visions, multiple efforts have been tried for creating electronic health record as well as the information highway for their use. In the US the health system is very scattered and most hospital systems do not contain for example mental health, dental health and or vaccine registry information. On one hand through major medical research the emergence of clinical and health data repositories or “Intelligent Data Warehouses” that not only include traditional clinical data, but also advanced imaging, molecular medicine, tissue micro-array analysis and other bioinformatics information is available. These increasingly multi-modality data warehouses are constantly updated, continuously expanded and populated with millions of records. Although these repositories of electronic information can be leveraged not only to improve point of care clinical decision-making for individual patients, they can also support population health chronic and infectious disease analytics (i.e., epidemiology and surveillance), cost efficient multi-center (e.g., and multi-country) clinical trials, and comprehensive post-market pharmaco-vigilance. On the other hand the integration of healthcare and public health is a major concern as well. Globalization (i.e., the interdependencies that each country has with many others) for example has raised the sense of awareness through “the information highway”. In 2004 the total production of flu vaccines coming to the US from the UK’s Chiron had to be thrown away (approximately in the range of 42 to 44 million vaccines).

During and since 2007 the US public has learnt through successive media stories related to: the death of pets due to food-import contamination, children’s toys imports containing lead paint, food contamination, drug contamination, drug ingredients contaminated, etc. During 2008 we heard about: People getting very sick from fish containing the ciguatera toxin and Tab / drinking water containing about 36 different medications, e.g., antibiotics, antidepressants, etc. As the northern hemisphere prepared for the second wave of the 2009 H1N1 Flu Pandemic (which was expected to start around October 2009) all nations could have benefited by having epidemiology and surveillance data from all southern hemisphere nations available for the production of more “accurate” vaccines. In 2011 the European Union had to cut back in their consumption of vegetables and fruit because of an e-coli outbreak. Simultaneously the food from Asia in some cases was contaminated with radiation from the nuclear disaster caused by the combination of earthquake / tsunami at the Fukushima site. In South America the eruption of the volcano Puyehue in Chile closed all the airports in Uruguay, Argentina, Paraguay and the south of Brazil. All of these events resulted in major conflicts regarding world demand for food supplies. Still the perfect opportunity to transform our health care systems to a strategy of disease prevention and wellness is in the horizon. Using information technology as an enabler, we can encompass a wide range of opportunities that can start at the cellular, molecular and genetics levels and go as far as population health. Initial immunization studies show the level of antibody titers against viral diseases depends on the circadian time of inoculation. The concepts of chronobiology and chrono-therapeutics can be used to generate disease prevention strategies based on these circadian-rhythm dependencies.

Just imagine how the public could also be better protected not only against environmental threats, water contamination, food borne diseases through the use of remote sensing data and a worldwide food enterprise architecture, but through alerts that could flow into a person through Wearable Computing, Augmented Reality and the Veillances. Data, Information, Knowledge and Wisdom could “flow” into an individual alerting him/her that they need to immediately visit their doctor, or stop consuming certain products. Some examples of our current problem – environment could change outcomes by using these tools:

1. Getting the right information at the right time- the steroid injection that they got for pain from laboratory x (in Massachusetts) is contaminated. Just in the USA, between September 2012 and March 2013 at least 44 people have died and over 700 are contaminated from fungal meningitis according to the CDC and their life may be at risk;

2. Preventing potential water and or food poisoning- on February 4th, 2013, a report regarding the drinking water in many places within the State of California containing large amounts of Arsenic. Since we eat year round vegetables and fruits, livestock, poultry, etc. from that State, it may require the public to be cautious.

As discovery from new research expands our knowledge about our body, its genome, and the cause-effect of new drugs, it also provides an opportunity to bring not only all these types of information to the forefront of the patient regardless where she /he may be at, but enable the transition from a system that has focused on disease to one that will focus on wellness through prevention and hopefully improve the quality of our lives.

*Keywords:* Personal health records, Future, Technology, Quality of life.

## Ambient Assisted Living Technologies and Their Social Implications: A Perspective from Europe

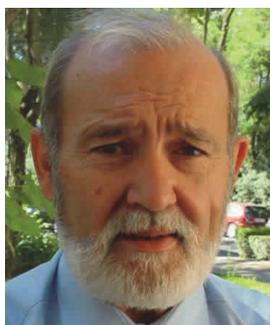
**Chair:** Joseph Herkert

**Date/Time:** Friday, June 28, 2013 / 16:00–16:30 hrs

**Venue:** Room Two

### **José L. Monteagudo**

*Head of Telemedicine and eHealth Research  
Instituto de Salud Carlos III, Madrid Spain*



José is Ph.D. on Telecommunication Engineering from the Polytechnic University of Madrid. Now he is leading the national Platform of Innovation Clusters on Telemedicine and e Health (PITEHS) for Chronic Care applications in Spain.

He has been involved in European research projects, and he has also served in various committees and working groups of the European Commission concerning research programs on e-Health. He is currently member of the Content Working Group of the AAL (Ambient Assisted Living) Joint Programme and participates in the

European Innovation Partnership on Active and Healthy Ageing.

### **Abstract**

Ambient Assisted Living (AAL) refers to intelligent systems of assistance for a better, healthier and safer life in the preferred living environment and covers concepts, products, systems and services that interlink and improve new technologies and the personal and social environment. R&D activity on AAL in Europe has been aimed to use technology to extend the time people can live in a decent way in their own home by increasing their autonomy and self-confidence, the discharge of monotonously everyday activities, to monitor and care for the elderly or ill person, to enhance the security and to save public and private resources.

Over the past years, national and European R&D programs have stimulated the development of innovative ICT-based AAL applications involving various technology areas and innovative technology approaches. For instance, the European AAL Joint Program, supported by 23 European Countries and the European Commission, has funded more than 150 projects over the last 5 years. These projects are directed to support elderly people in aspects such as the prevention and management of chronic conditions, social interaction, independence, mobility, self-management of Daily Life Activities and occupation in life [<http://www.aal-europe.eu>]. Research activities range from the practical aspects of body-worn sensors for medical interventions to the provision of holistic services within the AAL environment. Results include a great number of pilot experiences that have focused mostly on verifying technology prototypes and technical architectures. However, the breakthroughs in terms of widespread availability and deployment of AAL systems are yet to be achieved.

To address this situation, major collaborative efforts are now being mobilized under the initiative of the European Innovation Partnership on Active and Healthy Ageing (EIP-AHA) addressing the challenge of implementing AAL at scale [<https://webgate.ec.europa.eu/eipaha/>]. Working plan aims to identify and remove barriers to innovation across the health and care delivery chain, through interdisciplinary and cross-sectorial approaches. The Partnership goal is to increase by 2 the average number of healthy life years in the EU population by 2020. HLY is a functional health status measure that is increasingly used to complement the conventional life expectancy measures in Europe. The emphasis is not exclusively on the length of life, as is the case for life expectancy, but also on the quality of life. The HLY measure reflects the fact that not all years of a person's life are typically lived in perfect health. Chronic disease, frailty, and disability tend to become more prevalent at older ages, so that a population with a higher life expectancy may not be healthier. Indeed, a major question with an aging population is whether increases in life expectancy will be associated with a greater or lesser proportion of the future population spending their years living with disability. Health maintenance activities are an integral part of the experience of healthy and active ageing, and most notably they point not just to the physical health but also to mental well-being and social connectedness.

The EIP-AHA Strategic Implementation Plan has been adhered by 261 projects submitted by groups of stakeholders spanning the public and private sector. In addition, 54 regions and municipalities applied to be 'Reference Sites', to exchange good practice and to share knowledge and experience on past successes in active and healthy ageing. In this context our Institute is participating in the B3 Action Group on "Integrated care for chronic diseases, including remote monitoring at regional level" by means of the PITES Project. In particular we are engaged in citizen empowerment, development of the workforce and in interoperability aspects. In this subject interoperability of AAL devices (or rather its absence) is identified as a major obstacle to widespread diffusion because increases costs and reduces effectiveness of deployed systems. Beyond the devices sphere, a major concern is about interoperability of AAL data with the electronic patient health record, as well as the organizational interoperability, or the ability or organizations to interchange information and to collaborate in shared processes.

Regarding the social impact of AAL technologies, it must be taken into account technology is not the unique factor to consider. As some theorists have pointed out, society is not exclusively driven by technology. For them, technologies do not create the transformations in society by themselves; they are designed and implemented by people in their social, economic and technological contexts. In addition, at times, technologies have unintended consequences that combine to have serious impacts undreamed of by the creators of the technology.

Ambient Assisted Living technologies mean creating new worlds for aged adults. Certainly, a major driving force in human activity is the desire for optimal health, for better living conditions and improved quality of life. Individuals seek to achieve this for themselves, for their family, and for the communities of which they are a part. It is intended AAL technologies can help individuals to improve their quality of life, to stay healthier and to live longer, thus extending one's active and creative participation in the community. However it is difficult to assess the actual impact on the quality of life of currently developed AAL technologies and the implications of living in smart worlds. We need to understand the complex relationship between technology and society particularly considering the potentialities of ICT and its pervasive nature.

*Keywords:* Ambient intelligence, Assistive living, Technology, Social implications, Smart worlds, Europe.

## Will Wearable Computers and Augmented Reality Enable Us to Lead Healthy and Happy Lives?

**Chair:** Cara Morris

**Date/Time:** Saturday, June 29, 2013 / 13:30–14:00 hrs

**Venue:** Room One



**Alejandro (Alex) R. Jadad**

*Founder, Centre for Global eHealth Innovation;  
Canada Research Chair in eHealth Innovation;  
Professor, Institute of Health Policy, Management and Evaluation; and  
Department of Anesthesia; and Dalla Lana School of Public Health;  
University Health Network and University of Toronto  
Toronto, Canada*

Dr. Jadad holds the Canada Research Chair in eHealth Innovation at the University of Toronto and the University Health Network, where he is the Founder of the Centre for Global eHealth Innovation and Principal Investigator, Techna. He is also a Professor in the Department of Anesthesia, in the Institute of Health Policy, Management and Evaluation, and in the Dalla Lana School of Public Health, Faculty of Medicine, University of Toronto.

He is a physician, innovator, educator and public advocate whose mission is to optimize health and wellness for all, through the innovative use of information and communication technologies.

His research and innovation work focuses on virtual tools to support the encounter between the public and the health system (with emphasis on the management of polypathologies); interactive tools to promote knowledge translation and mentorship of health professionals and the public; and online resources to support social networks, to respond to major public health threats (e.g., chronic conditions, pandemics), to support international collaboration, and to enable the public (particularly young people) to shape the health system and society.

### Abstract

We all want to live a happy, healthy life until our last breath, with no regrets. Surprisingly, particularly within academic circles, we rarely discuss the meaning of these terms, and even less the role that technological breakthroughs could play to enable all humans to live full lives. In 2008, Dr. Jadad pointed out that the official definition of health, unchanged since the creation of the World Health Organization in 1948, would condemn us all to be not healthy as it requires “a state of complete physical, mental and social well-being and not just the absence of disease or infirmity.” After three years engaged in a global conversation, Dr. Jadad and an international team of collaborators re-conceptualized “health” as the ability for individuals or communities to adapt and self-manage when facing physical, mental challenges. This new approach allows anyone to be healthy, even when living with multiple chronic diseases.

In this session, Dr. Jadad will summarize a large body of knowledge that supports the new approach to health, describe similar efforts around the meaning of wellness and happiness, and showcase the work of a global network of innovators who are using these new conceptual insights to recreate all aspects of daily life. He will also challenge the audience to imagine and implement opportunities for wearable computers and augmented reality applications to meet the physical, mental and social challenges, and to eliminate the multiple sources of unnecessary suffering that we humans are facing in the 21st century.

*Keywords:* Wearable computers, Augmented reality, Full life, Evolution, Health, Happiness, Challenges.

## Wireless Platforms for the Hemodynamic Monitoring of the Elderly Patient

**Chair:** Joseph Herkert

**Date/Time:** Friday, June 28, 2013 / 16:30–17:00 hrs

**Venue:** Room Two



**Ricardo L. Armentano**

*DECANO, Facultad de Ingeniería, Ciencias Exactas y Naturales,  
UNIVERSIDAD FAVALORO – Buenos Aires (C1093AAS)*

**Ricardo Armentano** is currently Dean of the Facultad de Ingeniería, Ciencias Exactas y Naturales, of the Universidad Favaloro; class 1 researcher by the Ministry of Education, Culture and Technology of the República Argentina, Co-Director of the Cuidarte project and Grade 5 Investigator of the PEDECIBA (United Nations Program for the Development of Basic Sciences), within the project URU/84/002 of the Ministry of Education and Culture and the Universidad de la República, Montevideo, Uruguay and level 2 researcher of the national agency of research and innovation ANII.

He received the Engineering degree in 1984, by the end of 1994 he qualified as Doctor of the University of Buenos Aires in Physiological Sciences and in 1999 he obtained the Ph.D. degree from Université de Paris VII Denis Diderot, for the Doctorat de Biomecanique: Mecanique de Systèmes Biologiques. In 1994 he was appointed Principal Investigator of the Basic Science Research Institute of the Favaloro Foundation, and since then he is the leader of the Project Arterial System Dynamics, to which he has dedicated most of his efforts.

In 1996, he was appointed Director of the Master of Biomedical Engineering. In 2005 he was chosen Director of the Ph.D. programs in Signal Processing in the National Technological University of Buenos Aires, Argentina. He was President of the Argentine Society of Bioengineering (1996–1999). In 2001 he was elected as a Senior Member, and in 2005 Chair of the Argentine Chapter of the EMBS of the Institute of Electrical and Electronic Engineers. He was the Conference Chair of the 32nd EMBC IEEE International Conference Buenos Aires 2010. Ricardo Armentano has done a thorough, remarkable work in the field of arterial dynamics, from its theoretical fundamentals to its application in clinical practice.

Given that poverty, malnutrition and environmental degradation may increase the propensity to cardiovascular diseases, Professor Armentano focused their work to model cardiovascular dynamics in these high-risk groups. Ricardo Armentano has dedicated, throughout his career, a considerable amount of time to prepare and qualify a research group, aware of the importance that an adequate working environment has over the final results.

He created a team consisting of young students, engineers, medical doctors, physicists, mathematicians and other specialists. He centered his attention in human resources to spread out his latest advances and potentially increase the whole research line motivation. He is a Member of the IEEE Society on Social Implications of Technology since 2010.

### Abstract

With the number of people aged 65 and over rising relative to the rest of the population, the costs to the state to care for or assist them are set to continue increase. New wireless technologies could give new possibilities for monitoring vital parameters with wearable biomedical sensors, and give patients the freedom to be mobile and still be under continuous monitoring and thereby receive better quality of patient care. It is widely acknowledged that by assisting senior citizens to look after their health at home, their independence can be maintained for longer, providing a higher quality of life for the retiree and lower care costs for the state and family. Our approach consists of a platform for cardiac monitoring in daily life, at rest and during the physical activity of elderly patient. To this end we propose to adapt a technical garment (<http://www.gowtrainer.com/index.php>) that has 2 integrated sensors that capture the cardiac information of the user. It communicates via

### *Panels Session*

Bluetooth with the app for smartphones. A sensor adapted to be incorporated in a garment comprising a respiration sensor and at least two ECG sensors that in use of the garment are in contact with a user's skin. This monitoring system will be use to measure one or more parameters indicating a physical status of the elderly patient. The introduction of such a system into the lives of the elderly can also offer reminders to take medicines, dietary advice, immediate access to medical professionals and much more. It also reduces the need for visits to a local doctor. This presentation will also discuss the current promising hardware/software platforms for wireless cardiac monitoring that would include important measurements such as their blood pressure, arterial pulse wave velocity and have that information directly uploaded to the system. Any healthcare professional they deal with can therefore have immediate access to their recent health records.

*Keywords:* Cardiac monitoring, Elderly patient, Wearable biomedical sensors, Quality of life.

## Keynote Panel

### The Society of Intelligent Veillance

**Chair:** Jeremy Pitt

**Date/Time:** Thursday, June 27, 2013 / 12:05–12:30 hrs

**Venue:** Hart House, historic center of culture at The University of Toronto

**Marvin Minsky<sup>1</sup>, Ray Kurzweil<sup>2</sup> and Steve Mann<sup>3</sup>**

<sup>1</sup>MIT, United States

<sup>2</sup>Google, Inc, United States

<sup>3</sup>University of Toronto, Canada

The Society of Mind is the theory, emerging in the 1970s, that natural intelligence arises from the interactions of numerous simple agents, each of which, taken individually, is “mindless”, but, collectively, give rise to intelligence:

“What magical trick makes us intelligent? The trick is that there is no trick. The power of intelligence stems from our vast diversity, not from any single, perfect principle.” [Minsky 1988]

In many ways, Society of Mind has guided, or at least predicted, the direction modern computing has taken – distributed computing, GPGPU (General-Purpose Graphics Processing Units), the Internet, and cloud-based computing (which fulfills the Sun Microsystems slogan, “The network is the computer”).

The Society of Mind is inextricably intertwined with concepts like consciousness, free will, and mastery over one’s own self-determination. As such it is as much a philosophy as it is a theory.

The Age of Intelligent Machines is finally upon us. We take, as a given, that a computer program could exhibit human-level intelligence if it were technically advanced to the degree made possible by present-day computing hardware. [Kurzweil 1990]

*Keywords:* Society of Mind, Age of Intelligent Machines, Veillance.

## Sponsors

### Primary Sponsors



### Co-Sponsors



**IFMBE** (International Federation of Medical and Biological Engineering)



## Patrons

### Sapphire Patron



**Epson** is a global innovation leader that is dedicated to exceeding the vision of its customers worldwide.

While best known for its printing and projection products, Epson has taken a lead role in the burgeoning “smart glasses” market with the March 2012 launch of the Moverio BT-100, the world’s first android based, transparent display.

The Moverio BT-100 has quickly been adopted and customized by the development community in a number of fascinating ways. Please swing by our booth at IEEE ISTAS to check out our latest demos and partners – [www.epson.com/moverio](http://www.epson.com/moverio) and [www.youtube.com/moverio](http://www.youtube.com/moverio)



**APX-Labs** a privately-held software company headquartered outside of Washington DC with offices in Cambridge MA and San Francisco CA.

To meet the challenge of creating the premier enterprise smart glasses platform, we assembled engineers from a broad range of disciplines including: computer vision, game development, real-time networking, electrical and optical engineering, Android mobile development, human factors and mechanical engineering. – <http://www.apx-labs.com/>



**MetaView** is a wearable computing and augmented reality venture springing out of Columbia University. We have developed an amazing pair of stereoscopic glasses combined with super low latency gesture tracking.

We are actively advised by Professor Steven Feiner, who has many firsts in augmented reality to his name. We were recently accepted by Y Combinator, and joined by Professor Steve Mann as our Chief Scientist. We know natural computation is the future, and our goal is to bring a beautiful, flawless, and intuitive user experience to the world – [www.meta-view.com](http://www.meta-view.com)

### Ice Patrons



The **University of Wollongong’s** goal to secure a place in the top 1 per cent of universities worldwide is off to a good start with one of the four major world rankings (Leiden Ranking) showing UOW has topped NSW in the field of “Research Quality” – securing the University a top 1 per cent spot, out of about 20,000 universities worldwide.

UOW was ranked 186th in the world overall in the 2013 Leiden Ranking, moving up from 233rd last year. Overall, UOW was rated fifth in Australasia (and number one in NSW) for research quality. A standout for UOW was the quality of its Engineering disciplines which, according to the Leiden Ranking, has now seen Natural Sciences and Engineering move into 81st spot in the world – <http://www.uow.edu.au/eng/index.html>.

### Gala Patrons



**Autographer** is a new breed of digital camera that we believe can change the way the world thinks about photography.

Autographer’s development evolved from the Vicor Revue/Sensecam. Soon after launching into the medical research sphere, the Revue started to attract a large amount of interest from people who wanted to use it for more social, creative and documentary applications. In response OMG Life was setup to develop a consumer product.

## Patrons



**Streamfolio** provides invited individual users with unlimited access to a video portfolio with no storage limits. Streamfolio users are provided with a single user account within the Streamfolio Community, full access to all of the ELGG platform features upon login (public/private sharing), full access to the private Streamfolio video portfolio application upon login (private sharing only).

With a iPhone and Android mobile app. users can shoot, describe, tag and share their video creations with ease from their mobile device and then access the video at anytime online later. User can assign license types to their data including full copyright or CC BY. A share-email-trigger for a mobile user is currently in development. More information available at <http://streamfolio.com>.

### Lanyard Patron



Launched in 2009, **buildAR** was the world's first AR Content Management System (AR-CMS). The first version launched as a test to see if people were interested in being able to create their own augmented experiences.

It turned out you were! So then we got busy developing a production version and officially launched the new and improved buildAR at the Augmented Reality Event in Silicon Valley in May 2011.

### History of AR Exhibit Patron



Vuzix is a leading supplier of video and cloud connected video eyewear products in the consumer, industrial, media and entertainment markets.

The company's personal display products offer users a portable high quality viewing experience for industrial wearable displays, consumer digital content viewing as well as 3D, virtual and augmented reality experiences. Vuzix also provides developer software and support to enable the growth and development of AR applications for its mobile devices.

With its origins in defense research and development for next generation display solutions, Vuzix holds over 48 patents and patents pending in the video eyewear field. The company has won 14 Consumer Electronics Show Innovations Awards, the RetailVision Best New Product and several wireless technology innovation awards, among others. Founded in 1997, Vuzix is a public company (TSX:VZX --- News, OTC:BB: VUZI, FMB: V7X) with offices in Rochester, NY, Oxford, UK and Tokyo, Japan – [www.vuzix.com](http://www.vuzix.com)

### Supporting Patrons



**Uberveillance.com** informs research into omnipresent electronic surveillance facilitated by technology that makes it possible to embed surveillance devices in the human body – <http://www.uberveillance.com>.



**Optinvent's** has patented technologies and extensive know-how in the field of near to eye display products (digital eyewear, wearable AR Display, see-through HMD).

The management team has 20 years of experience in the field of consumer electronics and display optics – <http://optinvent.com/>

### General Patrons



**Cisco** (NASDAQ: CSCO) enables people to make powerful connections-whether in business, education, philanthropy, or creativity. Cisco hardware, software, and service offerings are used to create the Internet solutions that make networks possible-providing easy access to information anywhere, at any time.

Cisco was founded in 1984 by a small group of computer scientists from Stanford University. Since the company's inception, Cisco engineers have been leaders in the development of

## Patrons

Internet Protocol (IP)-based networking technologies. Today, with more than 65,225 employees worldwide, this tradition of innovation continues with industry-leading products and solutions in the company's core development areas of routing and switching, as well as in advanced technologies such as: Consumer Networking, Networking, Security, Unified Communication, Telepresence, Collaboration, Data Center, Virtualization, Unified Computing Systems – <http://www.cisco.com>.



**Singularity Weblog** started as a personal journal of Socrates' thoughts on trends, news, issues, films and people related to the technological singularity.

However, due to the active involvement of readers like you, it is evolving into a growing community of people interested in exploring and shaping our future. The blog is not meant to provide definitive answers, but rather, to ask the right questions in an attempt to generate discussion, provoke thought and stir the imagination. It aims to spark a conversation about the impact of technology, exponential growth and artificial intelligence where everyone's opinions and participation are greatly encouraged – <http://www.singularityweblog.com>



**AR.ORG** unites hundreds of companies, and thousands of entrepreneurs, engineers and designers – committed to advancing Augmented Reality – an emerging technology that digitizes interaction with the physical world.

Members tap into valuable members-only resources: major discounts to industry events, networking opportunities with industry leaders, up-to-date educational programs and technical training, unparalleled market research, exposure in extensive promotional programs, and representation in the voice of the industry. AR.ORG also owns and produces ARE – the largest international event for augmented reality and the global stage for AR innovation. All profits from ARE are reinvested into AR.ORG's industry services – <http://www.augmentedreality.com>



**Augmate** Corporation is a next generation internet software company, we provide visual efficiency tools for businesses and consumers by merging the digital and physical worlds using eye-wear (AR Glasses) and mobile devices.

We cut the tether of the laptop and break the chain of a desktop computer by placing digital information, imagery, and applications directly on top of physical world objects – <http://www.augmate.com>

Infinity Augmented Reality Inc. (Infinity AR)(OTCQB: ALSO) are developers of a comprehensive Augmented Reality experience and platform with its main office based in New York City. Infinity AR's software enables viewing of the real world overlaid with digital images, sound, video and information as is accessible using a screen, smartphone, tablet, digital glasses and other hardware.



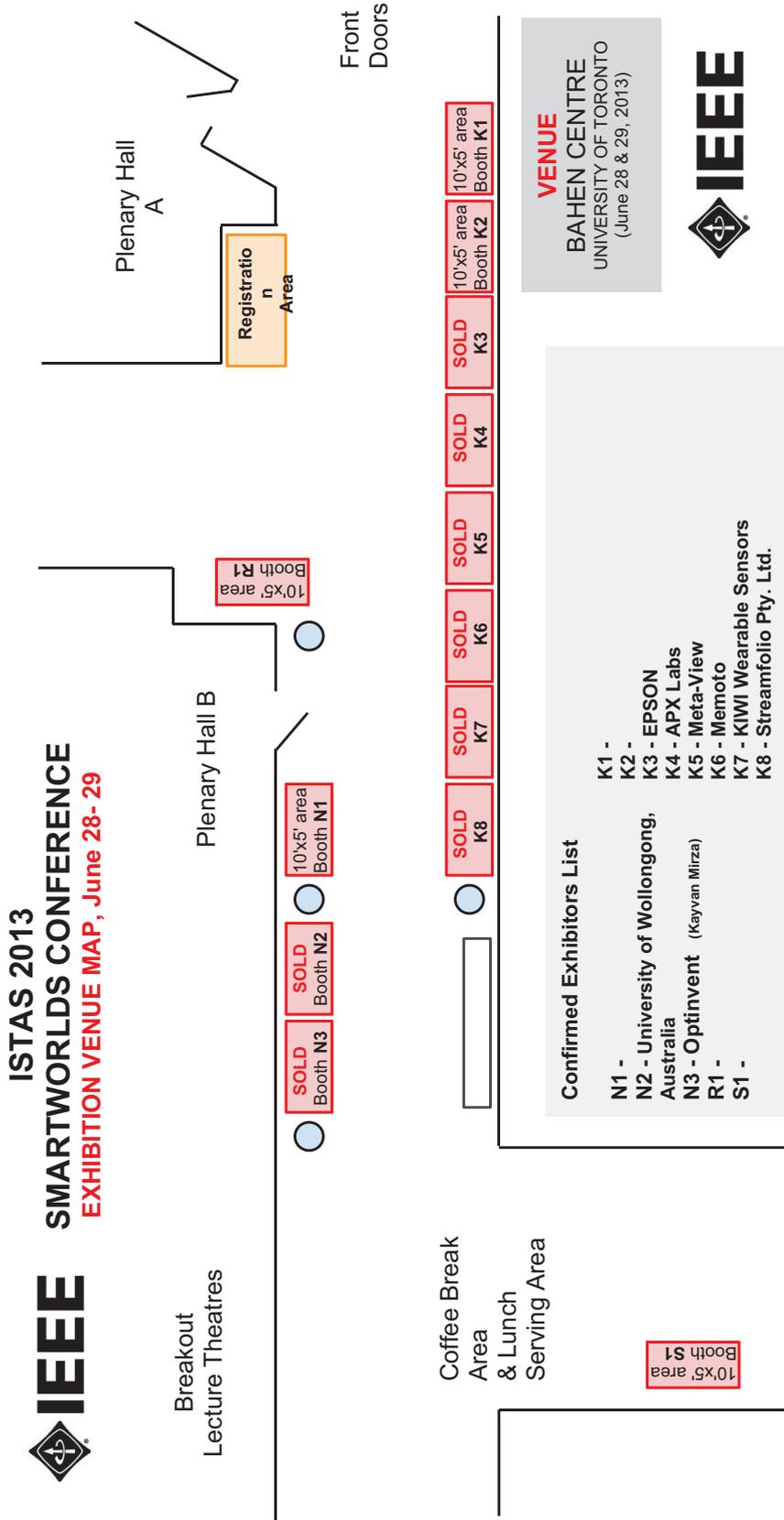
The **Infinity AR** platform incorporates an array of Augmented Reality applications geared toward the mainstream consumer integrating location recognition, facial recognition, voice recognition, phone and data communication, sound and more, all directly displayed to the end user in real-time – <http://www.infinityar.com/>



The **Institute for Infocomm Research** (I<sup>2</sup>R pronounced as i-squared-r) is a member of the Agency for Science, Technology and Research (A\*STAR) family. Established in 2002, our vision is to power a vibrant and strong infocomm ecosystem in Singapore.

We seek to foster world-class infocomm and media research and develop a deep talent pool of infocomm professionals to power a vibrant knowledge-based Singapore. At I<sup>2</sup>R, intelligence, communications and media form our 3 strategic thrusts. Our research capabilities are in information technology, wireless and optical communication networks, interactive and digital media, signal processing and computing – <http://www.i2r.a-star.edu.sg/>

# Exhibitors



Purchase your booth at <http://goo.gl/1ZqL6>

## **Technical Program**



## Day 1 — June 27, 2013 (Thursday)

Session	Engineering — Infrastructure
Date/Time	June 27, 2013 (Thursday) / 09:35 – 11:00 hrs
Venue	Hart House, historic center of culture at The University of Toronto
Chair(s)	Katina Michael

097	Cyborg Anthropology and the Future of the Interface <i>Amber Case</i>	
011	Veillance and Reciprocal Transparency: Surveillance Versus Sousveillance, AR Glass, Lifelogging, and Wearable Computing <i>Steve Mann</i>	3
079	Early in the 21st Century, Intelligence Will Underlie Everything of Value <i>Ray Kurzweil</i>	1

Session	Engineering — Infrastructure
Date/Time	June 27, 2013 (Thursday) / 11:35 – 12:30 hrs
Venue	Hart House, historic center of culture at The University of Toronto
Chair(s)	Jeremy Pitt

081	The Society of Mind <i>Marvin Minski</i>	2
099	The Society of Intelligent Veillance <i>Marvin Minsky, Ray Kurzweil and Steve Mann</i>	41

Session	Engineering — Infrastructure
Date/Time	June 27, 2013 (Thursday) / 13:30 – 15:00 hrs
Venue	Hart House, historic center of culture at The University of Toronto
Chair(s)	Simon Randall

003	Lifelog Semantics from Wearable Computing <i>Cathal Gurrin</i>	11
068	The Design of a Lifelogging Camera <i>Martin Kallstrom</i>	27
004	Wearable Computing and Security Implications <i>Monique Morrow</i>	12

## Technical Program

Session	Engineering — Infrastructure	
Date/Time	June 27, 2013 (Thursday) / 15:35 – 17:05 hrs	
Venue	Hart House, historic center of culture at The University of Toronto	
Chair(s)	Linda Theron	
Thad	Mobile Music Touch: Passive Haptic Learning and Rehabilitation <i>Thad Starner</i>	6
061	Bio-Inspired Solutions for Intelligent Android Perception and Control <i>Emil M. Petriu</i>	18
059	Connecting Memory Extensions to Internal Memory <i>Jean-Gabriel Ganascia</i>	16

## Day 2 — June 28, 2013 (Friday)

<b>Session</b>	<b>Assistive/Usability</b>
<b>Date/Time</b>	<b>June 28, 2013 (Friday) / 09:00 – 10:30 hrs</b>
<b>Venue</b>	<b>Room One</b>
<b>Chair(s)</b>	<b>Douglas Baldwin</b>

074	The Need for User Centered Wearable Devices for the Blind <i>Daniel Kish</i>	61
065	Privacy by Design and Wearable Computing <i>Ann Cavoukain</i>	61
085	Police Operations Management Systems: from In-Car Video to Body Worn Video Recorders <i>Blair Falkinson</i>	62

<b>Session</b>	<b>AR</b>	<b>Parallel</b>
<b>Date/Time</b>	<b>June 28, 2013 (Friday) / 11:00 – 12:30 hrs</b>	
<b>Venue</b>	<b>Room One</b>	
<b>Chair(s)</b>	<b>Stephen Lake</b>	

Epson	<i>Anna Jen</i>	62
Apx	<i>Brian Ballard</i>	63
Meta	<i>Blair Falkinson</i>	63

<b>Session</b>	<b>Lifelogging</b>	<b>Parallel</b>
<b>Date/Time</b>	<b>June 28, 2013 (Friday) / 11:00 – 12:30 hrs</b>	
<b>Venue</b>	<b>Room Two</b>	
<b>Chair(s)</b>	<b>Gary Beirne</b>	

015	Investigating Older and Younger Peoples' Motivations for Lifelogging with Wearable Cameras <i>Niamh Caprani, Noel O'Conner and Cathal Gurrin</i>	63
095	Using Adapative Architecture to Probe Attitudes Towards Ubiquitous Monitoring <i>Stuart Moran, Nils Jaeger, Holger Schmadelbach and Kevin Glover</i>	63
044	Measuring the Effect of Sousveillance in Increasing Socially Desirable Behaviour <i>Mir Adnan Ali, Jonathan Polak Nachumow, Jocelyn A. Srigley, Steve Mann, Colin D. Furness and Michael Gardam</i>	64

## Technical Program

Session	Design	Parallel
Date/Time	June 28, 2013 (Friday) / 11:00 – 12:30 hrs	
Venue	Room Three	
Chair(s)	Peter Bugaj	
032	The Electronic Textile Interface Workshop: Facilitating Interdisciplinary Collaboration <i>Clint Zeagler, Scott Pobine, Scott Gilliland, Stephen Audy, Halley Profita and Thad Starner</i>	64
053	Sociocultural Conventions, Sensitiveness and Learning in the (So-Called) Smart World <i>Teemu Leinonen</i>	65
051	Praxistemology: Early Childhood Education, Engineering Education in a University, and Universal Concepts for People of All Ages and Abilities <i>Steve Mann and Marko Hrelja</i>	65
Session	UbiComp	Parallel
Date/Time	June 28, 2013 (Friday) / 11:00 – 12:30 hrs	
Venue	Room Four	
Chair(s)	Alexander Hayes	
012	Constructing Age and Technology as Augmentation, Not Degradation: Exploring What the Aged Themselves Think They Need, Not What is Decided for Them <i>Marcus Wigan</i>	65
075	Brain Computer Interfaces: Ethical and Policy Considerations <i>Ellen M. McGee</i>	66
020	SenseSeer - Mobile-Cloud-Based Lifelogging framework <i>Rami Albatal, Cathal Gurrin, Jiang Zhou, Yang Yang, Na Li and Denise Carthy</i>	66
Session	Apps	Parallel
Date/Time	June 28, 2013 (Friday) / 13:30 – 15:00 hrs	
Venue	Room One	
Chair(s)	Günter Alce	
062	The 3 Laws of Augmented Reality Design: How to Design Augmented Reality Application that Add Value and Delight Users <i>Ori Inbar</i>	67
092	Augmented Reality and the Emergence of 'Point-of-Eye' in Visual Culture <i>Helen Papagiannis</i>	67
027	Training the Next Generation of AR Developers <i>Kevin Kee and Tim Compeau</i>	68
Session	Design	Parallel
Date/Time	June 28, 2013 (Friday) / 13:30 – 15:00 hrs	
Venue	Room Two	
Chair(s)	Chris Dancy	
088	Scenarios for Peer-to-Peer Learning in Construction with Emerging Forms of Collaborative Computing <i>Teemu Leinonen, Jukka Purma, Alexander Hayes and Ngua Kiarrii</i>	69

## Technical Program

**064** Electronic Textile Interfaces 69  
*Clint Zeagler*

**050** Audio-Only Augmented Reality System for Social Interaction 70  
*Tom Gurion and Nori Jacoby*

<b>Session</b>	<b>HDR</b> <span style="float: right;"><b>Parallel</b></span>
<b>Date/Time</b>	<b>June 28, 2013 (Friday) / 13:30 – 15:00 hrs</b>
<b>Venue</b>	<b>Room Three</b>
<b>Chair(s)</b>	<b>Bradley Kjell</b>

**033** High Dynamic Range Tone Mapping Based On Per-Pixel Exposure Mapping 70  
*Jason Huang, Valmiki Rampersad and Steve Mann*

**043** Comparametric HDR (High Dynamic Range) Imaging for Digital Eye Glass, Wearable Cameras, and Sousveillance 71  
*Mir Adnan Ali, Tao Ai, Akshay Gill, Jose Emilio, Kalin Ovtcharov and Steve Mann*

**029** Veillances: Protocols & Network Surveillance 71  
*Nancy Paterson*

<b>Session</b>	<b>Social Networking</b> <span style="float: right;"><b>Parallel</b></span>
<b>Date/Time</b>	<b>June 28, 2013 (Friday) / 13:30 – 15:00 hrs</b>
<b>Venue</b>	<b>Room Four</b>
<b>Chair(s)</b>	<b>Stephanie Cork</b>

**019** Peer-Produced Privacy Protection: A Common-Pool Approach 72  
*Vaibhav Garg, Sameer Patil, Apu Kapadia and Jean Camp*

**018** Social Media in Conflict: A Comparison of Military and Social Movement Technocultures in Egypt, Spain and the United States 72  
*Chris Grey and Angel Gordo-Lopez*

**084** Google Glass: By the Numbers 73  
*Pete Wassell*

<b>Session</b>	<b>Build</b> <span style="float: right;"><b>Parallel</b></span>
<b>Date/Time</b>	<b>June 28, 2013 (Friday) / 15:30 – 17:30 hrs</b>
<b>Venue</b>	<b>Room One</b>
<b>Chair(s)</b>	<b>Gene Becker</b>

**080** Moving Surveillance Techniques to Sousveillance: Towards Equiveillance Using Wearable Computing 73  
*Corey Manders*

**046** Augmented Reality System Based on 3D Camera Selfgesture Sensing 74  
*Raymond Lo, Alexander Chen, Jason Huang, Valmiki Rampersad, Han Wu and Steve Mann*

**052** The Future is Un-Real 74  
*Rob Manson*

**087** Interaxon: Taking BCI to the Masses 74  
*Ariel Garten*

## Technical Program

<b>Session</b>	<b>mHealth</b>	<b>Parallel</b>
<b>Date/Time</b>	<b>June 28, 2013 (Friday) / 15:30 – 17:30 hrs</b>	
<b>Venue</b>	<b>Room Two</b>	
<b>Chair(s)</b>	<b>Joseph Herkert</b>	

<b>070</b>	Healthcare & Public Health: Perspectives on Wearable Computing, Augmented Reality and the Veillances <i>Luis Kun</i>	75
<b>071</b>	Ambient Assisted Living Technologies and Their Social Implications: A Perspective From Europe <i>José L. Monteagudo</i>	76
<b>072</b>	Wireless Platforms for the Hemodynamic Monitoring of the Elderly Patient <i>Ricardo L. Armentano</i>	77
<b>038</b>	Identity Awareness of Research Data in Veillance & Social Computing <i>Alexander Hayes, Steve Mann, Amir Aryani, Susannah Sabine, Leigh Blackall, Pia Waugh and Stephan Ridgway</i>	78

<b>Session</b>	<b>Methodology</b>	<b>Parallel</b>
<b>Date/Time</b>	<b>June 28, 2013 (Friday) / 15:30 – 17:30 hrs</b>	
<b>Venue</b>	<b>Room Three</b>	
<b>Chair(s)</b>	<b>Terri Bookman</b>	

<b>049</b>	DIY & Maktivism: Tinkering Towards Better Worlds <i>Megan Boler, Chris Hables Gray and Steven Mann</i>	78
<b>040</b>	DIY Prosthetics Workshops: ‘Critical Making’ for Public Understanding of Human Augmentation <i>Isaac Record, Matt Ratto, Amy Ratelle, Adriana Ieraci and Nina Czegledy</i>	79
<b>096</b>	Millennials’ Increasing Openness to Microchip Implants in Humans: A Confluence of Factors <i>Christine Perakslis</i>	79
<b>022</b>	Visuo-Haptic Learning of the Cochlea: Using Physical Optical Glyphs with Augmented Reality <i>Andrea Zariwny</i>	80

<b>Session</b>	<b>Open Data</b>	<b>Parallel</b>
<b>Date/Time</b>	<b>June 28, 2013 (Friday) / 15:30 – 17:30 hrs</b>	
<b>Venue</b>	<b>Room Four</b>	
<b>Chair(s)</b>	<b>Alexander Hayes</b>	

<b>094</b>	Ubiquitous Computing for Teenagers: A New Perspective on Child-Computer Interaction <i>Amandeep Dhir and Mohammed Al-Kahtani</i>	80
<b>093</b>	A Privacy Framework for Secondary Use of Medical Data <i>Jennifer Heath</i>	81
<b>090</b>	The Democratic Singularity <i>Pia Waugh</i>	81
<b>054</b>	An Ethical Framework for Ubiquitous Learning <i>Leigh Blackall</i>	81

## Day 3 — June 29, 2013 (Saturday)

<b>Session</b>	<b>Transparency</b>	<b>Parallel</b>
<b>Date/Time</b>	June 29, 2013 (Saturday) / 09:00 – 10:30 hrs	
<b>Venue</b>	Room One	
<b>Chair(s)</b>	Chris Hables Gray	

098	Light: The Essence of Civilization <i>David Brin</i>	83
055	“You are Your Data”: Digital Self-Tracking and Algorithmic Subjectivity <i>Natasha Schüll</i>	83
jeff	If Technology is a Dissipative Structure, Bring It on Deserves a Closer Look <i>Jeff Robbins</i>	84

<b>Session</b>	<b>Social Implications</b>	<b>Parallel</b>
<b>Date/Time</b>	June 29, 2013 (Saturday) / 11:00 – 12:30 hrs	
<b>Venue</b>	Room One	
<b>Chair(s)</b>	Janet Rochester	

057	Formal Models of Social Processes: Towards a New Science of Institutions <i>Jeremy Pitt and Andrzej Nowak</i>	84
022	Visuo-Haptic Learning of the Cochlea: Using Physical Optical Glyphs with Augmented Reality <i>Andrea Zariwny</i>	85
002	Ready to Wear (or Not): Examining the Rhetorical Impact of Proposed Wearable Devices <i>Isabel Pedersen</i>	85

<b>Session</b>	<b>Ambient Intelligence</b>	<b>Parallel</b>
<b>Date/Time</b>	June 29, 2013 (Saturday) / 11:00 – 12:30 hrs	
<b>Venue</b>	Room Two	
<b>Chair(s)</b>	Jon Dougal	

105	Studying the World by Mining Photo-Sharing Websites <i>David Crandall</i>	86
102	PlaceRaider: Virtual Theft in Physical Spaces with Smartphones <i>Robert Templeman, Zahid Rahman, David Crandall and Apu Kapadia</i>	86
083	The Future of Outdoor Media Systems <i>Larry Schirmer</i>	86

## Technical Program

<b>Session</b>	<b>Sousveillance</b>	<b>Parallel</b>
<b>Date/Time</b>	<b>June 29, 2013 (Saturday) / 11:00 – 12:30 hrs</b>	
<b>Venue</b>	<b>Room Three</b>	
<b>Chair(s)</b>	<b>Niahm Caprani</b>	

<b>039</b>	The Inevitability of the Transition From a Surveillance-Society to a Veillance-Society: Moral and Economic Grounding for Sousveillance <i>Mir Adnan Ali and Steve Mann</i>	87
<b>104</b>	Art and Science as Co-Conspirators in the Service and Disservice of Humanity <i>Ryan Janzen</i>	88
<b>036</b>	Three Dimensional HDR (High Dynamic Range) Veillance for 3D Cameras Such as Kinect Sensors <i>Raymond Lo, Jason Huang, Valmiki Rampersad and Steve Mann</i>	88

<b>Session</b>	<b>Health</b>	<b>Parallel</b>
<b>Date/Time</b>	<b>June 29, 2013 (Saturday) / 13:30 – 15:00 hrs</b>	
<b>Venue</b>	<b>Room One</b>	
<b>Chair(s)</b>	<b>Cara Morris</b>	

<b>073</b>	Will Wearable Computers and Augmented Reality Enable Us to Lead Healthy and Happy Lives? <i>Alex R. Jadad</i>	88
<b>060</b>	Wearable Monitors on Babies: Big Data Saving Little People <i>Carolyn McGregor</i>	89
<b>013</b>	Law and Policy in an Era of Cyborg-Assisted-Life <i>Joseph Carvalko</i>	89

<b>Session</b>	<b>Sensors</b>	<b>Parallel</b>
<b>Date/Time</b>	<b>June 29, 2013 (Saturday) / 13:30 – 15:00 hrs</b>	
<b>Venue</b>	<b>Room Two</b>	
<b>Chair(s)</b>	<b>Andrew Everitt</b>	

<b>008</b>	Ambient Intelligence & Information Interactions: Theorizing Autonomies and Awareness for 21st Century Society - A Technology-People Balance <i>Helen Patricia McKenna, Marilyn P. Arnone, Michelle L. Kaarst-Brown, Lee W. McKnight and Sarah A. Chauncey</i>	90
<b>030</b>	Putting Locative Technology In Its Sense of Place <i>Glen Farrelly</i>	90
<b>024</b>	Investigating the Factors Influencing Information Security Compliance in a Financial Services Firm <i>Rutendo Mushore and Michael Kyobe</i>	91

## Technical Program

Session	Surveillance	Parallel
Date/Time	June 29, 2013 (Saturday) / 13:30 – 15:00 hrs	
Venue	Room Three	
Chair(s)	Adib Ghu	
037	Watching Me, Watching You. (Process Surveillance and Agency in the Workplace) <i>Sally A. Applin and Michael D. Fischer</i>	91
034	“I’ll be Watching You”: Awareness, Consent, Compliance and Accountability in Video Surveillance <i>Brenda McPhail, Andrew Clement, Joseph Ferenbok and Arndis Johnson</i>	92
103	User Expectations of Privacy in Self-Generated Mobile Health Data <i>Heather Patterson</i>	92
Session	Law	Parallel
Date/Time	June 29, 2013 (Saturday) / 15:30 – 17:30 hrs	
Venue	Room One	
Chair(s)	Pete Wassell	
089	Governmental and Private Video Surveillance <i>Susan Herman</i>	92
086	Waiting for Public Outrage <i>Avner Levin</i>	93
026	IXmaps – Tracking Your Personal Data Through the NSA’s Warrantless Wiretapping Sites <i>Andrew Clement</i>	93
063	Autonomous Systems for Smarties <i>Nikola Serbedzija</i>	94
Session	Drones	Parallel
Date/Time	June 29, 2013 (Saturday) / 15:30 – 17:30 hrs	
Venue	Room Two	
Chair(s)	Susannah Sabine	
100	Drones, Bones and Human Meaning Zones <i>Joseph Ferenbok</i>	94
101	Canada’s Emerging Domestic Drone Regulations <i>Shayna Gersher</i>	95
066	Drones for Good <i>Matthew Schroyer</i>	95



## **Abstracts**



## Friday, 28 June 2013

<b>Session</b>	<b>Assistive/Usability</b>
<b>Date / Day</b>	<b>June 28, 2013 (Friday)</b>
<b>Time</b>	<b>09:00 – 10:30 hrs</b>
<b>Venue</b>	<b>Room One</b>
<b>Chair</b>	<b>Douglas Baldwin</b>

**Paper ID: 074**     **09:00 – 09:30 hrs**

### **The Need for User Centered Wearable Devices for the Blind**

*Daniel Kish*

*President, World Access for the Blind.*

This talk focuses on outlining some of the challenges that modern technology presents disabled individuals. Blindness is emphasized as an example that exemplifies the issues faced. Blind people fall into a dichotomous category in which they both benefit greatly from the technological revolution, and are becoming even more isolated and immobilized than ever before. Certainly, the industry at large as it moves forward with greater ideas is steadfastly focused on visual augmentation, with little to no interest in non-visual access. Consumer electronics from the most basic to the most complex which everyone takes for granted, and which are presumably making life easier for everyone (who can see), are fast presenting folks who cannot see with a more imposing barrier to everyday functioning than we've ever faced. For example, the simple act of TV watching has been revolutionized so far into the modern age as to be virtually off limits to the blind, as are an increasing number of household appliances and handheld devices. Specific examples of this will be provided, together with discussion about implications and solutions. One answer to be discussed is the design of a user centered wearable device usable by blind folks that will interface or access all manner of vision guided devices such as TV's and household appliances. The problem with the user centered gadget is that, no one seems to care about the development or implementation of such a thing. However, due to pervasive lack of special interest, the only way to move something like that forward is by making it somehow intriguing to the mainstream - something that everyone wants. Some thoughts about the characteristics of such a device will be provided, together with ideas about how to circumvent barriers to production and distribution.

*Keywords:* Wearables, User-centric devices, World access for the blind.

**Paper ID: 065**     **09:30 – 10:00 hrs**

### **Privacy by Design and Wearable Computing**

*Ann Cavoukian*

*Information and Privacy Commissioner, Ontario, CA.*

Commissioner Cavoukian's presentation is premised on the position that we can and must have both effective law enforcement and a robust right to personal privacy, including with respect to drone-based surveillance.

Governments have long used technology to help prevent serious harm and prosecute wrongdoing. Since September 11th, however, we have seen an increase in the state's capacity for surveillance, including of law abiding citizens.

Democracy posits that the individual is the source of the state's legitimacy and as such the state must be transparent to the citizen so the citizen can hold it to account. On the other hand, the citizen requires non-transparency or privacy from the state so he or she can enjoy dignity and autonomy. Thankfully, even as millions

of smart and cellphone wielding social media citizens are co-creating new more open societies, the demand for privacy refuses to die.

In short, the information age may bring an end to practical obscurity, for example, with respect to our activities in public spaces, but our embrace of new technologies does not in any way signal an end to our right to privacy. Privacy is being transformed with the rise of PbD and the evolution of our right to informational privacy.

The right to informational privacy is the right to exercise a significant measure of control over the collection, use and disclosure of one’s own personal information. In the context of state surveillance, the right to informational privacy is and must continue to be protected by both: (i) the implementation of PbD principles in the design and operation of legitimate state deployed surveillance; and (ii) insistence on legal rules and norms. We can and must have both - strong privacy protection, embedded into innovative advances in technology.

*Keywords:* PbD, Privacy by design, Wearable computing, Privacy.

**Paper ID: 085      10:00 – 10:30 hrs**

**Police Operations Management Systems: from In-Car Video to Body Worn Video Recorders**

*Blair Falkinson*

*Toronto Police Service, Canada.*

Blair Falkinson has been a member of the Toronto Police Service (TPS) for over twenty-nine years. He has held positions in a broad range of policing functions throughout his career including: Primary Response/General Patrol, Traffic and Collision Investigation, Forensic Identification, Community Response/Bicycle Patrol, School Resource Officer, Crime Analyst and Police Vehicle Operations to name a few. He represents the TPS on a number of committees and working groups related to City Transportation, Ministry of Transportation/Police, Ministry of the Attorney General - eTicket Filing, Ontario Association of Chiefs of Police – IT Sub-Committee and is the Service subject matter expert for in-car camera systems, electronic ticketing and electronic collision reporting. He is currently working in a team involved with configuring, testing, training and deploying a new Police Operations Management System (RMS). He is the Project Lead for Electronic Ticketing and is working to deploy thermal print technology in front-line police vehicles as well as mobile workstations and printers on police motorcycles. Sergeant FALKINSON and several other TPS members recently completed a year-long review of traffic policing services delivery for the TPS with a comprehensive report containing forty recommendations and a ten-year vision, which was approved by the Chief. The report won the Canadian Council of Motor Transport Administrators (CCMTA) Police Partnership award for 2011.

*Keywords:* Toronto police, Body-worn video, In-car video recording.

<b>Session</b>	AR	Parallel
<b>Date / Day</b>	June 28, 2013 (Friday)	
<b>Time</b>	11:00 – 12:30 hrs	
<b>Venue</b>	Room One	
<b>Chair</b>	Stephen Lake	

**Paper ID: Epson      11:00 – 11:30 hrs**

*Anna Jen*

*Epson*



**Paper ID: Apx** 11:30 – 12:00 hrs*Brian Ballard**APX Labs., 2350 Corporate Park Dr, Herndon VA 20171, USA.***Paper ID: Meta** 12:00 – 12:30 hrs*Blair Falkinson**Toronto Police Service*

<b>Session</b>	<b>Lifelogging</b>	<b>Parallel</b>
<b>Date / Day</b>	<b>June 28, 2013 (Friday)</b>	
<b>Time</b>	<b>11:00 – 12:30 hrs</b>	
<b>Venue</b>	<b>Room Two</b>	
<b>Chair</b>	<b>Gary Beirne</b>	

**Paper ID: 015** 11:00 – 11:30 hrs**Investigating Older and Younger Peoples' Motivations for Lifelogging with Wearable Cameras***Niamh Caprani, Noel O'Conner and Cathal Gurrin**CLARITY, Ireland.*

People have a natural tendency to collect things about themselves, their experiences and their shared experiences with people important to them, especially family. Similar to traditional objects such as photographs, lifelogs have been shown to support reminiscence. A lifelog is a digital archive of a persons experiences and activities and lifelog devices such as wearable cameras can automatically and continuously record events throughout a whole day. We were interested in investigating what would motivate people to lifelog. Due to the importance of shared family reminiscence between family members we focused our study on comparing shared or personal motivations with ten older and ten younger family members. We found from our results that both older and younger adults were more likely to lifelog for the purposes of information sharing and that reviewing lifelog images supported family reminiscence, reflection and story-telling. Based on these findings, recommendations are made for the design of a novel intergenerational family lifelog system.

*Keywords:* Wearable cameras, Image sharing, Reminiscence.**Paper ID: 095** 11:30 – 12:00 hrs**Using Adaptive Architecture to Probe Attitudes Towards Ubiquitous Monitoring***Stuart Moran, Nils Jaeger, Holger Schnadelbach and Kevin Glover**University of Nottingham, United Kingdom.*

The term Ubiquitous Monitoring aims to capture the unprecedented degree to which data collection will occur in the future through ongoing developments in embedded, wireless and sensory technologies. Intelligent buildings represent the most current instantiations of this technology in the form of building management/automation systems. However, there is an emerging field of research called adaptive architecture, which aims to explore more meaningful and direct interactions between occupants and their environments. In this paper, we use the experience of a prototype adaptive/biofeedback architecture called ExoBuilding as a probe to explore user attitudes towards future monitoring systems in buildings. We present results from a semi-

structured interview, which encouraged participants to envision future monitoring technologies, making projections based on their real experiences with ExoBuilding.

*Keywords:* Adaptive, Architecture, Probe, Monitoring, Ubiquitous.

**Paper ID: 044**    **12:00 – 12:30 hrs**

### Measuring the Effect of Sousveillance in Increasing Socially Desirable Behaviour

Mir Adnan Ali<sup>1</sup>, Jonathan Polak Nachumow<sup>1</sup>, Jocelyn A. Srigley<sup>1</sup>, Steve Mann<sup>1</sup>, Colin D. Furness<sup>2</sup> and Michael Gardam<sup>1</sup>

<sup>1</sup>University of Toronto, Canada.

<sup>2</sup>Infonaut Inc, Canada.

Hospital Acquired Infections (HAIs) occur frequently in hospitalized patients. Staff compliance with Hand Hygiene (HH) policy during patient care has been shown to reduce HAIs. Currently, hospitals evaluate adherence to HH policies through direct observation by human auditors. The auditors do not have authority over staff members; thus, this process is more akin to sousveillance (watching from below) than surveillance (watching from above). When behavior change occurs due to awareness of being observed, it is referred to as the “Hawthorne effect”. We quantified the effect of sousveillance by comparing the frequency of HH events with an auditor present to when no auditor was present. The data analysed in the present work is from an ongoing study on hand hygiene compliance monitoring.

A monitoring network recorded 290,000 hand hygiene events over 6 months; auditors were present on five occasions for about an hour each visit. When using an exponential underlying distribution we found that the change in the HH event rate was significant ( $p < 0.01$ ) in 4 of the 5 auditor visits. Finally, with a hyper-exponential underlying distribution, 5 of 5 were significant ( $p < 0.01$ ). There was no significant change in the HH event rate among dispensers located within patient rooms (not visible to the auditor), irrespective of auditor’s presence.

*Keywords:* Hawthorne effect, Infection control, Sousveillance, Veillance, Statistical analysis, Behavior change, Hospital acquired diseases, Hand hygiene.

Session	Design	Parallel
Date / Day	June 28, 2013 (Friday)	
Time	11:00 – 12:30 hrs	
Venue	Room Three	
Chair	Peter Bugaj	

**Paper ID: 032**    **11:00 – 11:30 hrs**

### The Electronic Textile Interface Workshop: Facilitating Interdisciplinary Collaboration

Clint Zeagler<sup>1</sup>, Scott Pobine<sup>2</sup>, Scott Gilliland<sup>1</sup>, Stephen Audy<sup>1</sup>, Halley Profita<sup>3</sup> and Thad Starner<sup>1</sup>

<sup>1</sup>Georgia Institute of Technology, United States.

<sup>2</sup>Parsons The New School for Design, United States.

<sup>3</sup>University of Colorado at Boulder, United States.

We present our findings from the Electronic Textile Interface Swatch Book Workshops. The workshops were designed as the first in a series of collaborative design experiences that introduce small groups of faculty/students teams from particular design disciplines to the concept of electronic textile interfaces (ETIs) through the use of a textile interface “swatch book” with the support of technician/facilitators. The work here focuses on the experience of the working relationship between the designer participants and the more technologically oriented facilitators, rather than on how much the participants learned about technology. The contribution of this work is an exploration into understanding how through the use of technology we can bridge the gap between the distant discipline expertise needed to work on projects like ETIs.

*Keywords:* Wearable technology, Design education, Design processes, Textiles, Interface design, Pedagogy.

**Paper ID: 053**    11:30 – 12:00 hrs

### **Sociocultural Conventions, Sensitiveness and Learning in the (So-Called) Smart World**

*Teemu Leinonen*

*Aalto University, Finland.*

Aspects of culture — such as language, ethics, norms, customs, and social structures — have a great impact on the ways we see and approach new technologies. People appreciate their culture and its social conventions. They are the glue that keeps communities united. They make us feel alive and safe.

Researchers and designers largely don't like cultures and their social conventions; as building on something existing is not considered to be innovative. Researchers are expected to do research that will change the world. Most people are, however, relatively happy with their existing life and not willing to change.

When considering new technologies we should pay special attention to cultural sensitiveness. New technologies are acceptable only when they are designed to serve existing sociocultural contexts. Being sensitive with cultural aspects asks us to recognize people's dignity by understanding and empathizing them.

In addition of being culturally sensitive we must recognize that cultures are not static. They do change with time. Learning where people are critically thinking, analyzing and taking goal-driven action leads to change. Smart people develop and take in use new cultural conventions. They can ignore them or destruct them depending on their own judgment. The so-called smartworld needs smart people: sensitive and learned ones.

*Keywords:* New media, Learning, Smart world, Culture, Critical thinking.

**Paper ID: 051**    12:00 – 12:30 hrs

### **Praxistemology: Early Childhood Education, Engineering Education in a University, and Universal Concepts for People of All Ages and Abilities**

Steve Mann and Marko Hrelja

*University of Toronto, Canada.*

Existential tinkering as a form of inquiry must be brought into the engineering curriculum. This paper suggests that high quality engineering education must have an element of play, expression, and exploration as forms of inquiry. Current methods of engineering education have too much emphasis on structure, creating rigidity - destroying the capacity for creativity and radical innovation. We introduce "existinquiry" (existential tinkering as inquiry) as a learning methodology consisting of three parts: learning by thinking, learning by doing, and learning by being. The goal of this learning methodology is to create lateral thinkers who integrate art and science into the creation process. Our hope is that "existinquiry" will create more competitive and versatile thinkers capable of solving more sophisticated problems.

*Keywords:* Engineering education, Praxistemology, Existential epistemology as education, Education, Wearable, Computing, Veillance, Tinquiry, Tinkering as inquiry.

<b>Session</b>	<b>UbiComp</b>	<b>Parallel</b>
<b>Date / Day</b>	<b>June 28, 2013 (Friday)</b>	
<b>Time</b>	<b>11:00 – 12:30 hrs</b>	
<b>Venue</b>	<b>Room Four</b>	
<b>Chair</b>	<b>Alexander Hayes</b>	

**Paper ID: 012**    11:00 – 11:30 hrs

### **Constructing Age and Technology as Augmentation, not Degradation: Exploring What the Aged Themselves Think They Need, Not What is Decided for Them**

*Marcus Wigan*

*ICT Swinburne University of Technology, Australia.*

The widespread Western community construction of age as a dependent state has been reflected in many of the studies of technology and the aged. The present paper considers the situation that would obtain if this was reversed, and genuine utilisation of the skills and knowledge of the aged applied to their own situations, as appropriate enhancements rather than as imposed assumptions. Examples are given, and parallels are drawn between the paternalistic and genuine engagement models of planning in other areas of society, and questions are raised as to the social implications of these persistent myths and the benefits of revising them.

*Keywords:* Aged, Elderly, Technology, Demand, Patronize, Listen, Augmentation, User-centric, Information asymmetry, Power balance, Bodily augmentation, Smart sensors, Medical informatics.

**Paper ID: 075**     **11:30 – 12:00 hrs**

### **Brain Computer Interfaces: Ethical and Policy Considerations**

*Ellen M. McGee*

*Ethics Consultant.*

In the not so distant future, we will probably witness the emergence of humans who are essentially coupled with bioelectronic devices, science fiction's "cyborgs." Innovations in semiconductor devices, cognitive science, bioelectronics, nanotechnology and applied neural control technologies, are facilitating breakthroughs in these hybrids of humans and machines. Noteworthy ethical and legal concerns are raised by three future possibilities: 1) the prospect of using these technologies to improve and augment human capabilities, 2) the prospect of achieving a type of immortality through cloning of an individual and implanting the clone with a chip that contains the uploaded memories, emotions and knowledge of the clone's source, and 3) the chance that humankind, as we know it, may eventually be phased out, or become just a step in guided evolution. There is a need to address the risks inherent in these enhancement technologies, and to consider, from the standpoint of neuroethics, the issues of safety, informed consent, justice, privacy and autonomy, that brain computer interfaces raise. This talk proposes regulation through scientific societies, national guidelines, federal agencies and United Nation policies. Countries should consider establishing agencies to monitor enhancement technologies, along with the adoption of new governing principles and restructured requirements. Ultimately, the world community, through the United Nations, needs to address, via debate and treaty, the enhancement possibilities inherent in brain computer interfaces.

*Keywords:* Ethics, BCI, Wearables, Neuroethics, Justice, Privacy, Autonomy.

**Paper ID: 020**     **12:00 – 12:30 hrs**

### **SenseSeer - Mobile-Cloud-Based Lifelogging framework**

*Rami Albatat*<sup>1</sup>, *Cathal Gurrin*<sup>2</sup>, *Jiang Zhou*<sup>2</sup>, *Yang Yang*<sup>2</sup>, *Na Li*<sup>2</sup> and *Denise Carthy*<sup>3</sup>

<sup>1</sup>*CLARITY - Ireland.*

<sup>2</sup>*CLARITY - DCU, Ireland.*

<sup>3</sup>*BDI - DCU, Ireland.*

Smart-phones are becoming our constant companions, they are with us all of the time, being used for calling, web surfing, apps, music listening, TV viewing, social networking, buying, gaming, and a myriad of other uses. Smart-phones are a technology that knows us much better than most of us could imagine. Based on our usage and the fact that we are never far away from our smart phones, they know where we go, who we interact with, what information we consume, and with a little clever software, they can know what we are doing and even why we are doing it. They are beginning to know us better than we know ourselves. In this work we present "SenseSeer" a generic mobile-cloud-based mobile Lifelogging framework. This framework supports customisable analytic services for sensing the person, understanding the semantics of life activities and the easy deployment of analytic tools and novel interfaces. At present, SenseSeer supports services in many domains, such as personal health monitoring, location tracking, lifestyle analysis and tourism focused applications. This work demonstrate the design principles of SenseSeer and three of its services: MyHealth, MyLocation and MySocial Activity.

*Keywords:* Lifelogging, Mobile sensing, Semantic extraction.

Session	Apps	Parallel
Date / Day	June 28, 2013 (Friday)	
Time	13:30 – 15:00 hrs	
Venue	Room One	
Chair	Günter Alce	

**Paper ID: 062**    13:30 – 14:00 hrs

### The 3 Laws of Augmented Reality Design: How to Design Augmented Reality Application that Add Value and Delight Users

*Ori Inbar*

*AugmentedReality.org.*

In this talk I will review a collection of AR experiences and test them against Lex Ardez' "3 laws of augmented reality design":

- (1) Augmentation must emerge from the real world and/or relate to it
- (2) Augmentation must not distract from reality, but rather make you more aware of it
- (3) Augmented interaction must deliver a superior experience to alternatives, or better yet - there's no alternative.

These rules are very logical and simple and yet most AR implementations fail to meet these laws. When it comes to defining an AR experience, the #3 is the most important: do not implement AR only for a cool factor; if a traditional interaction technique (on computers, mobile devices etc.) does a good job - do not try to do recreate it with AR. Look for the specific experiences that can only be achieved with AR, even if it's very niche, then hire designers that are willing to experiment, try and fail until they find the right formula. In most cases the simpler experience is the better experience.

The talk is based on my experience in the last 6 years building AR applications and reviewing practically every AR app that was published in that time frame. I have seen many applications that have a wow factor that lasts for 2 minutes - but most applications are not used more than once. Designers and producers need to look at it in a very different way than traditional user experiences. It's important to understand that AR is about digitizing our interacting with the physical world. It should not be viewed as a traditional form of Human Machine Interaction (HMI). But rather be thought of as Human- World-Interaction, which requires a new thinking, new rules, and new experiences.

I believe that in the next few years we'll see AR becoming an integral part of any aspect of our work and life. And it will completely change the way we interact with people, places and things. Of course traditional approaches (PCs, mobile touch) will still be best for certain things - and AR shouldn't be forced for things that it's not intended for - but it'll create new categories of things that we can't even imagine. AR has the power to enable us to do things and feel things we couldn't otherwise. It can help us learn, and master skills instantly. AR Technology has reached a "good enough" level; it is up to designers to bring it to the masses in a meaningful way.

*Keywords:* Augmented, Reality, Design, Applications, Laws, Human machine interaction.

**Paper ID: 092**    14:00 – 14:30 hrs

### Augmented Reality and the Emergence of 'Point-of-Eye' in Visual Culture

*Helen Papagiannis*

*Chief Innovation Officer (CIO), Infinity Augmented Reality Inc., USA.*

As a Ph.D. (A.B.D.) researcher, my practice has focused on Augmented Reality (AR) as a new creative medium, working towards identifying and contributing to a stylistic language of AR as it emerges. With no defined conventions, AR is still in its infancy, and as such, it is a critical time for artists, designers, filmmakers, and storytellers to help shape its creative future and cultural impact as a medium.

This talk will highlight 'Point-of-View', more specifically, 'Point-of-Eye', as a characteristic of AR eyewear that is beginning to impact and influence contemporary visual culture in the age of AR as a new medium, particularly as a trope in storytelling.

AR eyewear like Google's "Glass" (2013) and Mann's "Digital Eye Glass" (EyeTap) (1981) are worn in front of the human eye, serving as a camera to both record the viewer's environment and superimpose computer-generated imagery atop the present environment. With the position of the camera, such devices present a direct 'Point-of-Eye' (PoE), as Mann calls it, providing the ability to see through someone else's eyes.

In "The Cinema as a Model for the Genealogy of Media" (2002), Andre Gaudreault and Phillippe Marion state, "The history of early cinema leads us, successively, from the appearance of a technological process, the apparatus, to the emergence of an initial culture, that of 'animated pictures', and finally to the constitution of an established media institution" (14). AR is currently in a transition period from a technological process to the emergence of an initial AR culture, one of 'superimposed pictures', with PoE as a characteristic of the AR apparatus that will impact stylistic modes.

Gaudreault and Marion identify key players in this process as: the inventors responsible for the medium's appearance, camera operators for its emergence, and the first film directors for its constitution. 'Camera operators' around the world are beginning to contribute to AR's emergence as a medium, and through this process, towards an articulation of a media language of AR. Mann, described as the father of wearable computing, has been a 'camera operator' since the 90's. In 2013, Google Glass's early adopter program selected 8000 'camera operators' to explore these possibilities, with Kickstarter funded proposals since from directors for PoE film projects including both documentaries and dramas. What new stories will the AR apparatus enable? Like cinema before it, what novel genres, conventions, and tropes will emerge in this new medium towards its constitution?

*Keywords:* Augmented reality, Point-of-eye, Visual culture, Storytelling.

**Paper ID: 027**     **14:30 – 15:00 hrs**

### **Training the Next Generation of AR Developers**

*Kevin Kee*<sup>1</sup> and Tim Compeau<sup>2</sup>

<sup>1</sup>*Brock University, Canada.*

<sup>2</sup>*University of Western Ontario, Canada.*

The Ontario Augmented Reality Network (OARN) brings together educational institutions, commercial developers, government, cultural and trade associations, and business generators to build and expand the Augmented Reality Applications sector. OARN is dedicated to knowledge sharing and generation to foster new ideas, create new products, and build a highly qualified labour pool. The potential economic and cultural impact of AR makes it incumbent on educators to pay close attention to the industry and consider how best to provide the necessary training to equip students to enter the AR workforce. In 2012, OARN conducted research into current college and university courses which provide AR training and interviewed a number of key players in the AR industry. We questioned commercial developers, artists, and educators about the future prospects of AR and what they viewed as the most important elements for effective AR training. OARN also facilitated a variety of workshops across Ontario which introduced students and public audiences to the fundamentals of AR development. In this paper we share our findings, and link employer expectations to training recommendations for post-secondary educators and potential AR developers alike.

*Keywords:* Augmented reality, Training, Post-secondary education, OARN.

<b>Session</b>	<b>Design</b>	<b>Parallel</b>
<b>Date / Day</b>	<b>June 28, 2013 (Friday)</b>	
<b>Time</b>	<b>13:30 – 15:00 hrs</b>	
<b>Venue</b>	<b>Room Two</b>	
<b>Chair</b>	<b>Chris Dancy</b>	

**Paper ID: 088**     **13:30 – 14:00 hrs**

### **Scenarios for Peer-to-Peer Learning in Construction with Emerging Forms of Collaborative Computing**

*Teemu Leinonen*<sup>1</sup>, Jukka Purma<sup>1</sup>, Alexander Hayes<sup>2</sup> and Ngua Kiarri<sup>1</sup>

<sup>1</sup>*Aalto University, Finland.*

<sup>2</sup>*University of Wollongong, Australia.*

Many Small and Medium Enterprises (SMEs) in Europe are interested in finding new methods of training and workplace learning. Technology-enhanced practices of peer-to-peer learning may offer various new possibilities for SMEs. In this study we consider emerging technologies for informal learning in construction work. These technologies include wearable computing, invisible and ambient computing, augmented reality and novel interaction technologies. Three preliminary scenarios presented in this paper demonstrate how these technologies may be used. These scenarios have been developed, with a focus on the use of technology within a community supporting peer-to-peer learning, that may negate some of the social concerns of wearable and ubiquitous technologies. The inclusion of the construction workers in the design process, combined with smart design, is expected to find acceptable and fair solutions. It remains to be seen whether construction industry work communities will support this assertion.

*Keywords:* Peer-to-peer, Workplace learning, SME, Wearable computing, Construction, Augmented reality, Network, Collaboration.

**Paper ID: 064**     **14:00 – 14:30 hrs**

### **Electronic Textile Interfaces**

*Clint Zeagler*

*Georgia Tech, United States.*

Can we use the fabric and embellishments that create the garments we wear to also operate and control the electronic devices we carry with us? Why hasn't technology found its way into our garments, which are both wearable and ubiquitous? What uses could shine as exemplary applications to validate the benefits of textile interfaces, and what hurdles do we need to overcome to help make textile interfaces useful alternatives? Georgia Tech's contextual computing group in collaboration with Georgia Tech's School of Industrial Design is looking to answer these questions through workshops, user studies and prototype development. Specifically, I will discuss e-textile techniques we can use to create interfaces for on-body interactions. It is also important to understand the limitations and wash-ability of the conductive materials used to create electronic textile interfaces, and how to overcome these limitations by adjusting machinery and garment design. Through project examples I will showcase the different uses we have found for our electronic textile interfaces, and how they could have a broad and important impact. Finally, I will layout some important design considerations for creating your own electronic textile interfaces.

*Keywords:* Technology, Wearables, Fashion, Textile interfaces.

**Paper ID: 050**    14:30 – 15:00 hrs

### Audio-Only Augmented Reality System for Social Interaction

Tom Gurion and Nori Jacoby

*Georgia Tech, United States.*

We explore new possibilities for interactive music consumption by proposing an audio-only augmented reality system for social interaction. We designed and built an Android application that measures the relative position of the device from specially designed Bluetooth beacons. Participants can freely move the beacons that are installed on physical objects, thereby dynamically changing the structure of the music in the virtual space. In a controlled experiment, we assessed the interactive component of the system in the context of a silent rave party by comparing the system positioning readings in interactive and non-interactive control segments. We also directly assessed the user experience using self-reported pre/post surveys. Our preliminary results show that in the post-party survey, participants self-reported significantly higher levels of movement using the system, compared with their behavior on other parties as reported in the pre-party survey. We used the relative positioning system in the application to objectively validate that the interactive components of the system facilitate greater participant movement in space, thereby offering more frequent opportunities for social interaction. Indeed, in the post-party survey participants reported that they danced significantly less with people that they knew ahead of time, compared with their pre-party survey reporting of usual behavior. Our results displaying the potential of using audio-only augmented reality in future mobile applications.

*Keywords:* Augmented reality, Music technology, Social interaction, Relative indoor positioning system.

<b>Session</b>	HDR	Parallel
<b>Date / Day</b>	June 28, 2013 (Friday)	
<b>Time</b>	13:30 – 15:00 hrs	
<b>Venue</b>	Room Three	
<b>Chair</b>	Bradley Kjell	

**Paper ID: 033**    13:30 – 14:00 hrs

### High Dynamic Range Tone Mapping Based On Per-Pixel Exposure Mapping

Jason Huang, Valmiki Rampersad and Steve Mann

*University of Toronto, Canada.*

The needs of a realtime vision aid require that it function immediately, not merely for production of a picture or video record to be viewed later. Therefore the vision system must offer a high dynamic range (often hundreds of millions to one) that functions in real time. In compliment with the existing efficient and real-time HDR compositing algorithms, we propose a novel method for compressing High Dynamic Range (HDR) images by Per-Pixel Exposure Mapping (PPEM). Unlike any existing methods, PPEM only varies exposure to achieve tone mapping. It takes advantage of the camera response to enable exposure synthesis which we call Wyckoff set expansion. The method evaluates the synthetic exposures in a recursive pairwise process to generate a tone mapped HDR image. The results can be approximated using a look-up table, which can be used for real-time HDR applications.

*Keywords:* Wearable computing, HDR, Augmented reality, High dynamic range, Sousseillance, Spatiotonal mapping, Tonemapping.

**Paper ID: 043**    **14:00 – 14:30 hrs**

**Comparametric HDR (High Dynamic Range) Imaging for Digital Eye Glass, Wearable Cameras, and Sousveillance**

Mir Adnan Ali, *Tao Ai*, Akshay Gill, Jose Emilio, Kalin Ovtcharov and Steve Mann

*University of Toronto, Canada.*

Wearable computing can be used to both extend the range of human perception, and to share sensory experiences with others. For this objective to be made practical, engineering considerations such as form factor, computational power, and power consumption are critical concerns. In this work, we consider the design of a low-power visual seeing aid, and how to implement computationally-intensive computational photography algorithms in a small form factor with low power consumption.

We present realtime an FPGA-based HDR (High Dynamic Range) video processing and filtering by integrating tonal and spatial information obtained from multiple different exposures of the same subject matter. In this embodiment the system captures, in rapid succession, sets of three exposures, “dark”, “medium”, and “light”, over and over again, e.g. “dark”, “medium”, “light”, “dark”, “medium”, “light”, and so on, at 60 frames per second. These exposures are used to determine an estimate of the photoquantity every 1/60th of a second (each time a frame comes in, an estimate goes out).

This allows us to build a seeing aid that helps people see better in high contrast scenes, for example, while welding, or in outdoor scenes, or scenes where a bright light is shining directly into the eyes of the wearer. Our system is suitable for being built into eyeglasses or small camera-based, lifelogging, or gesture-sensing pendants, and other miniature wearable devices.

*Keywords:* HDR, High dynamic rang, FPGA, Tonemapping, Spatiotone mapping, Edge preserving filter, Domain transform, Veillance, Sousveillance, Quadtree, CCRF.

**Paper ID: 029**    **14:30 – 15:00 hrs**

**Veillances: Protocols & Network Surveillance**

*Nancy Paterson*

*OCAD University, Canada.*

Multi Protocol Label Switching (MPLS) is a type of data traffic routing protocol for core and wireless internet networks which originated in the 1990s. Its usage has grown enormously in next generation networking as it is considered superior in many ways to traditional routing for its traffic control and engineering capabilities especially in 4G LTE wireless networks. This paper discusses ramifications of MPLS routing and Deep Packet Inspection (DPI) in the growing area of end user privacy and policy based networking. DPI examines information not only in layers 2 through 4 of the Open Systems Interconnection (OSI) model, but also layers 5 through 7, as required. DPI performs an analysis of the packet in order to identify applications associated with the traffic. MPLS traffic is ‘typed’ at present into four to six Classes of Service (CoS) to denote the type of data but many more CoS classes are possible and here is where further differentiation of data traffic type and service are conceivable. As argued in this paper privacy concerns arise from the fact that the end user IP number, their type of device, geographic location and type of data traffic [or application in use at any particular point in time] are being aggregated together. Other policy based networking technologies have emerged such as Software Defined Networking (SDN) OpenFlow; yet much of the detail in SDN still remains to be resolved. Privacy issues raised in this paper relate to SDN as many of the routing practices and usage of end user metadata are the same. The effort to provide end users with security for their ecommerce or other applications may require new forms of protection for end user privacy.

*Keywords:* Multi protocol label switching, Policy based networks, Deep packet inspection, Privacy.

Session	Social Networking	Parallel
Date / Day	June 28, 2013 (Friday)	
Time	13:30 – 15:00 hrs	
Venue	Room Four	
Chair	Stephanie Cork	

**Paper ID: 019**      13:30 – 14:00 hrs

**Peer-Produced Privacy Protection: A Common-Pool Approach**

Vaibhav Garg<sup>1</sup>, Sameer Patil<sup>2</sup>, Apu Kapadia<sup>3</sup> and Jean Camp<sup>3</sup>

<sup>1</sup>Drexel University, United States.

<sup>2</sup>Helsinki Institute of Information Technology, Finland.

<sup>3</sup>Indiana University, United States.

Privacy risks have been addressed through technical solutions (e.g., privacy-enhancing technologies) as well as regulatory measures (e.g., Do Not Track). These approaches are inherently limited as they are grounded in the paradigm of a rational end user who can determine, articulate, and manage her consistent privacy preferences. This implies that self-serving efforts to implement individual privacy preferences lead to socially optimal outcomes w.r.t information sharing. Consequently, solutions to specific risks are developed, and even mandated, without effective reduction in the overall harm of privacy breaches. We present a systematic framework to examine the limitations of current technical and policy solutions. To address the shortcomings of the existing privacy solutions, we argue for considering information sharing to be transactions within a community. Outcomes of privacy management can be improved at a lower overall cost if peers, as a community, are empowered by appropriate technical and policy mechanisms. Designing for a community requires encouraging dialogue, enabling transparency, and supporting enforcement of community norms. In this paper we show how peer production of privacy is possible through PETs that are grounded in the notion of information as a common-pool resource and community governance.

*Keywords:* Privacy, Common-pool, Community governance.

**Paper ID: 018**      14:00 – 14:30 hrs

**Social Media in Conflict: A Comparison of Military and Social Movement Technocultures in Egypt, Spain and the United States**

Chris Grey<sup>2</sup> and Angel Gordo-Lopez<sup>2</sup>

<sup>1</sup>University of California Santa Cruz, USA.

<sup>2</sup>Universidad Complutense de Madrid, Spain.

There are important differences in the way social media is used in military and social movement cultures. The NATO (US and Spain) and Egyptian militaries use social media in the human terrain model and security police mode for quantifying and controlling social space to meet low-intensity, counter-insurgency, and regime maintenance goals (or for recruitment and public relations). For social movement cultures, such as secular Egyptian revolutionaries, the 15 M (los indignados), Occupy and Idle No More, social media is an integral part of life, it is context. In particular, the hierarchical nature of military institutions precludes social media being part of organizational and decision-making culture in the way it is integral to horizontalist movements. For them, it is part of civil society. This does not mean, however, that it isn't also used by both groups for propaganda and disinformation, classic military modes.

The synergy between network technoculture and decentralized social movements is clear when military, social movement, and network theories and practices are compared. These differences are manifested in asymmetrical relationships to "veillance," alternative modes of producing social technologies, contrasting theories of power, and opposing conceptions of morality and efficacy. At the root, military and social movement cultures have contradictory epistemologies, and therefore politics.

*Keywords:* Social media, Social movements, Military technoculture, Veillance.

**Paper ID: 084**    14:30 – 15:00 hrs

### Google Glass: By the Numbers

*Pete Wassell*

*Augmate, Canada.*

In this presentation, I will cover the the public's response to Google Glass as the first mass marketed wearable computer device. I will dive into the consumer anticipation, potential applications, technology challenges, design issues, privacy backlash, and the overall Google effect. I will show the month to month roller coaster of trends and volumes surrounding Google Glass from April 2012 - April 2013. There is a plethora of market research data to mine due to the way Google has announced this product nearly two years before its availability. Because of this, we can critically review Google's Public Relations, Video Marketing, Exclusive Rollout, and other user adoption strategies.

Some findings like instances of paired keyword terms and similar technology comparisons will lend insight to the overall public reaction to Google Glass. I collected this information from both the general Internet (headlines and comments) as well as social media sites like: YouTube, Twitter, Facebook, LinkedIn, and Google+. I will support this talk with graphs and visual data collected and crunched through API's and social media reporting tools like: Klout, Kred, PeerIndex, Facebook Insights, Google Analytics Social Reports, PeopleLinx, SimplyMeasured, and others. The conclusions of my analysis should indicate how ready the general public is for this new computing platform.

*Keywords:* Digital eyewear, Design, Privacy, Augmate, Trends.

<b>Session</b>	<b>Build</b>	<b>Parallel</b>
<b>Date / Day</b>	<b>June 28, 2013 (Friday)</b>	
<b>Time</b>	<b>15:30 – 17:30 hrs</b>	
<b>Venue</b>	<b>Room One</b>	
<b>Chair</b>	<b>Gene Becker</b>	

**Paper ID: 080**    15:30 – 16:00 hrs

### Moving Surveillance Techniques to Sousveillance: Towards Equiveillance Using Wearable Computing

*Corey Manders*

*A\*Star Research, Singapore.*

To date, a large amount of research has been conducted using surveillance systems. In fact many conferences, journals, and research programmes are devoted entirely to this subject. However, sousveillance, "watching from below" (or capturing image data from the perspective of a live observer), being a newer area of investigation currently has much less associated work. Since both research topics involve image processing, many similarities exist. Thus, much of the work which is done in surveillance may be "ported" to sousveillance. One such example is that of colour constancy. In particular, a problem that occurs when using multiple cameras for surveillance and associated tracking, is that colours can vary widely across cameras. An object and it's associated data that appears in one view and one system, may present completely difference data in another camera and system. New techniques have been developed to attempt to unify colours between cameras and systems. The same problem exists in the area of sousveillance. For example, an object observed by one cyborg may appear differently to another cyborg. Given that in the situation of sousveillance, the camera control as well as the environment are largely in control of the wearcam operator/cyborg, colour constancy techniques which are used surveillance can actually be done more accurately in the case of sousveillance. This discussion will present one method of mapping an existing method of colour constancy for multiple surveillance cameras to colour constancy for a group of cyborgs.

*Keywords:* Surveillance, Sousveillance, Equiveillance, Cyborg, Color calibration, Color constancy, Cameras.

**Paper ID: 046** 16:00 – 16:30 hrs**Augmented Reality System Based on 3D Camera Selfgesture Sensing**Raymond Lo, *Alexander Chen*, Jason Huang, Valmiki Rampersad, Han Wu and Steve Mann*University of Toronto, Canada.*

Three-Dimensional (3D) range cameras have recently appeared in the marketplace for use in surveillance (e.g. cameras affixed to inanimate objects) applications. We present FreeGlass as a wearable hands-free 3D gesture-sensing Digital Eye Glass system. FreeGlass comprises a head-mounted display with an infrared range camera, both connected to a wearable computer. It is based on the MannGlas (TM) computerized welding glass, which embodies HDR (High Dynamic Range) and AR (Augmented/ Augmented Reality). FreeGlass recontextualizes the 3D range camera as a sousveillance (e.g. cameras attached to people) camera. In this sousveillance context, the range camera is worn by the user and shares the same point-of-view as the user. Computer vision algorithms therefore benefit from the use of the range camera to allow image segmentation by using both the infrared and depth information from the device for 3D hand gesture recognition system. The gesture recognition is then accomplished by using a neural network on the segmented hand. Recognized gestures are used to provide the user with interactions in an augmented reality environment. Additionally, we present applications of FreeGlass for serendipitous gesture recognition in everyday life, as well as for interaction with real-world objects (with and without gesture recognition). A plurality of FreeGlass units can be used together, each sensor having a different spreading sequence, or the like, so that a number of people can collaborate and share the same or similar Augmented Reality space(s).

*Keywords:* 3D sensor, Gesture recognition, Range sensor, Self gesturing, Self gestures, Natural User Interface, NUI, Interactive system, Kinect, PrimeSense, Veillance, Surveillance, Sousveillance, FreeGlass, MannGlas, Surveillance hypocrisy.

**Paper ID: 052** 16:30 – 17:00 hrs**The Future is Un-Real***Rob Manson**Managing Director, MOBLabs.*

“Augmented Reality”, “Diminished Reality”, “Virtual Reality”, “Mixed Reality”, “Mediated Reality”, “Augmented Reality”, “Augmented Virtuality”, the now pervasive “Online Reality” and of course the good old “Offline or ‘Real’ Reality”! It seems like the future is fragmenting your sense of reality to the point where it may feel like you are “losing your grip on reality”. This presentation explores the different conceptual models that have been used to define the fundamental idea of “Reality”. It explores the structural changes that Pervasive Computing is creating and how they impact these definitions. It lays out the key perspectives on “where” reality may actually exist and how it is constructed. Then it paints a broad framework that integrates these different perspectives into one single model in an aim to make this complex and abstract discussion both simpler and more rigorous.

This discussion has broad implications for our sense of “Body Image”, “Personal Space”, “Empathy”, “Personal Relationships”, “Human Computer Interfaces” and the “limits of Neuroplasticity”.

The position you take here can set the boundaries for your views on “what it means to be a ‘real’ human”.

*Keywords:* Reality, Augmented reality, Pervasive computing, Diminished reality, Virtual reality, Mixed reality, Mediated reality, Augmented reality, Augmented virtuality, Online reality, Offline reality, Wearable computing, Head mounted displays.

**Paper ID: 087** 17:00 – 17:30 hrs**Interaxon: Taking BCI to the Masses***Ariel Garten**Interaxon Canada.*

The fusion of human, machine and consciousness has raised big questions about human value, autonomy, and whether technology so intertwined in our daily lives may lead to one day controlling us. In this talk, Ariel will discuss the benefits and potential of BCI technology in terms of the individual and their interaction with their inner and outer world. She will expand on the next wave of Quantified Self and how BCI will play a significant

role in growing the consumer category in numerous segments including health, entertainment, education and fitness.

*Keywords:* Interaxon, Human, Machine, Consciousness, Quantified self.

<b>Session</b>	<b>mHealth</b>	<b>Parallel</b>
<b>Date / Day</b>	<b>June 28, 2013 (Friday)</b>	
<b>Time</b>	<b>15:30 – 17:30 hrs</b>	
<b>Venue</b>	<b>Room Two</b>	
<b>Chair</b>	<b>Joseph Herkert</b>	

**Paper ID: 070**      **15:30 – 16:00 hrs**

### **Healthcare & Public Health: Perspectives on Wearable Computing, Augmented Reality and the Veillances**

*Luis Kun*

*National Defense University, USA.*

In the past decade during IEEE sponsored professional meetings the theme of “Global Health Transformation through true Interoperability” was brought to the forefront in the inaugural keynotes. Some technologies that started with the monitoring of hemodynamic variables of astronauts by NASA in the 60s were further developed by the Department of Defense for the purposes of treating their injured in the battlefield via Telemedicine. By August 5th, 1997 President Clinton signed the first piece of legislation that was allowing the concepts of homecare to be tried to measure cost and medical effectiveness. With the development of the Internet, the World Wide Web (WWW), social media, intelligent agents, mobile technology, sensors, and pieces of clothing containing them, a new generation of devices have been created offering new possibilities for improvements particularly in areas such as assistance for living (for those suffering from chronic conditions), and more generally, homecare. The use of wearable computing and the use of augmented reality in the developed world, in particular, offer some unique opportunities to improve outcomes. In the 21st Century as Health Care and Public Health infrastructure intersect deeper into the many Information Technology (IT) subfields, abundant and formidable changes can occur that will allow society to shift current systems into some where wellness and disease prevention will be the focus. Many changes can affect positively medical outcomes which are cost effective as well as eliminate medical errors and patient safety for example. In these arenas, with the convergence of science, technology and with Information Technology acting as a catalyst for change, health care systems around the world are slowly shifting from “hospital based” ones into distributed systems that include: hospitals, clinics, homecare systems with treatment and management of chronic diseases for the elderly via Internet, etc. In order to achieve such visions, multiple efforts have been tried for creating electronic health record as well as the information highway for their use. In the US the health system is very scattered and most hospital systems do not contain for example mental health, dental health and or vaccine registry information. On one hand through major medical research the emergence of clinical and health data repositories or “Intelligent Data Warehouses” that not only include traditional clinical data, but also advanced imaging, molecular medicine, tissue micro- array analysis and other bioinformatics information is available. These increasingly multi-modality data warehouses are constantly updated, continuously expanded and populated with millions of records. Although these repositories of electronic information can be leveraged not only to improve point of care clinical decision-making for individual patients, they can also support population health chronic and infectious disease analytics (i.e., epidemiology and surveillance), cost efficient multi-center (e.g., and multi-country) clinical trials, and comprehensive post-market pharmaco-vigilance. On the other hand the integration of healthcare and public health is a major concern as well. Globalization (i.e., the interdependencies that each country has with many others) for example has raised the sense of awareness through “the information highway”. In 2004 the total production of flu vaccines coming to the US from the UK’s Chiron had to be thrown away (approximately in the range of 42 to 44 million vaccines).

During and since 2007 the US public has learnt through successive media stories related to: the death of pets due to food- import contamination, children’s toys imports containing lead paint, food contamination,

drug contamination, drug ingredients contaminated, etc. During 2008 we heard about: People getting very sick from fish containing the ciguatera toxin and Tap/drinking water containing about 36 different medications, e.g., antibiotics, antidepressants, etc. As the northern hemisphere prepared for the second wave of the 2009 H1N1 Flu Pandemic (which was expected to start around October 2009) all nations could have benefited by having epidemiology and surveillance data from all southern hemisphere nations available for the production of more “accurate” vaccines. In 2011 the European Union had to cut back in their consumption of vegetables and fruit because of an e-coli outbreak. Simultaneously the food from Asia in some cases was contaminated with radiation from the nuclear disaster caused by the combination of earthquake/tsunami at the Fukushima site. In South America the eruption of the volcano Puyehue in Chile closed all the airports in Uruguay, Argentina, Paraguay and the south of Brazil. All of these events resulted in major conflicts regarding world demand for food supplies. Still the perfect opportunity to transform our health care systems to a strategy of disease prevention and wellness is in the horizon. Using information technology as an enabler, we can encompass a wide range of opportunities that can start at the cellular, molecular and genetics levels and go as far as population health. Initial immunization studies show the level of antibody titers against viral diseases depends on the circadian time of inoculation. The concepts of chronobiology and chrono- therapeutics can be used to generate disease prevention strategies based on these circadian-rhythm dependencies.

Just imagine how the public could also be better protected not only against environmental threats, water contamination, food borne diseases through the use of remote sensing data and a worldwide food enterprise architecture, but through alerts that could flow into a person through Wearable Computing, Augmented Reality and the Veillances. Data, Information, Knowledge and Wisdom could “flow” into an individual alerting him/her that they need to immediately visit their doctor, or stop consuming certain products. Some examples of our current problem – environment could change outcomes by using these tools:

- (1) Getting the right information at the right time- the steroid injection that they got for pain from laboratory x (in Massachusetts) is contaminated. Just in the USA, between September 2012 and March 2013 at least 44 people have died and over 700 are contaminated from fungal meningitis according to the CDC and their life may be at risk;
- (2) Preventing potential water and or food poisoning- on February 4th, 2013, a report regarding the drinking water in many places within the State of California containing large amounts of Arsenic. Since we eat year round vegetables and fruits, livestock, poultry, etc. from that State, it may require the public to be cautious.

As discovery from new research expands our knowledge about our body, its genome, and the cause-effect of new drugs, it also provides an opportunity to bring not only all these types of information to the forefront of the patient regardless where she/he may be at, but enable the transition from a system that has focused on disease to one that will focus on wellness through prevention and hopefully improve the quality of our lives.

*Keywords:* Personal health records, Future, Technology, Quality of life.

**Paper ID: 071      16:00 – 16:30 hrs**

### **Ambient Assisted Living Technologies and Their Social Implications: A Perspective From Europe**

*José L. Monteagudo*

*Instituto de Salud Carlos III, Spain.*

Ambient Assisted Living (AAL) refers to intelligent systems of assistance for a better, healthier and safer life in the preferred living environment and covers concepts, products, systems and services that interlink and improve new technologies and the personal and social environment. R&D activity on AAL in Europe has been aimed to use technology to extend the time people can live in a decent way in their own home by increasing their autonomy and self- confidence, the discharge of monotonously everyday activities, to monitor and care for the elderly or ill person, to enhance the security and to save public and private resources.

Over the past years, national and European R&D programs have stimulated the development of innovative ICT-based AAL applications involving various technology areas and innovative technology approaches. For instance, the European AAL Joint Program, supported by 23 European Countries and the European Commission, has funded more than 150 projects over the last 5 years. These projects are directed to support elderly people in aspects such as the prevention and management of chronic conditions, social interaction, independence, mobility, self-management of Daily Life Activities and occupation in life [<http://www.aal-europe.eu>]. Research activities range from the practical aspects of body-worn sensors for medical interventions to the

provision of holistic services within the AAL environment. Results include a great number of pilot experiences that have focused mostly on verifying technology prototypes and technical architectures. However, the breakthroughs in terms of widespread availability and deployment of AAL systems are yet to be achieved.

To address this situation, major collaborative efforts are now being mobilized under the initiative of the European Innovation Partnership on Active and Healthy Ageing (EIP-AHA) addressing the challenge of implementing AAL at scale [<https://webgate.ec.europa.eu/eipaha/>]. Working plan aims to identify and remove barriers to innovation across the health and care delivery chain, through interdisciplinary and cross-sectorial approaches. The Partnership goal is to increase by 2 the average number of healthy life years in the EU population by 2020. HLY is a functional health status measure that is increasingly used to complement the conventional life expectancy measures in Europe. The emphasis is not exclusively on the length of life, as is the case for life expectancy, but also on the quality of life. The HLY measure reflects the fact that not all years of a person's life are typically lived in perfect health. Chronic disease, frailty, and disability tend to become more prevalent at older ages, so that a population with a higher life expectancy may not be healthier. Indeed, a major question with an aging population is whether increases in life expectancy will be associated with a greater or lesser proportion of the future population spending their years living with disability. Health maintenance activities are an integral part of the experience of healthy and active ageing, and most notably they point not just to the physical health but also to mental well-being and social connectedness.

The EIP-AHA Strategic Implementation Plan has been adhered by 261 projects submitted by groups of stakeholders spanning the public and private sector. In addition, 54 regions and municipalities applied to be 'Reference Sites', to exchange good practice and to share knowledge and experience on past successes in active and healthy ageing. In this context our Institute is participating in the B3 Action Group on "Integrated care for chronic diseases, including remote monitoring at regional level" by means of the PITES Project. In particular we are engaged in citizen empowerment, development of the workforce and in interoperability aspects. In this subject interoperability of AAL devices (or rather its absence) is identified as a major obstacle to widespread diffusion because increases costs and reduces effectiveness of deployed systems. Beyond the devices sphere, a major concern is about interoperability of AAL data with the electronic patient health record, as well as the organizational interoperability, or the ability or organizations to interchange information and to collaborate in shared processes.

Regarding the social impact of AAL technologies, it must be taken into account technology is not the unique factor to consider. As some theorists have pointed out, society is not exclusively driven by technology. For them, technologies do not create the transformations in society by themselves; they are designed and implemented by people in their social, economic and technological contexts. In addition, at times, technologies have unintended consequences that combine to have serious impacts undreamed of by the creators of the technology.

Ambient Assisted Living technologies mean creating new worlds for aged adults. Certainly, a major driving force in human activity is the desire for optimal health, for better living conditions and improved quality of life. Individuals seek to achieve this for themselves, for their family, and for the communities of which they are a part. It is intended AAL technologies can help individuals to improve their quality of life, to stay healthier and to live longer, thus extending ones active and creative participation in the community. However it is difficult to assess the actual impact on the quality of life of currently developed AAL technologies and the implications of living in smart worlds. We need to understand the complex relationship between technology and society particularly considering the potentialities of ICT and its pervasive nature.

*Keywords:* Ambient intelligence, Assistive living, Technology, Social implications, Smart worlds, Europe.

**Paper ID: 072**    **16:30 – 17:00 hrs**

### **Wireless Platforms for the Hemodynamic Monitoring of the Elderly Patient**

*Ricardo L. Armentano*

*Universidad Favaloro, Argentina.*

With the number of people aged 65 and over rising relative to the rest of the population, the costs to the state to care for or assist them are set to continue increase. New wireless technologies could give new possibilities for monitoring vital parameters with wearable biomedical sensors, and give patients the freedom to be mobile and still be under continuous monitoring and thereby receive better quality of patient care. It is widely acknowledged that by assisting senior citizens to look after their health at home, their independence can be maintained for longer, providing a higher quality of life for the retiree and lower care costs for the state and family. Our

approach consists of a platform for cardiac monitoring in daily life, at rest and during the physical activity of elderly patient. To this end we propose to adapt a technical garment (<http://www.gowtrainer.com/index.php>) that has 2 integrated sensors that capture the cardiac information of the user. It communicates via Bluetooth with the app for smartphones. A sensor adapted to be incorporated in a garment comprising a respiration sensor and at least two ECG sensors that in use of the garment are in contact with a user's skin. This monitoring system will be use to measure one or more parameters indicating a physical status of the elderly patient. The introduction of such a system into the lives of the elderly can also offer reminders to take medicines, dietary advice, immediate access to medical professionals and much more. It also reduces the need for visits to a local doctor. This presentation will also discuss the current promising hardware/software platforms for wireless cardiac monitoring that would include important measurements such as their blood pressure, arterial pulse wave velocity and have that information directly uploaded to the system. Any healthcare professional they deal with can therefore have immediate access to their recent health records.

*Keywords:* Cardiac monitoring, Elderly patient, Wearable biomedical sensors, Quality of life.

**Paper ID: 038**     **17:00 – 17:30 hrs**

### **Identity Awareness of Research Data in Veillance & Social Computing**

Alexander Hayes<sup>1</sup>, Steve Mann<sup>2</sup>, Amir Aryani<sup>3</sup>, Susannah Sabine<sup>4</sup>, Leigh Blackall<sup>5</sup>, Pia Waugh<sup>6</sup> and Stephan Ridgway<sup>7</sup>

<sup>1</sup>University of Wollongong, Australia.

<sup>2</sup>University of Toronto, Canada.

<sup>3</sup>RMIT University, Australia.

<sup>4</sup>Scholar at Large, Australia.

<sup>5</sup>La Trobe University, Australia.

<sup>6</sup>Australian Government Information Management Office, Australia.

<sup>7</sup>DET NSW, Australia.

The research landscape is fast changing, presenting challenges for researchers as they move to a model of open access and reuse of data. Identity awareness of research data addresses the required connectivity between research data and other elements in research ecosystems in order to make the data available and reusable beyond the initial research. Connections between the data, researchers, publications and research grants inform best practice principles of identity awareness of research. Dataset cases presented in this paper articulate the challenges that researchers face as they seek to expose data created as a result of Veillance or social computing research activities.

*Keywords:* Data, Research, Computing, Licensing, Access, Ethics, Funding, Reuse, Veillance, Social, Technology.

<b>Session</b>	<b>Methodology</b>	<b>Parallel</b>
<b>Date / Day</b>	<b>June 28, 2013 (Friday)</b>	
<b>Time</b>	<b>15:30 – 17:30 hrs</b>	
<b>Venue</b>	<b>Room Three</b>	
<b>Chair</b>	<b>Terri Bookman</b>	

**Paper ID: 049**     **15:30 – 16:00 hrs**

### **DIY & Maktivism: Tinkering Towards Better Worlds**

Megan Boler<sup>1</sup>, Chris Hables Gray<sup>2</sup> and Steven Mann<sup>1</sup>

<sup>1</sup>University of Toronto, Canada.

<sup>2</sup>University of California, United States.

What do social movements have in common with engineering? It turns out, a great deal. The authors of this paper are involved in mapping the growing interconnections between new sociopolitical and techni-

cal creations, and creating new technological inventions. This work comes together in related conceptions of technology and existentiality (Mann 2003), DIY/DIT (do-it-yourself and do-it-together) citizenship (Boler 2008), Maktivism (Mann 2012), cyborg citizenship (Gray 2001), tinquiry (tinkering-as-inquiry) and praxistemology (Mann 2013), cyborg epistemology (Gray, Mentor, Figueroa-Sarriera 1995), “feeling power” (Boler 1999) as well as in inventions of new technologies like Wearable Computing, AR (Augmented Reality) Glass, and Natural User Interfaces (Mann 2001). This academic and activist work is part of a much greater cultural convergence between technological and political realms, as we will explore in our main shared example: Veillance.

The practices and actions undertaken in recent social movements determined to materialize “better worlds” are potent examples of the tinkering and making that is as much concerned with ensuring that the process reflects the ideals. Thus 21st Century social movements overlap with significant technological currents in information technology engineering in ways that reveal shared epistemologies and praxes. The overlap is apparent in shared concepts such as DIY/DIT, decentralized network architectures, rhizomes, commons based technical and political production/open source (Benkler 2006) “commons-based peer production.” It is also clear in Brian Holmes (2008) “open source to alternative society?” and Bauwens (2012), augmented participation. In many respects it comes down to nonhierarchical governance (as with internet protocols, crowd sourcing, and the mass meetings of the Arab Spring, Los Indignados, Occupy) and in shared groups and techs: Anonymous, Wikileaks, Ushahidi, Open Mesh, among others. This paper will be grounded in SSHRC (Social Sciences and Humanities Research Council of Canada) and NSERC (National Sciences and Engineering Research Council) funded, mixed-methods research into social media and movement participation.

*Keywords:* Social movements, Tinkering, Social justice, Maktivism, Activism, User-generated, Information technology, Open source, Occupy wall street, Engineering, Veillance, Surveillance, Sousveillance.

**Paper ID: 040** 16:00 – 16:30 hrs

### **DIY Prosthetics Workshops: ‘Critical Making’ for Public Understanding of Human Augmentation**

*Isaac Record*<sup>1</sup>, Matt Ratto<sup>1</sup>, Amy Ratelle<sup>1</sup>, Adriana Ieraci<sup>2</sup> and Nina Czegledy<sup>1</sup>

<sup>1</sup>University of Toronto, Canada.

<sup>2</sup>Conveyor Built, Canada.

We reflect on our ongoing series of DIY Prosthetics Workshops intended to engage the public in critical discourse about technology and human augmentation through engagement with prosthetics. The goal of these workshops is to enhance understanding of prosthetic technologies through both conceptual and material exploration. We describe our efforts to capture the makings of our workshop in an open, modifiable “kit” comprising “three Ps:” prompts for reflection, parts for construction, and publics for participation.

*Keywords:* Hacking, Making, Critical making, Prosthetics, Workshop, Kit.

**Paper ID: 096** 16:30 – 17:00 hrs

### **Millennials’ Increasing Openness to Microchip Implants in Humans: A Confluence of Factors**

*Christine Perakslis*

*Johnson and Wales University - Providence, United States.*

In 2005, the European Group on Ethics articulated that there was “a stepwise shift in progress of individuals being turned into networked beings allowing movements, habits, and contacts to be traced and defined.” Stepwise may now be better described as drastically accelerated with a confluence of factors. Because of technology, society has never been so vulnerable to informal, and unauthorized surveillance. Headlines reveal the risk to privacy with government mandates for broadcast surveillance of personal phone records, tracking through cell phones, and improper usage of electronic files by governments to discriminate against, or punish constituents with opposing views. Society perceives advantages of surveillance, such as when surveillance can mitigate individual vulnerabilities. When considering the global context, there are voids relative to regulations and uniformity of standards for microchip implants in humans. One emerging factor that ought to be carefully considered is the “next great generation” (aka Millennials born 1981-2000). Research reveals they are more open to microchip implants for employee identification when compared with preceding generations. Additionally, their openness to microchip implants has reportedly increased between 2005 and 2010. Millennials’ power to influence is increasing; they influence the decisions of other generations. They are the fastest growing segment of the US workforce and future owners of small businesses that constitute the political clout of the EU. Therefore,

Millennials are noteworthy society stakeholders who will affect the development of regulations and be forced to confront the ethical dilemmas relative to microchip implants which create networked beings who are traced and defined. However, researchers report Millennials prefer to have ethical dilemmas resolved by an external force (e.g. authority) rather than by resolving it on their own accord. The time is now for multi-generational dialogue. Preceding generations can educate Millennials on the lessons learned historically when the rights of society are diminished and partner with Millennials to move toward resolution of the ethical dilemmas as they emerge as the primary societal influencers.

*Keywords:* Millennials, Microchip implants, Employee identification.

**Paper ID: 022**     **17:00 – 17:30 hrs**

### **Visuo-Haptic Learning of the Cochlea: Using Physical Optical Glyphs with Augmented Reality**

*Andrea Zariwny*

*University of Toronto, Canada.*

To develop a novel augmented reality (AR)-enabled teaching tool to demonstrate the complex structure of the human cochlea to medical students. The cochlea is small but intricate anatomical structure often represented as a snail shell-like object. It is more accurately defined as a spiral negative space within the temporal bone, but this is difficult to convey with traditional teaching tools (prosections and illustrations largely). Using a handheld tablet equipped with an integrated camera, digitally-rendered 3D models of this structure can be visually superimposed over illustrations of the cochlea and/or physical models of the petrous temporal bone, thus highlighting the negative space.

*Keywords:* Augmented reality, 3D printing, Visuo-haptic, Anatomy, Cochlea, Pedagogy, Mobile app.

<b>Session</b>	<b>Open Data</b>	<b>Parallel</b>
<b>Date / Day</b>	<b>June 28, 2013 (Friday)</b>	
<b>Time</b>	<b>15:30 – 17:30 hrs</b>	
<b>Venue</b>	<b>Room Four</b>	
<b>Chair</b>	<b>Alexander Hayes</b>	

**Paper ID: 094**     **15:30 – 17:30 hrs**

### **Ubiquitous Computing for Teenagers: A New Perspective on Child-Computer Interaction**

Amandeep Dhir<sup>1</sup> and Mohammed Al-Kahtani<sup>2</sup>

<sup>1</sup>*Aalto University, Finland.*

<sup>2</sup>*Salman bin Abdulaziz University, Saudi Arabia.*

Ubiquitous computing (UbiComp) is a more than two-decade-old phenomenon, but its impact is still evident on the design and development of various mobile and internet-based applications and systems. In this paper, we present a novel and interesting research subject concerning the need for an understanding of the design of future UbiComp technologies, specifically aimed at teenage users. Designing UbiComp technologies for teenagers and young children is quite new, so little work is reported in scientific literature. For this reason, existing literature available on the design and use of internet and handheld-based applications by teenagers and young children has been examined, since it presents crucial design level considerations that might also be applicable for designing UbiComp technologies. The contribution of this paper is as follows: 1) It presents a multidisciplinary literature review comprising of previous research on child- computer interaction and various other Internet and media-based studies involving teen users. 2) It presents a new research agenda governing the design and development of UbiComp and “cool UbiComp”. 3) It outlines some of the interesting experiences from our ongoing field studies in India involving school-going teenagers. 4) It gives detailed discussions on various associated ethical issues concerning the process of approval needed for involving teenagers in the research, and practiced protocol for ensuring various international ethical standards and norms during our field

studies in India. 5) It presents four crucial challenges on “designing for teenagers” concerning privacy in teen design, social implications of technology use by teenagers, lack of education on ICT and internet safety policies and missing psychological and sociological foundations of designing for teenagers.

*Keywords:* Child computer interaction, “Cool design”, Ethical issues, Social implications, Teenager, Ubiquitous computing.

**Paper ID: 093** 15:30 – 17:30 hrs

### **A Privacy Framework for Secondary Use of Medical Data**

*Jennifer Heath*

*University of Wollongong, Australia.*

Secondary uses of medical data are not directly related to the delivery of healthcare to an individual and the provision of privacy within this context is increasingly challenging. This paper integrates theoretical and empirical research regarding privacy and proposes a privacy framework to support secondary use of medical data. Theoretical aspects consider two contemporary privacy theories and empirical aspects incorporate consumer survey results to propose a privacy framework for secondary use of medical data. This research is part of a larger study undertaken within the post-positivist and interpretive paradigms utilizing mixed methods. The proposed privacy framework engages healthcare consumers in decision making regarding the secondary use of their data.

*Keywords:* Privacy, Data management, Secondary use medical data, Information privacy theory.

**Paper ID: 090** 15:30 – 17:30 hrs

### **The Democratic Singularity**

*Pia Waugh*

*OpenGov Advocate, Australia.*

The Internet has brought a third of the world’s population together in a space that transcends almost every traditional barrier to communication and collaboration, including geography, gender, beliefs, ethnicity and age. Individuals are more empowered than ever before, especially with the massive global distribution of the power to publish, connect, monitor and enforce, along with the upcoming massive distribution of property as we enter the age of 3D printing.

Open government is a natural step in the evolution towards a more open society. We can see its roots clearly in the “hacker” culture of the 60s, through the Free and Open Source Software movement, open knowledge/culture and Wikipedia movement, and now the general openness trend which is permeating many aspects of society.

Gov 2.0 is about how we do open government in the digital age, looking at improved transparency and open data, at improved public engagement in policy and democracy, and at how to design the way governments serve their communities to be citizen- centric rather than departmentally-centric. Basically, governments need to evolve to be open, collaborative, responsive and iterative if they are to adequately serve the needs of the public.

This paper will discuss open government, Gov 2.0, what is happening in this space in Australia and why it is so imperative that we get government right in a digital world. The paper will shed light on how the distance between citizens and governments is rapidly closing, leading us towards a democratic singularity.

*Keywords:* Government, Open data, Open government, Public service, Civil service.

**Paper ID: 054** 15:30 – 17:30 hrs

### **An Ethical Framework for Ubiquitous Learning**

*Leigh Blackall*

*Latrobe University, Australia.*

Ubiquitous learning, through its association to the phrase ‘ubiquitous computing’ is often taken to mean learning mediated through portable computing devices that are coupled with digital media and data. This paper argues for a consideration that is less determined by technology, positioning instead that it be used to

## Abstracts

describe a broad and deliberate approach to learning generally, with or without the aid of computing devices or digital media.

Based on a feed-back structure of ethics, principles, methods and outcomes used by David Holgrem to popularise Permaculture Design, an ethical framework for ubiquitous learning is put forward to guide considerations. It draws on the theories, critiques and proposals of Ivan Illich, Neil Postman, Jean Lave and Etienne Wenger, Christopher Alexander, Richard Stallman and others to form three primary ethics: That learning happens everywhere; that it be relevant and; that it is shared. These ethics are substantiated through a number of principles that guide methods and hold outcomes accountable. And finally, to illustrate methods through this framework a range of projects and initiatives are presented. They include a situationist theatre production, The School of Everything and other convivial learning networks, and Open Educational Practices.

*Keywords:* Ethics, Ubiquitous learning, Networked learning, Open education, Peripheral participation, Situationism.

## Saturday, 29 June 2013

Session	Transparency	Parallel
Date / Day	June 29, 2013 (Saturday)	
Time	09:00 – 10:30 hrs	
Venue	Room One	
Chair	Chris Hables Gray	

**Paper ID: 098**      09:00 – 09:30 hrs

**Light: The Essence of Civilization**

*David Brin*

*Futurist, United States.*

Will transparency end privacy? The question reflects zero-sum thinking. But transparency and omniveillance are the only conditions under which some personal privacy may be preserved, along with freedom and a creative economy. Light and reciprocal accountability foster healthy science, democracy, markets and justice, the four great arenas underlying the enlightenment miracle. Can we find pragmatic ways to ensure they continue to thrive, while empowering individuals to say (and enforce) “leave me alone”?

*Keywords:* Transparency, Omniveillance, Privacy, Freedom, Democracy.

**Paper ID: 055**      09:30 – 10:00 hrs

**“You are Your Data”: Digital Self-Tracking and Algorithmic Subjectivity**

*Natasha Schüll*

*Massachusetts Institute of Technology.*

Big data has inspired much reflection on the ways in which people are tracked by governments and corporations, and how such tracking might threaten personal identity, liberty and privacy. My project takes a different angle on big data by exploring the phenomenon of self-tracking. While people have long used technology to record and reflect upon their emotional states, bodily processes, habits, and use of time, the present historical moment is witnessing a dramatic increase in the practice and scope of self-tracking as individuals are offered a range of relatively affordable devices with which to measure, assess, and modulate themselves. Simple analog technologies like weighing scales and wristwatches are being replaced by digital and mobile technologies that can collect and analyze massive amounts of data – often in real time, requiring no direct input or even awareness from users. As digital self-tracking of this nature increasingly becomes a part of everyday life, how does it alter self-understanding, self-care, and self-governance? Drawing on ethnographic research conducted among participants in the Quantified Self (QS) movement, I will argue that the computational and phenomenological affordances of self-tracking tools and systems facilitate what might be described as “algorithmic selfhood,” a mode of being caught between a drive for self-mastery and an abdication of insight, analysis, and management to external technology.

*Keywords:* Self-tracking, Personal analytics, Quantified self, Algorithmic subject.

**Paper ID: jeff 10:00 – 10:30 hrs**

**If Technology is a Dissipative Structure, Bring It on Deserves a Closer Look**

*Jeff Robbins*

*Rutgers University.*

Pouring forth, faster and faster, from the hi-tech cauldron are products whose powers exceed even the wildest speculation of yesterday’s science fiction. Smartphones, one million apps and counting, 3D printers, GPS to find and be found, chip implants in body and brain, dark pools of high-speed trading algorithms, self-driving cars, self-learning robots, Internet in your glasses, designer crops, livestock, and athletes... While the knee-jerk response to smart and new is to bring it on, how do we know that backstage is an unseen agenda? An agenda whose means are us, whose ends are not. Of particular concern, as it bears on advancing technology, is a proposal by Eric Schneider and the late James Kay that life is a response to the thermodynamic imperative of dissipating gradients. Evolving life represents, in their words, “order emerging from disorder in the service of causing even more disorder.” Their claim meshes with 1989 IEEE “Technics, Culture, and Consequences” conference contributor Rod Swenson’s view that “the world is in the order production business” because an ordered system can dissipate existing order more efficiently than helter-skelter falling apart. Examples include Bénard Cells self-organizing to escalate temperature gradient destruction, devastation produced by the massive cyclonic order in a hurricane, the chaos, suffering and death producible by the technical order in weapons, or the more subtle dissipations of technology doing more and more of the work for us. If the “accelerating returns”, as Ray Kurzweil puts it, of hell for leather technical advance represents the leading edge of life as a dissipative structure, as order emerging from disorder in the service of causing even more disorder, are we included in the returns of technical order? Or are we among the recipients of more disorder? This paper takes a closer look.

<b>Session</b>	<b>Social Implications</b>	<b>Parallel</b>
<b>Date / Day</b>	<b>June 29, 2013 (Saturday)</b>	
<b>Time</b>	<b>11:00 – 12:30 hrs</b>	
<b>Venue</b>	<b>Room One</b>	
<b>Chair</b>	<b>Janet Rochester</b>	

**Paper ID: 057 11:00 – 11:30 hrs**

**Formal Models of Social Processes: Towards a New Science of Institutions**

*Jeremy Pitt*<sup>1</sup> and *Andrzej Nowak*<sup>2</sup>

<sup>1</sup>*Imperial College London.*

<sup>2</sup>*University of Warsaw, Poland.*

The UK’s Royal Commission on Environmental Pollution recommended that a new type of adaptive institution is required to address global challenges like sustainability and climate change. Starting from Elinor Ostrom’s principles of enduring self-governing institutions for sustainable common-pool resource management, we have been developing a computational model of self-organising electronic institutions for fair and efficient resource allocation in distributed computer systems and networks. In this talk, we consider how to extend this work to embrace socio-technical systems, to provide the foundations for this new type of adaptive institution. In particular, we emphasise the inter-leaving of the artificial society of sensors and devices with the natural society of people and organisations. It is argued that this interleaving can be used to address problems of path dependency and ‘institution lag’ (the environment changes faster than the institution is able to respond), but also leveraged for benefits in terms of social innovation and community resilience. We discuss how this approach can be used to treat ‘big data’ as a knowledge commons, providing a common and integrated framework for both information management and critical infrastructure management. From there, we map out a broader and ambitious programme of research: a new science of institutions based on formal models of social processes (of which we consider three: collective awareness, planned emergence and computational justice) and its potentially transformative impact on society.

Saturday, 29 June 2013

## Abstracts

*Keywords:* Social processes, Socio-technical systems, Collective awareness, Big data, Knowledge commons, Planned emergence, Computational justice.

**Paper ID: 022**    **11:30 – 12:00 hrs**

### **Visuo-Haptic Learning of the Cochlea: Using Physical Optical Glyphs with Augmented Reality**

*Andrea Zariwny*

*University of Toronto, Canada.*

To develop a novel augmented reality (AR)-enabled teaching tool to demonstrate the complex structure of the human cochlea to medical students. The cochlea is small but intricate anatomical structure often represented as a snail shell-like object. It is more accurately defined as a spiral negative space within the temporal bone, but this is difficult to convey with traditional teaching tools (prosections and illustrations largely). Using a handheld tablet equipped with an integrated camera, digitally-rendered 3D models of this structure can be visually superimposed over illustrations of the cochlea and/or physical models of the petrous temporal bone, thus highlighting the negative space.

*Keywords:* Augmented reality, 3D printing, Visuo-haptic, Anatomy, Cochlea, Pedagogy, Mobile app.

**Paper ID: 002**    **12:00 – 12:30 hrs**

### **Ready to Wear (or Not): Examining the Rhetorical Impact of Proposed Wearable Devices**

*Isabel Pedersen*

*University of Ontario Institute of Technology, Canada.*

Future, wearable, digital devices are constantly emerging and celebrated in the mainstream news media. We are gradually embracing the idea that our future digital life will involve watch computers, heads-up displays, brain-computer interfaces, body sensors, and digital tattoos, to name a few examples. In keeping with the Google Glass phenomenon, these devices are often talked about long before they are available for purchase or use. In a sense, digital media are invented, designed, adopted and even celebrated before society is able to understand their impact on lives, culture, art, privacy, and social practices. More so, society clings to the belief that their emergence is imminent, creating an aura that impedes our assessment of them. Based on an ongoing project that uses digital rhetoric and digital humanities methodologies to explore wearables and their invention, this paper argues that emergent technology can spawn dehumanizing representations while it strives for the opposite, more human-centric interaction with computers. As we design digital devices to augment our physical existence, how are we altering the way people conceptualize so many other aspects of humanity such as creativity, analytical reasoning, nostalgia, imagination, and privacy. When mainstream media celebrate technology such as Google Glass and so many other new wearable devices, we need to take a much closer look at how they frame us, our culture, our society. This research uses a humanities model to uncover assumptions made in the language of invention in order to reveal how humans are conceptualized and misconceptualized. As future-proposed technology marches on, we need to understand the concepts driving the devices that inventors create, but also the social structuring and identity-building that humans endure in this process.

*Keywords:* New media, Wearables, Rhetoric, Invention, Public, Adoption, Digital humanities.

Session	Ambient Intelligence	Parallel
Date / Day	June 29, 2013 (Saturday)	
Time	11:00 – 12:30 hrs	
Venue	Room Two	
Chair	Jon Dougal	

**Paper ID: 105**    11:00 – 11:30 hrs

### Studying the World by Mining Photo-Sharing Websites

*David Crandall*

*Indiana University, United States.*

The popularity of photo-sharing websites has created immense collections of images online, with Flickr and Facebook alone hosting over 100 billion images. Each of these photos is an observation of what a small part of the world looked like at a particular point in time and space, as well as a record of where its photographer was and what he or she was paying attention to. When aggregated together and combined with the non-visual metadata available on photo sharing sites (including timestamps, geo-tags, and captions), these billions of photos are a rich source of information about the world and about human activity. In this talk I'll discuss some of our recent work in data mining and computer vision that aims to unlock this latent information from photo-sharing sites. I'll focus on recent lines of work including reconstructing maps and models of cities and landmarks, mining photos for evidence of environmental phenomena of interest to biologists and ecologists, and studying human preferences and interactions.

*Keywords:* Mining, Photo-sharing, Reconstruction, World, Environment, Metadata.

**Paper ID: 102**    11:30 – 12:00 hrs

### PlaceRaider: Virtual Theft in Physical Spaces with Smartphones

Robert Templeman, Zahid Rahman, *David Crandall* and Apu Kapadia

*Indiana University, United States.*

As smartphones become more pervasive, they are increasingly targeted by malware. At the same time, each new generation of smartphone features increasingly powerful onboard sensor suites. A new strain of sensory malware has been developing that leverages these sensors to steal information from the physical environment (e.g., researchers have recently demonstrated how malware can listen for spoken credit card numbers through the microphone, or feel keystroke vibrations using the accelerometer). Yet the possibilities of what malware can see through a camera have been understudied. Our work introduces a novel visual malware called PlaceRaider, which allows remote attackers to engage in remote reconnaissance and what we call virtual theft. Through completely opportunistic use of the camera on the phone and other sensors, PlaceRaider constructs rich, three dimensional models of indoor environments. Remote burglars can thus download the physical space, study the environment carefully, and steal virtual objects from the environment (such as financial documents, information on computer monitors, and personally identifiable information). Through two human subject studies we demonstrate the effectiveness of using mobile devices as powerful surveillance and virtual theft platforms, and we suggest several possible defenses against visual malware.

*Keywords:* Smartphones, Malware, Sensor, Vibrations, Monitor.

**Paper ID: 083**    12:00 – 12:30 hrs

### The Future of Outdoor Media Systems

*Larry Schirmer*

*Illuminating Concepts, Canada.*

Our American cities are run by mayors, city managers and councils who are endeavoring to reduce energy costs, provide enhanced public safety and improve their environs, all with reduced revenue streams. It seems

## Abstracts

an impossible task. To add to this challenge, our form of civic government has been divided or partitioned into segments to distribute tasks toward experts in their fields. These divisions compete regularly for funding; a never ending and sometimes politically charge situation.

The police and fire chiefs run the public safety areas along with road commissioners who try to give their officers fast access to information. Environmental planners and water resource commissioners deal with water, earth and air quality and are always in need of much more data to monitor and control their systems. Public Lighting is concerned with keeping the lights on, paying for the energy and maintaining vast amounts of equipment. Any major US city has between 50,000 and 200,000 lights. Lights have several components besides the light bulb which triple the repair and replacement needs. Therefore, there has been a major focus on wireless methods of monitoring any lighting maintenance requirements.

Acquiring data is expensive; making sense out of the data and creating an action once data is validated is even more expensive. The cost of improving our infrastructure in these areas, coupled with the high cost of energy, has caused governments to look toward any form of energy conservation to help pay for improvements, let alone pay for their current overhead and debt.

Because all of our cities are focused on reducing their energy consumption, one of the largest areas of conservation has been through improved LED street lighting. Light Emitting Diode lighting (LED's) promise to save at least 40% of the current energy consumption, and pay back the cost of a new installations over a reasonable time. Additionally, the notion of controlling the new street light's output through wireless controls, monitor when lights are out, and save additional energy by dimming "after hours" is being tested or deployed to varying degrees of success. When well thought out and deployed, wireless street lighting controllers can save up to 30% more energy than simple on-off systems. Coupled with a good LED light engine (light source), a controllable, dimmable wireless systems can save up to 70% of the current energy used by the old systems. This has caused a bit of a flurry of activity from some cities to test the feasibility of wireless controls.

*Keywords:* Illuminating concepts, Outdoor media systems, Emergencies, National security, Emergency services organisations, Situational awareness.

<b>Session</b>	<b>Sousveillance</b>	<b>Parallel</b>
<b>Date / Day</b>	<b>June 29, 2013 (Saturday)</b>	
<b>Time</b>	<b>11:00 – 12:30 hrs</b>	
<b>Venue</b>	<b>Room Three</b>	
<b>Chair</b>	<b>Niahm Caprani</b>	

**Paper ID: 039**    **11:00 – 11:30 hrs**

### **The Inevitability of the Transition From a Surveillance-Society to a Veillance-Society: Moral and Economic Grounding for Sousveillance**

*Mir Adnan Ali* and Steve Mann

*University of Toronto.*

Surveillance is a French word that means "to watch from above" (e.g. guards watching prisoners, police watching citizens, etc.). Another form of veillance (watching) is sousveillance, which means "to watch from below". Whereas surveillance often means cameras on large entities (e.g. buildings and land), sousveillance often means cameras on small entities (e.g. individual people). The importance of sousveillance has come to the forefront recently with advancements in wearable computing and AR (augmented or augmented reality).

We characterize sousveillance from both an economic and moral perspective. We further argue that sousveillance as a form of social action has positive survival characteristics, so that in the long run, assuming that social and technological trends continue, the widespread adoption of sousveillance is inevitable.

*Keywords:* Veillance, Sousveillance, Surveillance, Economics, Morality.

**Paper ID: 104**    11:30 – 12:00 hrs

**Art and Science as Co-Conspirators in the Service and Disservice of Humanity**

*Ryan Janzen*

*University of Technology, Canada.*

Developments in the arts, technology and science are presented in tandem as powerful forces of social change, with serious unresolved issues in their motivation, oversight, undersight, and mass collective motion. Manipulative techniques in music which are understood scientifically and applied in mass culture, are presented alongside technological innovations used to either encourage or stifle open public debate and political discourse. Moral and amoral activities in science and art are presented with historical examples and their profound effect on human society.

*Keywords:* Art, Science, Technology, Humanity, Effects, Innovations, Culture.

**Paper ID: 036**    12:00 – 12:30 hrs

**Three Dimensional HDR (High Dynamic Range) Veillance for 3D Cameras Such as Kinect Sensors**

*Raymond Lo, Jason Huang, Valmiki Rampersad and Steve Mann*

*University of Toronto, Canada.*

This paper presents the idea of 3D (Three Dimensional) HDR (High Dynamic Range) sensing, along with examples. We propose a method of 3D HDR veillance (sensing, computer vision, video capture, or the like) by integrating tonal and spatial information obtained from multiple HDR exposures for use in conjunction with one or more 3D cameras.

In one embodiment, as a proof-of-concept, we construct a 3D HDR camera from multiple 3D cameras such as Kinect sensors. In this embodiment the 3D cameras are arranged in a fixed array, such that the geometric relationships between them remain constant over time. Only a single camera calibration step is required at the initial time of assembling and fixing the cameras into the array. Preferably the cameras either view from the same position through beam splitters, or are fixed close to one another, so that they capture approximately the same subject matter. The cameras are arranged so they each capture a differently exposed image or video of approximately the same subject matter. In one embodiment, two Kinect cameras are attached together facing in the same direction, with an ND (Neutral Density) filter over one of them, so as to obtain a darker exposure. The dark and light exposures are combined to obtain more accurate 3D sensing in high contrast scenes.

The 3D HDR design ideas might, more generally, be incorporated into existing 3D cameras, resulting in a new kind of 3D sensor that can work in nearly any environment, including high contrast scenes such as outdoor scenes, or scenes where a bright light is shining directly into the sensor.

*Keywords:* 3D, HDR, High dynamic range, Video image processing, Intelligent image processing, Wearable computing, Sousveillance, Veillance, CYBORGlass, HDR video.

<b>Session</b>	<b>Health</b>	<b>Parallel</b>
<b>Date / Day</b>	<b>June 29, 2013 (Saturday)</b>	
<b>Time</b>	<b>13:30 – 15:00 hrs</b>	
<b>Venue</b>	<b>Room One</b>	
<b>Chair</b>	<b>Cara Morris</b>	

**Paper ID: 073**    13:30 – 14:00 hrs

**Will Wearable Computers and Augmented Reality Enable Us to Lead Healthy and Happy Lives?**

*Alex R. Jadad*

*Centre for Global eHealth Innovation, Canada.*

We all want to live a happy, healthy life until our last breath, with no regrets. Surprisingly, particularly within academic circles, we rarely discuss the meaning of these terms, and even less the role that technological

breakthroughs could play to enable all humans to live full lives. In 2008, Dr. Jadad pointed out that the official definition of health, unchanged since the creation of the World Health Organization in 1948, would condemn us all to be not healthy as it requires “a state of complete physical, mental and social well-being and not just the absence of disease or infirmity.” After three years engaged in a global conversation, Dr. Jadad and an international team of collaborators re-conceptualized “health” as the ability for individuals or communities to adapt and self-manage when facing physical, mental challenges. This new approach allows anyone to be healthy, even when living with multiple chronic diseases.

In this session, Dr. Jadad will summarize a large body of knowledge that supports the new approach to health, describe similar efforts around the meaning of wellness and happiness, and showcase the work of a global network of innovators who are using these new conceptual insights to recreate all aspects of daily life. He will also challenge the audience to imagine and implement opportunities for wearable computers and augmented reality applications to meet the physical, mental and social challenges, and to eliminate the multiple sources of unnecessary suffering that we humans are facing in the 21st century.

*Keywords:* Wearable computers, Augmented reality, Full life, Evolution, Health, Happiness, Challenges.

**Paper ID: 060**    **14:00 – 14:30 hrs**

### **Wearable Monitors on Babies: Big Data Saving Little People**

*Carolyn McGregor*

*Ontario Institute of Technology, Canada.*

Today, 8% of Canadian babies are born premature and internationally the average is 10%. These early births, are responsible for three quarters of all infant deaths in Canada. Premature infants, together with ill term infants, are cared for in Neonatal Intensive Care Units (NICUs) which contain state of the art medical equipment to monitor and provide life support, resulting in a significant Big Data environment. In addition, graduates of neonatal intensive care may be discharged with medical devices to support continued monitoring as ambulatory patients in and outside the home setting. In both NICU and ambulatory contexts wearable patient monitoring has many social implications. This research presents an assessment of the social implications of Big Data solutions for critical care within the context of the Artemis project that is enabling Big Data solutions for: 1) Real-time processing of complex intensive care physiological signals for new and earlier condition onset detection; 2) new approaches to physiological data analysis to support clinical research; and 3) cloud computing/services computing to provide rural and remote communities with greater options for advanced critical care within their own community healthcare facilities.

*Keywords:* Wearable monitors, Newborn infants, Babies, Big data, EHealth, Telehealth, Patient monitoring, NICUs.

**Paper ID: 013**    **14:30 – 15:00 hrs**

### **Law and Policy in an Era of Cyborg-Assisted-Life**

*Joseph Carvalko*

*Quinnipiac University, USA.*

Medical technology verges on incorporating directly into our anatomy processors with the computational power of the famous Watson IBM computer and Internet-like communications. As the size of computers spiral downward, their wholesale use (as well as RFID-type technology) will extend lifetimes, enhance our intellect, and assist in controlling technology outside the body via digital I/O and thought. This includes the eventual merging of synthetic DNA and artificial intelligence that together will bring new diagnostics, medical treatment and smart nano-prosthetics well within the horizon of the next generation. A prosthetic genome hastens the day when enhanced life forms, such as human organs, can be made entirely from a fusion of living organisms and non-living materials. Wide-spread diffusion of this technology into populations risk creating a world of “haves” that can afford and “have nots,” that cannot afford enhanced intellect and longevity. Without changes to current U.S. patent law, commercial interests might jeopardize our well-being through patent monopolies, market forces might squeeze out efficiencies at the expense of performance and reliability, and wrongdoers might dare to unleash digital viruses into a world filled with anatomically installed biomedical devices receptive to Internet-style communications. Overtime artificially altered and controlled metabolisms may begin to alter the progression of natural biological evolution and force an examination about what the notion of “human” means in the age of human cyborgs.

## Abstracts

*Keywords:* Cyborg, Artificial intelligence, Technology law, Science policy, Transhuman, Telemetry, Molecular computer, Human enhancement, RFID, Synthetic DNA, Evolution, Technology ethics.

<b>Session</b>	<b>Sensors</b>	<b>Parallel</b>
<b>Date / Day</b>	<b>June 29, 2013 (Saturday)</b>	
<b>Time</b>	<b>13:30 – 15:00 hrs</b>	
<b>Venue</b>	<b>Room Two</b>	
<b>Chair</b>	<b>Andrew Everitt</b>	

**Paper ID: 008**     **13:30 – 14:00 hrs**

### **Ambient Intelligence & Information Interactions: Theorizing Autonomies and Awareness for 21st Century Society - A Technology-People Balance**

*Helen Patricia McKenna*<sup>1</sup>, Marilyn P. Arnone<sup>2</sup>, Michelle L. Kaarst-Brown<sup>2</sup>, Lee W. McKnight<sup>2</sup> and Sarah A. Chauncey<sup>3</sup>

<sup>1</sup>*AmbientEase, Canada.*

<sup>2</sup>*Syracuse University, USA.*

<sup>3</sup>*Benchmark Education, USA.*

The primary aim of this research study is to explore the social and human potential of technologies designed to support awareness and enable autonomy. The concepts of awareness and autonomy are reconceptualized for 21st century technology-pervasive environments. Focusing on the use experience of faculty and students with an emerging and next generation technology, a case study approach is used. Multiple methods are employed for quantitative and qualitative data collection along with multiple data analysis techniques. This study makes several contributions to research and practice, including: the development of a conceptual framework for 21st century autonomies and awareness; an autonomies and awareness research agenda; a reframing of the intuition concept for 21st century technologies; proposed use of intuitive inquiry as a method for studying people-technology interactions; and a human-centered computing (HCC) approach in support of technology and people in balance, enabling more immediate engagement with social impact and social implications issues. More broadly, this paper provides a strategic and overarching perspective for building new systems within a research context for the 21st century.

*Keywords:* Ambient intelligence, Autonomous agents, Context awareness, Distributed computing, Electronic learning, Emergent phenomena, Human computer interaction, Human factors, Intelligent systems, Smart grids.

**Paper ID: 030**     **14:00 – 14:30 hrs**

### **Putting Locative Technology in Its Sense of Place**

*Glen Farrelly*

*University of Toronto, Canada.*

Our relationship to the places we inhabit and encounter is considered a foundational human experience. As we interact and learn about places, we bestow meaning on such places, forming the mental concept of a sense of place. Although our relationships to place have been considered since antiquity, new ubiquitous technologies, specifically mobile devices and location-based services, may be altering people's everyday relationships to place. This paper reports on an exploratory survey study conducted to provide groundwork for understanding the elements that comprise sense of place and the role location-based services may play. It was found that sense of place arises from diverse information sources, is multimodal, and is individualistic. In addition, findings suggest location-based can improve sense of place by enhancing people's familiarity, personal engagement, and social connection to place. Respondents also identified barriers to their usage of LBS in relation to place.

*Keywords:* Sense of place, Location-based services, Place theory, Locative media, Geotargetted information.

**Paper ID: 024** 14:30 – 15:00 hrs

**Investigating the Factors Influencing Information Security Compliance in a Financial Services Firm**

*Rutendo Mushore* and Michael Kyobe

*University of Cape Town, South Africa.*

Management of information security is a major challenge for financial institutions today and managers fiduciary duty to protect information is increasingly under scrutiny by national and international regulators. While measures have been put in place to ensure security and compliance, recent evidence suggests organisations still struggle to comply with regulations. A review of previous studies indicates fragmented work on compliance and the significance of the influencing factors has not been determined.

This paper aims to create awareness of the regulatory frameworks governing the use of IT, and the factors influencing compliance with information security regulations in the financial sector in South Africa. A conceptual framework explaining the nature of factors influencing compliance was developed and tested in a financial institution. Quantitative methods were used to analyse the data. The results show that compliance is mainly influenced by culture and the influence of mimetic pressure is insignificant. In addition, there appears to be much concern over international than national regulations. In particular, there is limited concern over the influence and implications of the stringent ECT Act which regulates the use of electronic technology in South Africa.

*Keywords:* Information security, Compliance, Financial sector, Regulations, South Africa.

<b>Session</b>	<b>Surveillance</b>	<b>Parallel</b>
<b>Date / Day</b>	<b>June 29, 2013 (Saturday)</b>	
<b>Time</b>	<b>13:30 – 15:00 hrs</b>	
<b>Venue</b>	<b>Room Three</b>	
<b>Chair</b>	<b>Adib Ghu</b>	

**Paper ID: 037** 13:30 – 14:00 hrs

**Watching Me, Watching You. (Process Surveillance and Agency in the Workplace)**

*Sally A. Applin* and Michael D. Fischer

*University of Kent, Canterbury, UK - CSAC.*

The notion that computers are somehow separate from our lives is misleading and ignores the level of integration that has emerged. Most of the processes that dispense, load, and deliver the supplies that sustain cosmopolitan life are impacted by some form of computer in one way or another. The systems created when networks of computers intersect with networks of people are shaping our current cultural environment and the way that we exist in the world. This phenomena has created multiple types of interactions that are hybrids between humans and machines and at present, the balance of human behavior towards other humans is impacted by processes in business and elsewhere that have an over arching governance based on machines. This limits human agency and impacts understanding, service and privacy rights for humans. Further, these processes increasingly depend on greater and greater quantities of what had previously been considered personal information, often scraped from online processes people do not anticipate, yielding an often revealing portrait of themselves. Also, a poorly configured paradigm has created a culture where, when systems are required for big business, people more often alter their behavior to suit machines and work with them, rather than the other way around, and that this has eroded conceptions of agency. We explore the use of Thing-theory to implement a partial means of implementing mutual surveillance between management and workers to increase human agency while developing more adaptive and efficient business processes.

*Keywords:* Surveillance, Manufacturing, Polysocial reality, Agency, Multi-agent simulation, Anthropology.

**Paper ID: 034** 14:00 – 14:30 hrs

**“I’ll be Watching You”: Awareness, Consent, Compliance and Accountability in Video Surveillance**

*Brenda McPhail, Andrew Clement, Joseph Ferenbok and Arndis Johnson*

*University of Toronto, Canada.*

This paper reports on-going, citizen-focussed research that seeks to a) understand what people know, and want to know, about the video surveillance they encounter; b) highlight the widespread privacy non-compliance of private sector video surveillance operators; and c) develop the means for citizens to hold surveillant organizations to public account. It combines in situ interviews, participatory design workshops and smartphone app development for probing surveillance practices while empowering concerned individuals to act collaboratively in better regulating video surveillance.

*Keywords:* Sousveillance, Crowdsourced veillance, Privacy, (non)Compliance.

**Paper ID: 103** 14:30 – 15:00 hrs

**User Expectations of Privacy in Self-Generated Mobile Health Data**

*Heather Patterson*

*New York University, United States.*

Rapid developments in self-quantification via ubiquitous computing allow individuals to collect health-relevant information using smart phone apps and health sensors, and share that data online for purposes of self-experimentation, community building, and research. Online disclosures of intimate bodily details, coupled with growing contemporary practices of data mining and profiling, may lead to radically inappropriate flows of information, potentially jeopardizing individuals’ social status, insurability, and employment opportunities. In this talk, I present results from an ongoing qualitative research study exploring how Fitbit users are actively constructing a vibrant health self-tracking social context, how they understand their privacy rights in their self-generated health data under existing laws and data collection and use policies, and how their needs and beliefs guide their information management practices. In the absence of clear statutory or regulatory protections for self-generated health information, its privacy and security rest heavily on robust individual data management practices, which in turn rest on users’ understandings of information flows, legal protections, and commercial terms of service. Fitbit users interviewed to date express highly granular preferences for health information sharing that vary as a function of information type, recipient, and perceived transmission principles guiding secondary information flows. These individuals are mindful of differential legal protections afforded their data, compared to information collected in traditional clinical medical contexts, and they take concrete steps to protect themselves from harm, particularly expressing concern about employers and insurance companies gaining access to their health information. Early results also point to simple steps that sensor and app developers can take to promote continued user trust and to respect newly emerging user expectations of privacy.

*Keywords:* Health, Privacy, User expectations, Mobility, Self-tracking, Privacy rights, Policies.

<b>Session</b>	<b>Law</b>	<b>Parallel</b>
<b>Date / Day</b>	<b>June 29, 2013 (Saturday)</b>	
<b>Time</b>	<b>15:30 – 17:30 hrs</b>	
<b>Venue</b>	<b>Room One</b>	
<b>Chair</b>	<b>Pete Wassell</b>	

**Paper ID: 089** 15:30 – 16:00 hrs

**Governmental and Private Video Surveillance**

*Susan Herman*

*Brooklyn Law School.*

The ACLU has long been concerned about the proliferation of governmental video surveillance. In New York

City, NYCLU volunteers counted and mapped thousands of surveillance cameras in Manhattan alone. In California, a report disclosed that video cameras were becoming ubiquitous in 37 cities, and that no one was monitoring the use of the images obtained.

On the other hand, the ACLU supports the right of individuals to fight back against governmental misconduct by videotaping police activity, at demonstrations or during private encounters. Videotapes have helped to provide concrete evidence of police misconduct on many occasions, including the private videotape that recorded Los Angeles police officers brutalizing a man named Rodney King.

While privacy is becoming a rare and vulnerable commodity in these days of omnipresent cell phone cameras, we believe that there is greater reason to be concerned about governmental surveillance than about private surveillance. In addition to threatening privacy, government-run surveillance radically changes the relationship between the individual and government. Video surveillance in public spaces can be added to GPS tracking, facial recognition techniques, radio frequency identification (RFID) tags, and vast databases to expose where anyone is and what they are doing at any given time.

Some ask why they should care if the government knows what they are doing if they are not committing any crimes. But because the government has the power to charge people with crimes and thereby deprive them of liberty, knowledge in the hands of the government becomes a unique form of power. People might become reluctant to engage in political protest or other activities the government might find suspect if they believe that a Big Brother government is always watching.

Whether we change our behavior if we believe our neighbors might be watching is an interesting question, but of a different order.

*Keywords:* Wearable computing, AR, Civil liberties, Privacy erosion, Evidence, Compliance, Regulation, Video surveillance, Governmental surveillance, Private surveillance, Chilling effect.

**Paper ID: 086**    **16:00 – 16:30 hrs**

### **Waiting for Public Outrage**

*Avner Levin*

*Ryerson University, Canada.*

The decade since 9/11 has witnessed the erosion of human rights and civil liberties at the hands of state and private sector surveillance. Remarkably, societies in countries such as the US, UK and Canada have been acquiescent to the erosion of liberty in the name of security. This paper provides examples of how surveillance has increased, how the private sector voluntarily cooperates with law enforcement agencies, and how the public has accepted increased surveillance, one technological innovation in a time. Examples discussed include: CCTV in the public and private sector; the development of location technology and the ability to analyze large quantities of data to track individual movements using cell-phone technology and the global positioning system; face recognition systems and their use for commercial and national security purposes; the increased presence of drones in civilian airspace; and the fundamental changes to airport security, culminating, at present, with intrusive full-body image scanners.

*Keywords:* Rights, Erosion, Law, 9/11, Surveillance, Privacy by design.

**Paper ID: 026**    **16:30 – 17:00 hrs**

### **IXmaps – Tracking Your Personal Data Through the NSAs Warrantless Wiretapping Sites**

*Andrew Clement*

*Faculty of Information, University of Toronto, Canada.*

The National Security Agency's warrantless wiretapping program is arguably one of the largest domestic surveillance operations in history. It also represents among the most serious contemporary challenges to democratic governance and civil liberties. This paper reports on the development of the IXmaps interactive mapping application designed to show internet users how their personal traffic may be intercepted by the NSA. Using crowdsourced data collection of thousands of individually generated traceroutes, IXmaps displays on a map of North America the path taken by user-initiated data packets in relation to the sites where the NSA has most likely established surveillance operations. We also discuss the potential for this mapping technique to serve as a tool for achieving better public understanding of surveillance in the internet core.

*Keywords:* NSA warrantless wiretapping, Counter-surveillance, Internet surveillance, Crowdsourced veillance.

**Paper ID: 063**     **17:00 – 17:30 hrs**

**Autonomous Systems for Smarties**

*Nikola Serbedzija*

*Fraunhofer, Germany.*

Managing software intensive systems that run in highly dynamic environments, where physical and social context, operational and functional requirements and workloads are continuously changing is a grand challenge in software engineering. In search for adequate technical solutions autonomic, knowledge-based and adaptive behavior have emerged as necessary characteristics of smart technology. Here, an approach to engineer smart systems is described, showing how to achieve awareness, adaptation and autonomous functioning of technical systems. The approach is based on decomposition of a complex system in service components – functionally simple building blocks blended with local knowledge attributes. The components behavior that satisfies local goals allows for a local autonomy. The internal components’ knowledge – representing local awareness - is used to dynamically construct ensembles of service components. Ensembles capture collective behavior by grouping service components in many-to-many manner, according to their communication and operational/functional needs meeting global goals, thus yielding autonomous behavior at a collective level. Linguistic constructs and software methods and tools supporting modeling, validation, development and deployment of autonomous systems are presented and illustrated by practical examples. After having shown how autonomous systems can be built, their pragmatic deployment is considered by addressing the following questions: to what extent the presents systems are really autonomous; how autonomous we want them to be; can we control the level of autonomy; are we loosing our own autonomy in favour of technical systems’ autonomy; what are the applica-tion domains that require autonomous systems and in which domains we do not want them. Last but not least the focus is shifted to the emerging issue of the impact that the development of smart technology can have on individuals and society in general.

*Keywords:* Adaptive mechanisms, Autonomous systems, Software engineering, Technology impact, Social implications.

<b>Session</b>	<b>Drones</b>	<b>Parallel</b>
<b>Date / Day</b>	<b>June 29, 2013 (Saturday)</b>	
<b>Time</b>	<b>15:30 – 17:30 hrs</b>	
<b>Venue</b>	<b>Room Two</b>	
<b>Chair</b>	<b>Susannah Sabine</b>	

**Paper ID: 100**     **15:30 – 16:00 hrs**

**Drones, Bones and Human Meaning Zones**

*Joseph Ferenbok*

*University of Toronto, Canada.*

Dating back thousands of years, in the history of civilization, major media shifts, writing, the book, the printing press, radio–have met with some intellectual resistance/backlash–Socrates in Phaedrus predicts that writing will destroy the need for memory–the measure of intelligence of the time. Google Glass is undoubtedly a disruptive technology in the economic sense (Stevenson 1996), but it is likely also a disruptive technology in the ethical and political sense. It will create its own market niche and social niche. The closer integration between external and internal processing of information will also mark a intermediate point that will redefine our understandings of public and personal spaces; our understandings of privacy and instantaneous mass distribution of informa-tion; and our relationships with our information (aka. identity).

McLuhan wrote that technology is the extension of the human: a way of augmenting our senses. At what point, when the technologies move beyond augmediating our senses are the technologies become replace-ments for our senses, for our way of understanding the world, for our ways of seeing affordances in the ‘natural landscape’? At what point, does the technology begin to construct, rather than just mediate or augment

meaning? And at that point, when the ‘technology’ becomes an agent in the construction of meaning, (likely even before the technology is integrated into traditional biological boundaries), does the tool define what is HUMAN?

The commercial success of wearable computers will be life—but not as WE know it. In this talk we will communally try to understand and grapple with the implications of how technology will likely change our understandings of our world and our relationship to information “maps” in the near future.

*Keywords:* Drones, Wearables, Meaning, Zones.

**Paper ID: 101     16:00 – 16:30 hrs**

### **Canada’s Emerging Domestic Drone Regulations**

*Shayna Gersher*

*Carleton University, Canada.*

Drones offer many possible benefits to society, but they also introduce potential dangers to civil liberties and pose privacy concerns. To understand how drones potentially infringe upon Canadian social values requires an understanding of the environment from which they are emerging. This presentation will address the environment of concern and speak to the current drone regulatory framework underway in Canada. As of November 2012, Transport Canada and its regulatory body – the Canadian Aviation Regulatory Committee – approved phase one of four in its domestic drone regulatory framework. The focus of phase one is on small remotely piloted aircraft systems (RPAS) that have a take-off weight of 25 kg or less and operate within the visual line of sight and under visual flight rules. Two troubling issues arise with Transport Canada’s domestic drone regulations. The first issue deals with regulatory policy that privileges representatives from the drone industry, police and defence agencies; while the second issue concerns the exclusion of certain classes of drones from regulation. These findings strongly suggest that Canada’s domestic drone regulations strengthen the authority of the state and market and set a precedent for drone integration into security operations that could jeopardize liberal rights and freedoms.

*Keywords:* Drones, Regulation, Privacy, Security, Civil liberties.

**Paper ID: 066     16:30 – 17:00 hrs**

### **Drones for Good**

*Matthew Schroyer*

*dronejournalism.org.*

Unmanned aircraft systems, more commonly called “drones” in popular media, face tremendous hurdles to being accepted in everyday life. Due to sensationalist news coverage and a gap in technical knowledge amongst the public, the perception of this new technology is overwhelmingly negative. And yet, the difference between the robots used in war, and the ones being used over forest fires, farmlands, and wildlife habitats are worlds apart. This information imbalance has resulted in a surge of American states proposing legislation to limit the use of unmanned aircraft. Some legislation would require police departments to obtain search warrants before deploying unmanned aircraft, which many privacy advocates agree is necessary. However, over-broad legislation could stifle economic and technological innovation, and block this life-saving technology from being used. The dangers to privacy and safety deserve consideration, but they must be debated alongside many benefits, which include disaster warning and mitigation, city planning, wildlife and resource management, journalism, and STEM education. This talk will include examples of how robotic aircraft have improved STEM education and allowed students to adopt engineering mindsets, and how this new technology can help meet the increasing demands to enhance engineering curriculum at the primary and secondary education levels. This presentation will examine how unmanned aircraft helped end illegal water contamination in a part of Texas, helped minimize exposure to dangerous levels of radiation in Japan, and provided intelligence to mitigate a natural disaster Malaysia. It will detail how UAS have been used to enhance journalism and journalism education, with an emphasis on the “drone” as a device to collect verifiable, geospatial data, instead of relying on hearsay and data from outside entities. Finally, with an eye to the future, this talk also will explore the potential for this technology to be integrated into “smart” cities and augmented reality.

*Keywords:* Drones, Good, Bad, Legislation, Benefits, Cases, Journalism, UAVs.

## Press Releases

### **Wearable Computing and Augmented Reality Conference Comes to U of T in June**

TORONTO, ON – Internet-connected eyeglasses and similar technologies will soon be on the market, but their benefits and dangers are little understood. University of Toronto Engineering Professor Steve Mann hopes to change that at a groundbreaking conference at U of T in June 2013.

Mann is a pioneering researcher in the fields of wearable computing and ‘augmediated reality’ (AR). He’s bringing together renowned experts in wearable technology, artificial intelligence, virtual reality and privacy to discuss both the potential and the pitfalls of these technologies. Speakers will include renowned artificial intelligence researcher Marvin Minsky, futurist and inventor Ray Kurzweil, legendary computer scientist Gordon Bell, privacy expert Helen Nissenbaum and American Civil Liberties Union president Susan N. Herman.

The conference, the annual Institute of Electrical and Electronics Engineers International Symposium on Technology and Society (ISTAS), is called ‘The Social Implications of Wearable Computing and Augmediated Reality in Everyday Life.’ It will be held at U of T Engineering’s Bahen Centre for Information Technology, June 27–29, 2013.

Papers on topics such as surveillance and sousveillance in society, humanistic intelligence, artificial intelligence, augmediated reality, geolocation mapping, Web 3.0, biofeedback, privacy, security, as well as legal, moral and ethical issues will be accepted through the conference website until February 28, 2013, Professor Mann, the general chair of the conference, said.

Known as the ‘father of wearable computing,’ Mann has been inventing, designing, building and wearing computer vision systems for more than 35 years, and has also written extensively on the legal, social and ethical implications of such technology. Among his inventions is the EyeTap, which he described as a device which allows the eye itself to function as both a display and a camera. “EyeTap is at once the eye piece that displays computer information to the user and a device which allows the computer to process and possibly alter what the user sees.”

“The environment around us is becoming ‘smarter,’ said Mann. “Soon, there will be a camera in nearly every streetlight to do better occupancy sensing, and ultimately a camera in every light fixture. Many appliances and everyday products, such as automatic flush toilets, faucets and sensor-operated showers, are starting to use more sophisticated camera-based, computer-vision technologies,” he added.

Wearable technology and AR are not something from science fiction or the distant future. They need to be discussed today, Mann contended. He noted that Google has already beta-tested internet-connected glasses similar to the EyeTap.

“Soon your built-in, 3-D camera in your eyeglasses will be able to display onto your retina the names of people it recognizes, and then let you see through walls and buildings to show you your friends sitting in a nearby restaurant. Then it reads your brainwaves, and if it senses you want to join them, it guides you to them.”

“In a world of smart things like smart lights, smart toilets, smart grids, smart meters, smart roads, and the like, what happens when you have ‘smart people,’ – when you put sensors on people? What do we make of the growing numbers of businesses like department stores and restaurants that prohibit cameras, yet display QR codes that require cameras to read and understand? These are some of the things we’ll discuss at ISTAS. We’re very excited and proud to host this conference.”

## **Living in a Smart World – People as Sensors, University of Wollongong**

Two University of Wollongong academics are playing key roles in a major overseas symposium which features the pioneer of wearable computing, Professor Steve Mann, and a person recognised as the 'Father of Artificial Intelligence', Professor Marvin Minsky.

Steve Mann will be the general chair of the 2013 IEEE International Symposium on Technology and Society (ISTAS13) taking place in Toronto, Canada from 27-29 June. The theme of this conference is SmartWorld. SmartWorld includes smart people -- not just smart grids, smart infrastructure, smart homes, smart cars or smart appliances.

Associate Professor Katina Michael from UOW's School of Information Systems and Technology is the program chair of ISTAS13.

"Smart people interacting with smart infrastructure means that intelligence is driving decisions," Professor Michael said.

"People wearing sensors (e.g. temperature, physiological characteristics), location data loggers, microphones, cameras, tokens, and other wearable and embeddable systems can see direct benefits for a host of applications including health and well-being, emergencies, convenience, and care-oriented solutions."

However, Professor Michael said these emerging technologies and applications have the potential to become controlling applications because they are used for example to make decisions, generate alerts and log employee movements.

"There are great socio-ethical implications that will stem from these technologies and fresh regulatory and legislative approaches are required to deal with this new environment," she said.

Professor Michael believes the time for discussing wearable computing and augmented reality in everyday life is now.

"Widespread diffusion of wearables has not yet occurred and the time for discussing the potential implications of these technologies is now. Law enforcement officers in Australia are already trialling these always-on recording devices as are members of the private security industry. In-car video recorders have been used officially and unofficially in a number of police forces over the last 10 years. What does it mean when the everyday citizen puts on the same equipment and presses the record button taking video images of those around them?"

Professor Michael highlighted how earlier this year Google launched their Glass Project in concept and they believe they will be going to market by 2014. Microsoft and Apple and a number of other smaller vendors are also developing this new technology at rapid speed.

"Are we ready for this explosion in personal recording devices that log the world around us? This is a particularly pertinent question for those people who will not be adopters of the technology. There is an asymmetric power relationship between wearers and non-wearers. The law, especially privacy and surveillance device laws, lag far behind in Australia and most other jurisdictions."

Professor Mann, formerly a member of the MIT Media Lab under the guidance of Nicholas Negroponte in the late 1990s, is a pioneer in the wearable computing field. Professor Mann is the general chair of ISTAS13 and will be speaking in the opening keynote panel with acclaimed Emeritus Professor of MIT Media Arts and Sciences, Marvin Minsky who wrote the groundbreaking book *The Society of Mind* and who has been long considered the 'Father of Artificial Intelligence'.

Other scholars who will be speaking at the conference in the domain of social implications include David Brin, a well known futurist and author; Science, Technology and Society scholar Associate Professor Natasha Schüll of MIT; Canada Research Chair in Digital Life, Media, and Culture, Dr Isabel Pederson of UOIT; and Ontario's Information and Privacy Commissioner, Dr Ann Cavoukian.

## **Press Releases**

Mr. Alexander Hayes, a Ph.D. candidate in the Faculty of Informatics at the University of Wollongong is studying the social implications of using point of view technologies in an everyday training and education context. He is especially interested in the effects of location-enabled body worn wearables and is presently conducting interviews with lead cross-sector and trans-disciplinary representatives before the widespread diffusion of wearables.

There are a number of homegrown organisations in the field of headcams and eyeglass cams, software applications in the augmented reality (AR) space that will also be involved in ISTAS13.

Professor Michael believes that innovation is the foundation of our world- we cannot stop it – but we can enhance the way we do things.

“The new rapid deployment model for first mover advantage has its obvious advantages for those who are developing the technology but what of the repercussions of the applications on consumers. We cannot just rely on criminal and civil laws to protect citizens. We need to educate people before the misuse of these technologies,” she said.

### **MEDIA PLEASE NOTE:**

Alexander Hayes is the Publicity Chair of the conference and can be contacted on +61427996984. Alternatively, Associate Professor Katina Michael is also available for comment on +0431201172.

## **7th Forum on the Social Implications of National Security**

### **Pros and Cons in Policing Security & Everyday Life**

7th Forum on the Social Implications of National Security  
Key Stakeholder Symposium – Toronto, Ontario CANADA  
30th June 2013

Unmanned aerial vehicles (UAVs or UASs) popularly known as drones are having a substantial presence in our skies and featuring in media around the world. Legislation restricting or banning the use of these technologies in various airspaces is having a direct impact on the policing, commercial, community engagement and educational potential of these technologies.

A direct correlation between augmented reality and lifelogging data repositories with UAVs / UASs bring this technology even further into contention with privacy, security and identity management authorities and advocates. The explosion of inter-related applications and diffusion of these technologies in an everyday, publicly accessible and smartworld context, calls for a Symposium that brings interdisciplinary, cross-sector, inter-agency and multinational perspectives together in a forum addressing the immediate issues and challenges of working in this space.

This Symposium will bring together key stakeholders on the 30th June 2013 in Toronto, Ontario Canada in a face-to-face forum / debate, with key speakers and representative figures from the (but not limited to) military, national security, medical, law enforcement, privacy, journalism, suppliers, academic and business leaders.

## UAVs: Pros vs Cons Symposium | Program

UAVs: Pros vs Cons Symposium | Program  
Ryerson University, Toronto  
30th June 2013

- 09.30 – 10.00 | Breakfast and Networking
- 10.00 – 10:05 | Welcome – Associate Professor Katina Michael, University of Wollongong
- 10.05 – 10.10 | Program Facilitator – Introduction – Ramona Pringle, Ryerson University
- 10.10 – 10.40 | Drones for Good – Mr. Ian Hannah, Avro Robotics
  
- 10.40 – 11.00 | Morning Tea**
- 11.00 – 11.05 | Program – Alexander Hayes – Patron & Sponsor Acknowledgement
- 11.05 – 12.00 | Unstructured Forum – Drones for Good – Open Comments from the Floor
- 12.00 – 12.30 | Scenarios 2: Drones for Bad – Associate Professor Avner Levin, Ryerson University
  
- 12.30 – 13.30 | Lunch**
- 13.30 – 14.00 | Unstructured Forum – Drones for Bad [Open Comments from the Floor]
- 14.00 – 14.30 | Policy: Drones, Law and Society – Professor Andrew Clement, University of Toronto
  
- 14.30 – 14.50 | Afternoon Tea**
- 14.50 – 15.30 | Unstructured Forum – Policy Options and Solutions [Open Comments from the Floor]
- 15.30 – 15.40 | Next Steps – Daria Ilkina, Ryerson University
- 15.40 – 16:00 | Close – Matthew Schroyer – Drone Journalism *et al.*

**Venue** 55 Dundas St. West, Ontario, Canada M5B 2K3  
**Event Patrons** Ryerson University, Toronto  
**Event Sponsors** Centre for Excellence in Policing & Security, University of Wollongong, Flinders University, Leeds University, EPIC.org, Dronejournalism.org, Drones For Good, SUAS News

## Author Index

- Ai, Tao 71  
Albatal, Rami 66  
Ali, Mir Adnan 64, 71, 87  
Al-Kahtani, Mohammed 80  
Applin, Sally A. 91  
Armentano, Ricardo L. 39, 77  
Arnone, Marilyn P. 90  
Aryani, Amir 78  
Audy, Stephen 64
- Ballard, Brian 62  
Bell, Gordon 4  
Blackall, Leigh 78, 81  
Boler, Megan 78  
Brin, David 5, 83
- Camp, Jean 72  
Caprani, Niamh 63  
Carthy, Denise 66  
Carvalko, Joseph 89  
Cavoukain, Ann 7, 61  
Chauncey, Sarah A. 90  
Chen, Alexander 74  
Clement, Andrew 92, 93  
Compeau, Tim 68  
Crandall, David 86  
Czegledy, Nina 79
- Dhir, Amandeep 80
- Emilio, Jose 71
- Falkinson, Blair 61, 62  
Farrelly, Glen 90  
Ferenbok, Joseph 92, 94  
Fischer, Michael D. 91  
Furness, Colin D. 64
- Ganascia, Jean-Gabriel 16  
Gardam, Michael 64  
Garg, Vaibhav 72  
Garten, Ariel 74  
Gersher, Shayna 95  
Gill, Akshay 71  
Gilliland, Scott 64  
Glover, Kevin 63  
Gordo-Lopez, Angel 72  
Gray, Chris Hables 78  
Grey, Chris 72
- Gurion, Tom 70  
Gurrin, Cathal 11, 63, 66
- Hayes, Alexander 69, 78  
Heath, Jennifer 81  
Herman, Susan N. 28, 92  
Hrelja, Marko 65  
Huang, Jason 70, 74, 88
- Ieraci, Adriana 79  
Inbar, Ori 19, 67
- Jacoby, Nori 70  
Jadad, Alejandro (Alex) R. 38, 88  
Jaeger, Nils 63  
Janzen, Ryan 88  
Jen, Anna 62  
Johnson, Arndis 92
- Kaarst-Brown, Michelle L. 90  
Kallstrom, Martin 27  
Kapadia, Apu 72, 86  
Kee, Kevin 68  
Kiarri, Ngua 69  
Kish, Daniel 30, 61  
Kun, Luis 34, 75  
Kurzweil, Ray 1, 41  
Kyobe, Michael 91
- Leinonen, Teemu 13, 65, 69  
Levin, Avner 93  
Li, Na 66  
Lo, Raymond 74, 88
- Manders, Corey 33, 73  
Mann, Steve 3, 41, 64, 65, 70, 71, 74, 78, 87, 88  
Manson, Rob 22, 74  
McGee, Ellen M. 32, 66  
McGregor, Carolyn 17, 89  
McKenna, Helen Patricia 90  
McKnight, Lee W. 90  
McPhail, Brenda 92  
Minsky, Marvin 2, 41  
Monteagudo, José L. 36, 76  
Moran, Stuart 63  
Morrow, Monique 12  
Mushore, Rutendo 91
- Nachumow, Jonathan Polak 64  
Nowak, Andrzej 84
- O'Conner, Noel 63  
Ovtcharov, Kalin 71
- Papagiannis, Helen 23, 67  
Paterson, Nancy 71  
Patil, Sameer 72  
Patterson, Heather 92  
Pedersen, Isabel 10, 85  
Perakslis, Christine 79  
Petriu, Emil M. 18  
Pitt, Jeremy 15, 84  
Pobine, Scott 64  
Profita, Halley 64  
Purma, Jukka 69  
Rahman, Zahid 86  
Rampersad, Valmiki 70, 74, 88  
Ratelle, Amy 79  
Ratto, Matt 79  
Record, Isaac 79  
Ridgway, Stephan 78  
Robbins, Jeff 26, 84
- Sabine, Susannah 78  
Schirmer, Larry 86  
Schnadelbach, Holger 63  
Schroyer, Matthew 25, 95  
Schull, Natasha Dow 14, 83  
Serbedzija, Nikola 20, 94  
Shay, Colonel Lisa A. 9  
Srigley, Jocelyn A. 64  
Starner, Thad 6, 64
- Templeman, Robert 86
- Wassell, Pete 73  
Waugh, Pia 78, 81  
Wigan, Marcus 65  
Wu, Han 74
- Yang, Yang 66
- Zariwny, Andrea 80, 85  
Zeagler, Clint 21, 64, 69  
Zhou, Jiang 66

## Programme - At - A - Glance

Time/Venue	Hart House, historic center of culture at The University of Toronto
08:00 onwards	Registration
09:00–09:10	<i>Welcome Message by <b>Laura Jacob</b>, IEEE SSIT President</i>
09:10–09:20	<i>Welcome Message by <b>Farid N. Najm</b>, ECE, UofT</i>
09:20–09:30	<i>Welcome Message by <b>Ryan Janzen</b>, Eyetap Laboratory, UofT</i>
	<b>Session:</b> Engineering   Infrastructure ( <b>Chair:</b> Katina Michael, University of Wollongong)
09:35–10:00	<b>Invited:</b> Cyborg Anthropology and the Future of the Interface - <b>Amber Case</b>
10:00–10:30	<b>Keynote:</b> Veillance and Reciprocal Transparency: Surveillance versus Sousveillance, AR Glass, Lifelogging, and Wearable Computing - <b>Steve Mann</b>
10:30–11:00	<b>Keynote:</b> Title - <b>Ray Kurzweil</b>
11:00–11:30	Morning Tea
	<b>Session:</b> Engineering   Infrastructure ( <b>Chair:</b> Jeremy Pitt, Imperial College London)
11:35–12:05	<b>Keynote:</b> The Society of Mind - <b>Marvin Minsky</b>
12:05–12:30	<b>Keynote Panel:</b> The Society of Intelligent Veillance - <b>Marvin Minsky, Ray Kurzweil and Steve Mann</b>
12:30–13:20	Lunch
	<b>Session:</b> Engineering   Infrastructure ( <b>Chair:</b> Simon Randall, Autographer)
13:30–14:00	<b>Invited:</b> Lifelog Semantics from Wearable Computing - <b>Cathal Gurrin</b>
14:00–14:30	<b>Plenary:</b> The Design of a Lifelogging Camera - <b>Martin Kallstrom</b>
14:30–15:00	<b>Plenary:</b> Wearable Computing and Security Implications - <b>Monique Morrow</b>
15:00–15:30	Afternoon Tea
	<b>Session:</b> Engineering   Infrastructure ( <b>Chair:</b> Linda Theron, Salon Voltaire, KI Group Consulting)
15:35–16:05	<b>Invited:</b> Mobile Music Touch: Passive Haptic Learning and Rehabilitation - <b>Thad Starner</b>
16:05–16:35	<b>Invited:</b> Bio-Inspired Solutions for Intelligent Android Perception and Control - <b>Emil M. Petriu</b>
16:35–17:05	<b>Invited:</b> Connecting Memory Extensions to Internal Memory - <b>Jean-Gabriel Ganascia</b>
19:00 onwards	<b>Gala Event – Cocktail Evening - Patron: Streamfolio Pty Ltd</b> (Press / Patrons / Exhibitors / Keynote / Invited / Plenary Speakers only)

Time/Venue	Bahen Centre, a central hub for University of Toronto's Engineering Faculty			
	Room One	Room Two	Room Three	Room Four
09:00–10:30	<b>Session:</b> Assistive/Usability <b>Chair:</b> Douglas Baldwin			
10:30–11:00	Morning Tea			
11:00–12:30	<b>Session:</b> AR <b>Chair:</b> Stephen Lake	<b>Session:</b> Lifelogging <b>Chair:</b> Gary Beirne	<b>Session:</b> Design <b>Chair:</b> Peter Bugaj	<b>Session:</b> UbiComp <b>Chair:</b> Alexander Hayes
12:30–13:30	Lunch			
13:30–15:00	<b>Session:</b> Apps <b>Chair:</b> Günter Alce	<b>Session:</b> Design <b>Chair:</b> Chris Dancy	<b>Session:</b> HDR <b>Chair:</b> Bradley Kjell	<b>Session:</b> Social Networking <b>Chair:</b> Stephanie Cork
15:00–15:30	Afternoon Tea			
15:30–17:30	<b>Session:</b> Build <b>Chair:</b> Gene Becker	<b>Session:</b> mHealth <b>Chair:</b> Joseph Herkert	<b>Session:</b> Methodology <b>Chair:</b> Terri Bookman	<b>Session:</b> Open Data <b>Chair:</b> Alexander Hayes
17:30–18:00	<b>Exhibits</b>			
18:00–19:00	<b>Industry Panel</b>			
19:00 onwards	<b>Banquet &amp; Banquet Keynote Speech by Gordon Bell, Microsoft</b>			

Time/Venue	Bahen Centre, a central hub for University of Toronto's Engineering Faculty			
	Room One	Room Two	Room Three	
09:00–10:30	<b>Session:</b> Transparency <b>Chair:</b> Chris Hables Gray			
10:30–11:00	Morning Tea			
11:00–12:30	<b>Session:</b> Social Implications <b>Chair:</b> Janet Rochester	<b>Session:</b> Ambient Intelligence <b>Chair:</b> Jon Dougal	<b>Session:</b> Sousveillance <b>Chair:</b> Niahm Caprani	
12:30–13:30	Lunch			
13:30–15:00	<b>Session:</b> Health <b>Chair:</b> Cara Morris	<b>Session:</b> Sensors <b>Chair:</b> Andrew Everitt	<b>Session:</b> Surveillance <b>Chair:</b> Adib Ghubril	
15:00–15:30	Afternoon Tea			
15:30–17:30	<b>Session:</b> Law <b>Chair:</b> Pete Wassell	<b>Session:</b> Drones <b>Chair:</b> Susannah Sabine		
17:30–18:00	<b>Closing:</b> Ryan Janzen, <i>Organising Chair</i>	<b>Closing:</b> Steve Mann, <i>General Chair</i>	<b>Closing:</b> Katina Michael, <i>Program Chair</i>	
18:00 onwards	<b>Sousveillance Walk: Tour of Toronto with Wearcams</b>			

