SenCity: Uncovering the Hidden Pulse of a City

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Abstract

The SenCity workshop explores the use of sensing technologies for visually resurfacing some of the hidden dynamics of the city by providing a collaborative and facilitated environment for applied research and creative exploration. Participants will collaboratively apply practical research and creative flair at the SenCity workshop to sense, visualise and share the hidden pulse of Zürich.

Author Keywords

Workshop; Sensing; Cities

ACM Classification Keywords

A.0. General: Conference Proceedings.

Rationale

Cities act as hubs designed to accommodate and support millions of inhabitants, nomads and tourists that rely on the city's infrastructure to move around, communicate and flourish as individuals and as a community. This shapes the culture, habits and pulse of a city creating an organic urban landscape often invisible to the naked eye, but traceable digitally. With the proliferation of sensing and pervasive technologies, we should be able to tell the levels of crowdedness of the city, its mood, or how clean it is by sensing and visualising these aspects. However, this poses

interesting research and design questions; how would one design a device for tracking and visualising crowdedness on buses, for example.

This workshop aims to explore the use of sensing technologies for visually resurfacing some of the hidden dynamics of the city by providing a collaborative and facilitated environment for applied research and creative exploration. This complements other workshops in the "urban" or "cities" theme, such as PURBA (Pervasive Urban Applications), that investigate urban environments from a theoretical perspective. After initial discussions on a joint workshop, the SenCity and PURBA organisers concluded that these workshops were complementary yet different enough to give participants the benefit of taking part in both; gaining the theory from PURBA and collaboratively applying practical research and creative flair at the SenCity workshop to sense, visualise and share the hidden pulse of Zürich.

Objectives

The SenCity workshop aims to create a practical, creative and structured platform for researchers, designers and practitioners to come together to discuss, design and rapidly prototype sensing devices that will then be taken into an urban environment and used in situ. By providing a collaborative platform for multi-disciplinary groups to work together we are seeking to create interesting and novel ways of using basic sensors to uncover the hidden pulse and habits of city life.

The organisers also aim to create a public installation that could be displayed at the conference post-workshop, visualising aggregate sensor data collected by the workshop participants in a meaningful and interesting way from across the varied urban landscape of Zürich.

The SenCity workshop will further discussions on topics such as (but not limited to):

- Crowd-sensing and monitoring of an urban environment
- Rapid prototyping with sensor technologies
- New methods of crowdsourcing in urban environments
- Sensing for sustainable behavioural change
- Visualising complex data from urban sensors or the urban crowd
- Novel applications for mobile devices, public displays and social networking services
- New applications for urban spaces

Detailed Plan

Before the Workshop
There will be a limited number of places available at this workshop. The call for papers and participation will be distributed in all the relevant communities, including those of ubiquitous computing, pervasive computing and HCI.

At the Workshop
The workshop will adopt a one day format of hands-on, focused activities that will be performed in cross-disciplinary groups of 5 or 6 people. The groups will be pre-assigned by the organizing committee prior to the workshop.

On arrival at the workshop, participants will be seated in their pre-assigned groups. The workshop will kick off with a short introduction session so participants can become familiar with those in their group as well as the other workshop delegates. Each group will then be given a development kit. The kit will contain a small processing device and a variety of pluggable sensors. A development environment with sample code will also be provided to support rapid development. A tutorial session will allow the participants to become familiar with the hardware and development tools. Participants will then be presented with the design and development challenge. Using the hardware, tools and knowledge from the tutorial, each group will design and develop a small sensing device that will capture some hidden element of the urban environment (e.g. crowdedness, pollution levels, etc.). Groups will be encouraged to think creatively, perhaps using a sensor for a non-obvious purpose or a combination of sensors in a novel way. Groups will also be encouraged to consider where their sensing device would be best deployed and how it might be camouflaged to better blend in to the urban environment. After the coffee break each group will have two hours of brainstorming and development to create their sensing device. Workshop organizers will be available during this time to provide help and guidance.

After a one hour lunch break participants will head out into the city of Zurich to deploy their sensing devices in a real-world urban environment and attempt to capture some interesting data. Maps and a suggested route will be provided to each group. The groups will have two hours to explore different deployment locations and identify interesting areas to sense their chosen hidden urban element. On returning to the workshop venue, each group will hand over their sensing device so that the workshop organizers can extract the captured data for visualization. While this is completed there will be a short coffee break and then each group will be invited to report to the rest of the workshop on their activities throughout the day including the type of sensing device they created, what sensors and design choices they made and their experiences during the real-world deployment session.

The final session of the day will be dedicated to the visualizations of the data captured by each group. A visualization framework will be developed by the organizers prior to the workshop and will present a combined view of the data captured by all groups. After final discussions the workshop will be brought to a close. The following table details the workshop schedule:

Time	Activity
09:00	Introductions and groupings
10:00	Development challenge presentation and sensor kit tutorial
10:45	Coffee break
11:00	Group discussions and collaborative design
11:30	Group development
13:00	Lunch
14:00	Installation, data collection and observations in Zurich city
16:00	Coffee break
16:15	Group report outs and feedback

16:45	Visualisation and discussion
17:30	Close

Table 1. Workshop Schedule

After the Workshop
The organizers wish to continue to display the generated visualisations in a public space at the conference venue for the duration of the Ubicomp conference (pending approval from the conference organizers). Our aim is to stimulate further discussions beyond the workshop attendees and to provide a public talking point.

Participant Selection & Expected Audience

The workshop will have an interdisciplinary appeal. We expect participation by scientists from a diverse list of disciplines such as ubiquitous computing, pervasive computing, HCI, mobile computing, embedded systems, computer science and information visualization.

Authors will be requested to submit a position paper of up to 2 pages in length and must in addition include a short biography covering their background and research interests. Only a limited number of places will be available at this workshop so participants will be selected through a peer review process. Successful candidates will then be pre-grouped into cross-disciplinary groups (based on their biography) before the workshop. Given the success of previous workshops (such as PURBA @ Pervasive and GeoHCI @ CHI) in the same "urban" or "cities" thread we expect to receive a respectable number of applicant submissions.

In addition to the organizing committee, the peer review and participant selection process will be supported by the Program Committee. The list (alphabetical by surname) of researchers who will serve on the PC is given below:

Eskindir Asmare	Imperial College London
Mara Balestrini	ICRI-Cities, UCL
Licia Capra	ICRI-Cities, UCL
Martin Dittus	ICRI-Cities, UCL
Kevin Doolin	TSSG
Babak Farschian	SINTEF
Ava Fatah	The Bartlett, UCL
Korbinian Frank	German Aerospace Centre
Vanessa Frias-Martinez	Telefonica
Adrian Friday	University of Lancaster
Lisa Koeman	ICRI-Cities, UCL
Antonio Kruger	DFKI
Neal Lathia	Cambridge University
Ilias Leontiadis	Cambridge University
Paul Marshall	UCLIC, UCL
Gerard Oleksik	Dovetailed
Patrick Olivier	Newcastle University
Christine Outram	Re-imagine Group
Daniele Quercia	Yahoo
Patrick Robertson	German Aerospace Centre
Yvonne Rogers	UCLIC, UCL
Ioanna Roussaki	ICCS

Johannes Schoning	Hasselt University
Chris Smith	ICRI-Cities, UCL
Nick Taylor	Heriot-Watt University
Martin Traumueller	ICRI-Cities, UCL
Janet van der Linden	Open University
Nicolas Villar	Microsoft Research Cambridge
Duncan Wilson	Intel Corporation

Organiser Backgrounds

Sarah Gallacher
Sarah is a Senior Research Associate in Intel Collaborative Research Institute on Sustainable Connected Cities (ICRI-Cities) at UCL. She joined UCL as a post-doc in early 2013 from Heriot-Watt University (HWU) in Scotland, Edinburgh. At HWU she achieved a MEng. in Software Engineering in 2005 and a PhD in Computer Science in 2011. In addition, Sarah worked on several EU research projects from 2005 – 2012, collaborating with researchers from all over Europe. Sarah conducts research in the areas of pervasive/ubiquitous computing, personalisation and applied machine learning. Previously she has developed personalisation and preference learning systems for pervasive service platforms and has also developed several pervasive services and applications. She has published more than 30 papers, in venues including Ubicomp, Pervasive, Mobiquitous, UIC, the Journal of Pervasive and Mobile Computing (PMC) and ACM Transactions on Autonomous and Adaptive Systems (TAAS). Current research interests in the cities domain include crowd sourcing and data mining.

Vaiva Kalnikaitė
Vaiva is a User Experience (UX) Designer and Entrepreneur based in Cambridge UK. She researches, designs and prototypes novel user experiences and ubiquitous technologies that better fit into the fabric of everyday life. She is particularly interested in devices for self-quantification and behavioural change. In 2011 Vaiva founded Dovetailed, a digital design studio delivering design thinking and beautifully crafted experiences to innovative companies and global brands. Vaiva also holds a Senior Research Associate position in the Intel Collaborative Research Institute on Sustainable Connected Cities (ICRI-Cities) at University College London.

Julie McCann
Julie is a Reader in Computer Systems, Department of Computing at Imperial College and leads both the Adaptive Embedded Systems Engineering Group and the Imperial part of the Intel Collaborative Research Institute for Sustainable Cities. Her research centres on highly decentralised algorithms and self-organising scalable solutions, applied to operating and database systems and wireless sensing networks. She has published over 100 articles, was awarded the 2008 Emerald Publishing Literati Network Highly Commended Award, and received over £10M funding (mainly EPSRC/NERC/TSB national programmes). All her projects are interdisciplinary, (applied to the arts, health or engineering) collaborating with e.g. RCA; Interactive Institute Stockholm, as well as many industrial partnerships e.g. Intel, Thames and Severn-Trent Water, BT, Arup Engineering, and BBC. Julie was PI on one of the earliest UK funded sensor networking applications for green smart spaces sponsored by TSB

in 2003 (UbiCare) and is currently working with NEC and Cisco on sustainability related projects.

David Prendergast
Dr David Prendergast is a social anthropologist and a Principal Investigator in the Intel Collaborative Research Institute for Sustainable Connected Cities with Imperial College and University College London. He also holds the position of Visiting Professor of Healthcare Innovation at Trinity College Dublin. His research over the last fourteen years has focused on later life-course transitions and he has authored a number of books and articles on ageing, health, technology and social relationships. During his career David has been involved in several major research projects including: a multi-year ethnography of intergenerational relationships and family change in South Korea; the provision of paid home care services in Ireland; and a three year ESRC study into death, dying and bereavement in England and Scotland. After receiving his PhD from Cambridge University, Dr Prendergast held research posts at the University of Sheffield, and Trinity College Dublin. David began working with Intel in 2006 attracted by the opportunity to utilize social research to design and develop culturally appropriate technologies. In recent years, David has been involved in a diverse range of research initiatives from the Global Ageing Project which explores the expectations and experiences of health and ageing around the world, to Irish and EU studies on pathways into health and social care, active retirement communities, loneliness, sleep and activity patterns, behavioural change, and social entrepreneurialism.

Jon Bird
Jon is a Senior Research Associate at the UCL Interaction Centre, University College London. He designs, prototypes and evaluates novel ubiquitous computing technologies. One of his research interests is using technology to facilitate behavioural change, with a particular focus on sustainable behaviour. Another is the design of wearable haptic systems for training posture and body movements. Jon manages the Interaction Research Laboratory which is used to develop prototypes and to run physical computing workshops for postgraduates at UCL. He has published 40 peer reviewed articles and has obtained 9 research grants totaling over £45,000. He has an in depth knowledge of a wide range of computer languages, including C and C++ and extensive experience of physical computing, including programming Arduino microcontrollers.

Hans-Christian Jetter
Hans-Christian is a research associate at the Intel Collaborative Research Institute on Sustainable and Connected Cities (ICRI-Cities) at UCL. Prior to this he was a research assistant in the HCI group of the University of Konstanz where he also achieved his PhD. His research focuses on the design and implementation of post WIMP interaction and information visualization techniques for collaborative, multi-touch and tangible user interfaces. He is also interested in cognitive models for embodied interaction. Hans-Christian has published over 40 peer reviewed papers and acts on the Technical Program Committee for many high ranked conferences (such as SIGCHI, UIST and MobileHCI) and journals (such as ToCHI and IP&M).