

www.dis2018.org

The Hong Kong Polytechnic University



9-13 JUNE
DIS 2018
DIVERSITY | HONG KONG

DESIGN
INTERACTING
SYSTEMS

Design and Diversity:
Designing Interactive Systems 2018



PolyU Design



WELCOME TO DIS 2018

We are pleased to welcome Designing Interactive Systems DIS 2018 to Hong Kong. DIS 2018 is the first of its kind in two ways. It is in Asia for the first time. Also, it is hosted by a design school.

The theme of the conference is Design and Diversity. The theme reflects a classic design theme - and also a foundational distinction in philosophy - of universals and particulars. Should we, as designers, follow Silicon Valley in its quest for products that engage everyone on the planet, or the architect Glenn Murcutt's conviction that he can only build in places he knows so well that his designs can be outstanding? The underlying logic of this question divides designers and design disciplines and emerges in every design process.

This theme operated as a guiding tool for selecting our four keynotes, professors Jodi Forlizzi, Kun-pyo Lee, Phoebe Sengers and Erik Stolterman. During their years in design, they have lived through its diversities. We were happy that they accepted the challenge to share their experiences and thoughts about diversity to the benefit of our community. The theme was also our tool for directing the DIS community into the future. A few years from now, we hope, we will start to see answers to the challenges our keynotes are posing to us.

The nucleus of the conference organization were two chairs and three technical chairs. This small group invited fifteen Subcommittee Chairs, three Pictorials chairs, and two chairs each for Workshops, Provocations and Work-in-Progress, Doctoral Consortium, and Demos. These chairs recruited 138 Associate Chairs, who recruited 1818 reviewers. Our review and decision schedule was brutal, but the organization worked through it efficiently, always with humor, and with collegial respect.

DIS 2018 received 645 submissions: 405 for full papers and notes submissions; 71 for pictorials; 23 for workshops submissions; 107 for Provocations and Work-in-Progress (out of these, 19 were Provocations); 20 for Doctoral Consortium Submissions; and 19 for Demos. Acceptance rates were: 23% for papers and notes, 24% Pictorials, 55% for Workshops, 73% for Demos, 53% for PWiPs, and 50% for Doctoral Consortium.

All this work led into a highly competitive conference between 9-13 June. June 9-10 were reserved for Workshops and Doctoral Consortium, and June 11-13 for 28 paper sessions. Pictorials are not in separate sessions; they are treated the same way as Full Papers. The 11th of June became an Experience Night of Demos, PWiPs, and a small design exhibition, which illuminated interaction design in Hong Kong and the Pearl River Delta. As extra, we organized a post-conference trip to a few technology companies in Shenzhen, China.

The program reflects the highly diverse nature of our discipline. We could not see any particular trends in papers, but a few observations may be possible. Two thirds of submissions focused on the following two human-oriented subcommittees: Experience and Methods and Processes. In comparison, the two technically oriented committees were smaller, but the quality of papers was particularly impressive in the Technical Innovation subcommittee. We expected to see more papers in design fiction, but with few exceptionally creative exceptions, fictional papers did not fare well in the review process. We also expected more papers on diversity, sustainability, and global and civic issues, but did not. Looking at our own PhD students, however, we believe this work is maturing over the next few years. We saw several papers that try to bridge the gap between interaction design and more traditional fields of design like crafts. Machine learning is becoming a research topic, as is everyday life, with all its richness including themes like interaction with pets, microbes, and food.

Finally, our sincere thanks to sponsors. The Chairs also want to thank the chairs of DIS 2016 and DIS 2017. In particular, Ilpo Koskinen wants to thank Oli Mival and Marcus Foth; their help was crucial in creating

the architecture of the conference. From Subcommittee Chairs to reviewers, the community came together beautifully. It was their volunteer work that keeps this community going; our sincere thanks goes for all of them. At the back end, we want to thank ACM and The Hong Kong Polytechnic University for their support. Our thanks also goes to Lisa Tolles for preparing the publication on tight schedule. Our local committee, especially the treasurer Christine Tsin, deserves a big thanks; this conference would not have happened without her. Our final thanks of course goes to the participants, who took a week off from their busy lives to travel to Hong Kong to present their work for their peers and to mingle with the community.

We welcome you to enjoy DIS 2018 in Hong Kong, one of the world's iconic, albeit less well known cities!



Chairs

Ilpo Koskinen

Youn-kyung Lim

Teresa Cerratto-Pargman

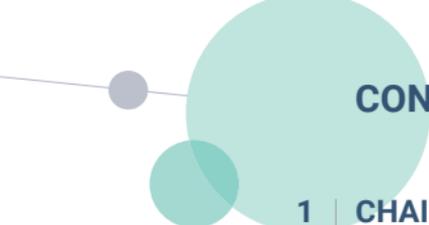
Chow, Ka Nin Kenny

Will Odom



PROGRAM OVERVIEW

PRE-CONFERENCE PROGRAM	
9-10 June	Workshops, Doctoral Consortium
10 June	Welcome Reception
MAIN PROGRAM	
11 June	Registration, and Opening Keynote 9 Paper sessions in 3 tracks Experience Night: Posters, Demos, Exhibition
12 June	11 Paper sessions and 1 Panel in 3 tracks Conference Dinner
13 June	7 Paper sessions and 1 Panel in 3 tracks Closing Keynotes
POST-CONFERENCE PROGRAM	
14 June	Extra Program - Trip to Shenzhen, China



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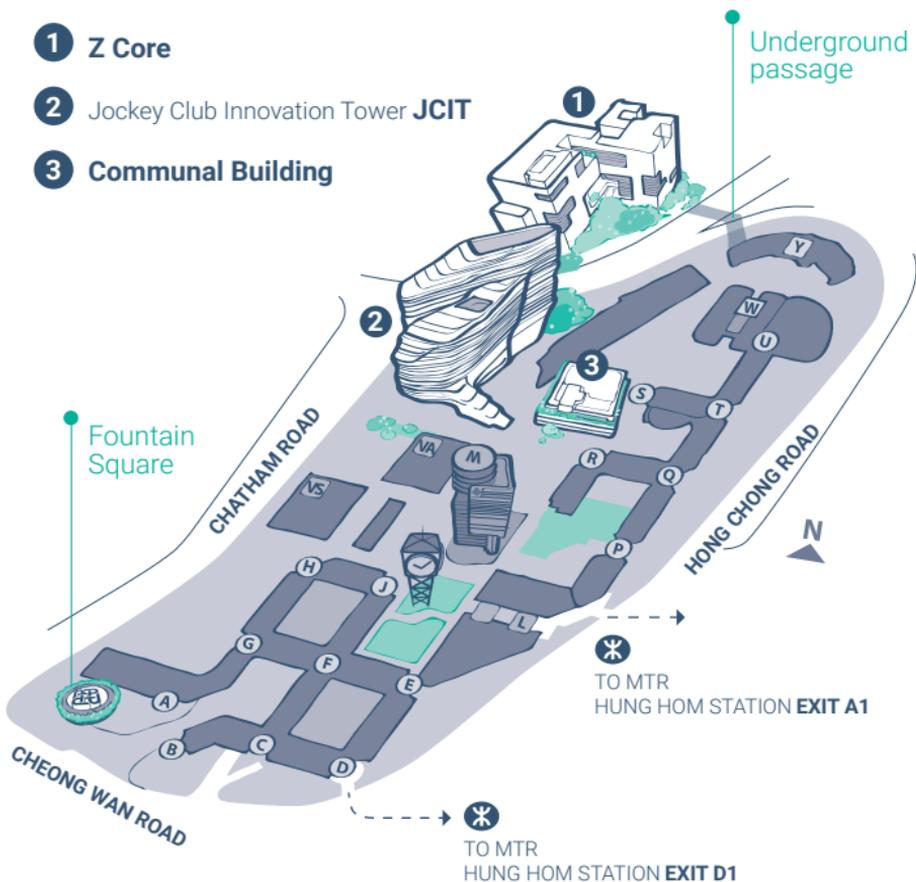
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- 25 EXPERIENCE NIGHT 11 JUNE**
 - 28 MINI DESIGN EXHIBITION
 - 29 PROVOCATIONS and WORK-IN-PROGRESS
 - 57 DEMOS
- Paper sessions, including notes and pictorials

67 MONDAY 11 JUNE
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CONFERENCE VENUE

DIS 2018 takes place in two main venues on the PolyU campus: Z Core and the Jockey Club Innovation Tower (JCIT). In addition, lunch is served at the Chinese Garden restaurant in the Communal Building (VS) next to the JCIT.

- 1 Z Core
- 2 Jockey Club Innovation Tower JCIT
- 3 Communal Building



Accessibility and dietary requirements

If you need assistance during the conference, please talk to a student volunteer. If you can't find a student volunteer, Mr. Pierre Tam is available via email, publicity@dis2018.

Z Core: Keynotes

The opening and the closing of the conference, as well as the keynotes, take place in Z209, an Auditorium in Z Core. Access to the main campus is under Chatham Road, through an underground tunnel. The route is not convenient but there will be plenty of student volunteers to help.

Access to the **underground passage** from the JCIT is on the ground level, taking either set of elevators. After exiting the building, walk through the parking area and turn left on the access road. Follow the signs through to PolyU Phase 8 Z core. There are escalators going to the 2nd floor of Z Core.

Remarks: Venues are subject to change upon necessary on site arrangement.

Lunch is served in restaurant Chinese Garden on the 4th floor of Communal Building. Since it has only slightly over 200 seats, some of the meals are served in bento boxes.

Coffee Breaks

Coffee is served on the 3rd and the 13th floors of the JCIT.

Free Wi-Fi

Select the WiFi SSID (Service Set Identifier) of 'Wi-Fi.HK via PolyU'. Password is not required, however, it is necessary to reload every two hours.

JCIT: Main Conference Venue

The main conference venue is the Jockey Club Innovation Tower (JCIT). Workshops and the Doctoral Consortium, parallel sessions and the Experience Night take place in the JCIT.

Parallel sessions are on the 3rd floor of the building in Rooms 302, 312 and 322. Access is available via both sets of elevators, and an escalator from the podium level.

Experience night is on the 13th floor. Please use the second set of elevators (the first set only reach the 9th floor).

Workshops take place in over 10 rooms in the building.

SOCIAL PROGRAM

Registration

EARLY REGISTRATION	
10 June	6 - 8 PM on 13/F, JCIT
MAIN REGISTRATION	
11 June Morning	8AM - 12PM on 2/F in front of Auditorium Z209, Z-Core
11 June Afternoon	1PM - 6PM on 3/F, JCIT
12 June Morning	8AM - 12PM on 3/F, JCIT

Welcome reception

The welcome reception is on Sunday 6:00 - 8:00 PM on 13/F JCIT.

Conference Dinner

The conference dinner is on Tuesday 7:30 - 9:30 PM at the Lamma Rainbow Restaurant, about 20 minutes from Hong Kong Island. It is located in the village of Sok Kwu Wan, on Lamma Island.

<http://lammairainbow.com> | **Bus transport to a ferry taking us to Lamma Island departs from the Ground Floor (GF) of JCIT at 6:00 PM.**



OPENING KEYNOTE

To Study Interaction and Interfaces: An Approach and Some Findings**Erik Stolterman** Indiana University, Bloomington, USA

It is hard to deny an often-heard claim that our artifacts and environments are becoming more and more complex, more and more “alive,” and as a consequence more and more demanding. We have to interact more. There seems to be no retreat or escape from interactivity. Some well-informed critics worry that the proliferation of interactions and interactive things has already gone too far. Their concerns raise many questions. Does interactivity in fact increase? How can we know? What does it really mean to claim that it does? And if indeed it is increasing, what does it mean? And why is this happening? And should something be done? Despite this development there seems to be no precise idea of what interaction is and what being interactive means, beyond a vague notion that it is some kind of interplay, usually optimistically understood as good-natured cooperation.

Yet, there seems to be no precise idea of what interaction is and what being interactive means. Instead, as designers, we are guided by our vague assumptions about it, sometimes universalizing our beliefs about interactivity, sometimes being too sensitive to human diversity.

In this talk I will present the analytical and philosophical work I have done for many years, together with my colleague Lars-Erik Janlert. We have examined properties and qualities of designed artifacts and systems; primarily those properties that are open for manipulation to designers, that is, properties that designers can and do intentionally affect by their design decisions (and thus in principle are possible to control). Rather than taking users and their subjective experiences of the artifacts and systems as the primary target for examination, unfashionable as it may be, we have chosen to be objective in the

sense of focusing on the artifacts and systems. Apart from discussing our approach, I will briefly introduce some of our main results consisting of some developed definitions of existing (and some new) concepts, such as, interactivity, interactability, interactiveness. I will end with some comments on what this kind of investigation can tell us about the future by introducing the notions of faceless interaction, interactivity clutter, and interactivity fields.



Bio Erik Stolterman

Erik Stolterman is Professor in Informatics and the Senior Executive Associate Dean of the School of Informatics, Computing, and Engineering at Indiana University, Bloomington. He is also professor at the Institute of Design at Umeå University, Sweden. Stolterman is co-Editor for the Design Thinking/Design Theory book series

by MIT Press, and on several editorial boards for international journals (The HCI journal, International Journal of Design, Design Studies, Design, Economics and Innovation, International Journal of Designs for Learning, Studies in Material Thinking, Human Computation, Artifact). Stolterman's main work is within the areas of HCI, interfaces, interactivity, interaction design, design practice, philosophy and theory of design. Stolterman has published a large number of articles and five books, including "Thoughtful Interaction Design" (MIT Press) and "The Design Way" (MIT Press) and the recently published "Things That Keep Us Busy—The Elements of Interaction" (MIT Press, 2017).

CLOSING KEYNOTES

Data and Design for Action

Jodi Forlizzi Carnegie Mellon University, USA

This is an interesting era for design in terms of the diverse ways that designers need to work. The advent of cloud computing and the sensors in the mobile phones we carry means that there is a vast amount of data collected about what people do. There is a vast

opportunity for designers to leverage this data to create products, services and systems that are tailored to individual needs. At the same time, designers at Google are designing products and services that millions of people use every day. All this sets up an interesting dichotomy for today's designers, who need to take into account both personal and adaptive and global and scaled in how they think, design, and take action.



Bio Jodi Forlizzi

Jodi Forlizzi is the Geschke Director and a Professor of Human-Computer Interaction in the School of Computer Science at Carnegie Mellon University and a Co-founder of Pratter.us, a healthcare startup. Her current research interests include designing educational games that are engaging and effective, designing

robots, AVs, and other technology services that adapt to people's needs, and designing for healthcare. Jodi is a member of the ACM CHI Academy and has been honored by the Walter Reed Army Medical Center for excellence in HRI design research. Jodi has consulted with Disney and General Motors to create innovative product-service systems.

Design Research, for What? Different Perspectives on Design Research

Kun-pyo Lee KAIST, South Korea

What are the diversifying factors of design research in academia and practice, and how can they be interconnected while maintaining the advantages of being diverse?

Design research has a relatively short history compared to other well established academic disciplines. Therefore, the relationship between design academia and design practice tend to be disconnected. This disconnection becomes more serious with the rapid introduction of new technologies such as AI keep challenging the validity of

the existing bodies of design knowledge, methods, and processes. Faced with these new big changes, a healthy cycle of coexistence of academia and practice is required more than ever and a mutual synergetic collaboration between academia and practice is inevitable. Practical designers regard research as something done in the pre-stage of the design concept development, whereas the academia perceives research as an instrument for knowledge generation. Design research in practice and academia differ significantly in respect to goal, deliverables, applicability, methods, scope, venue, among other things, but is this good for design?



Bio Kun-pyo Lee

Kun-pyo LEE is Professor at the Department of Industrial Design, KAIST, South Korea and the director of the Human-Centered Interaction Design Lab for more than 30 years. He is co-founder and president emeritus of IASDR (International Association of Societies of Design Research). He also served as Chief

Design Officer (Executive Vice President) of Corporate Design Center, LG Electronics. He is well known in Asia as an early pioneer in the field of design research, UX design and user-centered design, for which he was recognized as Honorary Fellow of the Design Research Society, and Local Hero at CHI 2015. After returning back to KAIST from LG with unique experiences in industry and academia he has been focusing on establishing a new design education paradigm under the name of Design 3.0 – Big, Deep and Open.

Diversifying Design Imaginations

Phoebe Sengers Cornell University, USA

The act of designing technologies does not simply create functionality; it also offers possibilities for action, ways of looking at the world, and modes through which we can relate to one another. How we design technologies reflects what we value; who we think is important, and

in what ways; which places, people and possibilities are in our imaginations, and which are not.

Current ways of designing technologies frequently narrow these possibilities, in two ways. The first is that technology design is dominated by a narrow demographic: predominantly white and Asian, white collar, highly educated, urban. These designers' ways of imagining new technological worlds are shaped by the worlds they themselves know and value, which are only a small slice of global ways of being. The second is that even as technology design is being increasingly engaged in around the world by and for people outside this demographic, local adaptations are frequently judged and limited by what makes sense from the perspective of Silicon Valley and other urban high-tech centers.

Supporting the rich diversity of human experience requires explicitly identifying and appreciating values and experiences outside of mainstream technology design logics.



Bio Phoebe Sengers

Phoebe Sengers is an Associate Professor at Cornell in Information Science and Science & Technology Studies, where she leads the Culturally Embedded Computing group. Her work integrates ethnographic and historical analysis of the social implications of technology with design methods to suggest

alternative future possibilities. Her group explores rural, working-class and global South experiences of technologies, traces the emerging entanglements between people and data, and uses design to speculate about alternative pasts and futures. Sengers led the Cornell campus of the Intel Science & Technology Center for Social Computing, has been a Fulbright Fellow, a Fellow in the Cornell Society for the Humanities, and a Public Voices Fellow, and received an NSF CAREER award. She holds an interdisciplinary PhD in Artificial Intelligence and Cultural Theory from Carnegie Mellon University.



3/F
JCIT

PRE-CONFERENCE PROGRAM

- 15 **9 & 10 JUNE TWO-DAY WORKSHOP**
- 15 **9 JUNE WORKSHOPS**
- 16 **10 JUNE WORKSHOPS**
- 20 **10 JUNE DOCTORAL CONSORTIUM**

PRE-CONFERENCE PROGRAM 9 - 10 JUNE WORKSHOPS

9 & 10 JUNE TWO-DAY WORKSHOP

Designing within Connected Systems

Mathias Funk, Bart Hengeveld

In this two-day workshop, we investigate how to design in the context of distributed, networked interfaces, dynamic input-output mappings and emergent aesthetics. With this workshop, we aim to complement the theoretical discussion of positions provided by the participants with the hands-on activity of designing and building a networked group interface for music manipulation using Leap Motion® controllers. Participants engage in a two-stage design process, the first focused on designing individual music controllers and the second on using these in a networked format. We conclude the workshop with a reflection and discussion of what was achieved at both theoretical and experiential levels, and project a roadmap of future activities together.

9 JUNE WORKSHOPS

Designing for Everyday Care in Communities

Austin Toombs, Andy Dow, John Vines, Colin Gray, Barbara Dennis, Rachel Clarke, Ann Light

Recent HCI scholarship has begun to incorporate the concept of care as an alternative design lens, moving beyond health care or social care to consider care as a fundamental relational quality of life. This one-day workshop brings together researchers to find a shared understanding of the ways in which interpersonal care and interdependence could be supported through technology design in community contexts. The goal is to raise issues and increase sensitivity towards care, with the ultimate aim of impacting design practices - including how one might design community interactions with and for care. Participants will learn together how such a focus

could impact their own research, while mapping and articulating how research and design in HCI-related fields can and does integrate care into sociotechnical systems more broadly.

Manipulating Reality? Designing and Deploying Virtual Reality in Sensitive Settings

Jenny Waycott, Greg Wadley, Steven Baker, Hasan Shahid Ferdous, Thuong Hoang, Kathrin Gerling, Christopher James Headleand, Adalberto L Simeone

Virtual reality (VR) is now being designed and deployed in diverse sensitive settings, especially for therapeutic purposes. For example, VR experiences are used for diversional therapy in aged care and as therapy for people living with conditions such as phobias and post-traumatic stress. While these uses of VR offer great promise, they also present significant challenges. Given the novelty of VR, its immersive nature, and its impact on the user's sense of reality, it can be particularly challenging to engage participants in co-design and predict what might go wrong when implementing these technologies in sensitive settings. This workshop provides a forum for researchers working in this emerging space to share stories about their experiences of designing and evaluating VR applications in settings such as aged care or mental health therapy. The workshop will develop a manifesto for good practice, outlining co-design strategies and ethical issues to consider when designing and deploying VR in sensitive settings.

10 JUNE WORKSHOPS

From Artifacts to Architecture

Hamed Alavi, Elizabeth Churchill, David Kirk, Henriette Bier, Himanshu Verma, Denis Lalanne, Holger Schnädelbach

The vision and mission of research under the banner of Ubiquitous Computing has increasingly moved from focusing on the realm of "artifacts" to the realm of "environments." We seek to scrutinize this very transition, and raise questions that relate to the specific attributes of built environments that set them inherently apart from artifacts. How does an interactive environment differ from an

interactive artifact, a collection of artifacts, or an integrated suite of artifacts? Consequently, we ask what are the new user experience dimensions that HCI researchers should merge into their considerations, for example, by supplementing usability and engagement with occupants' comfort across multiple dimensions, and shifting attention from (often) short lifespan and discretionary to durable and immersive experiences? In this contribution, we bring arguments from the literature of environmental psychology and architecture that highlight the points of divergence between artifacts and architecture, and then translate them into challenges for Human-Computer Interaction, and particularly for the emerging domain of Human-Building Interaction.

The “Next Billion Users”: Designing for Emerging Markets **Chandrika Cycil, Rajiv Arjan, Lauren Celenza**

The number of users coming online for the first time on mobile phones in emerging markets is fast growing. As the trajectory of internet use for these users follows a mobile-first experience, technical and infrastructural constraints impact the overall experience. The workshop aims to identify and discuss salient themes surrounding the technology needs of users in emerging markets that include Asia, Africa and South America. Emphasis will be on how researchers and designers understand these unique needs and the new insights and perspectives needed to design for mobile users in emerging markets.

Designing Interactive Systems to Support and Augment Creativity - A Roadmap for Research and Design

Peter Dalsgaard, Kim Halskov, Jonas Frich, Michael Mose Biskjaer, Andruid Kerne, Nic Lupfer

The aims of the workshop are to examine and discuss the current state of research in designing interactive systems to support and augment creative work, and to outline a roadmap for future research initiatives. The workshop will explore methodological issues and approaches, overarching trends and developments, exemplary cases, and future initiatives to study and design systems and tools to augment creative practices. Participation in the workshop requires participants to contribute with a position paper on one of the above

topics, and to read and comment on co-participants contributions before the workshop.

Let's Get Divorced: Constructing Knowledge Outcomes for Critical Design and Constructive Design Research

Jodi Forlizzi, John Zimmerman, Paul Hekkert, Ilpo Koskinen

Over the last two decades, constructive design research (CDR) - more commonly called Research through Design within HCI - has become an accepted mode of scholarly inquiry within the design research community. It has been described as having three distinct genres: lab, field, and showroom. The lab and field genres typically take a pragmatic stance and typically propose a preferred future. Research done following the showroom approach - more commonly known as critical design (CD), speculative design, or design fictions - typically offers a polemic and a critique of the current state embodied in an artifact. Recently, we have observed a growing conflict within the design research community between pragmatic and critical design researchers [4]. To help reduce this conflict, we called for a divorce between CD and pragmatic CDR, advocating that each approach has its own merits and should be evaluated on its own account. Other design researchers have pushed back on this stance, seeking to create some middle ground to connect these two types of research. In this day-long workshop, we develop methods for describing, evaluating, replicating, and making use of knowledge outcomes from these two forms of design research.

Time, Temporality, and Slowness: Future Directions for Design Research

William Odom, Siân Lindley, Larissa Pschetz, Vasiliki Tsaknaki, Anna Vallgård, Mikael Wiberg, Daisy Yoo

A diverse set of research and design initiatives related to time, temporality, and slowness has emerged in the DIS and HCI communities. The goals of this workshop are to: 1. bring together researchers to reflect on conceptual, methodological, and practice-based outcomes and issues and 2. to develop an agenda for future research in this growing area.

Handmaking Food Ideals: Crafting the Design of Future Food-related Technologies

Erica Vannucci, Ferran Altarriba Bertran, Justin Marshall, Danielle Wilde

Much technology is designed to help people enact processes faster and more precisely. Yet, these advantages can come at the cost of other, perhaps less tangible, values. In this workshop we aim to articulate values associated with handmade through a co-creative exploration in the food domain. Our objective is to explore the potential of integrating such values into future food-related technologies. In a full day workshop we will: critically reflect on the notion of handmade; engage actively with food - production, plating and consumption - as design material; and conduct collective discussions around the values that these processes and materials can embody when attended to through lenses other than efficiency. By handmaking: touching, smelling, tasting, listening, speaking and enacting choreographies with the materials at hand, we hope to deepen the discussion of the meaning associated with the handmade and bring a richness to ways that designers imagine future food-related technologies.

Designing for Effective Interactions with Data in the Internet of Things

Annika Wolff, Ahmed Seffah, Gerd Kortuem, Janet van der Linden

The Internet of Things (IoT), a type of cyber-physical system, has led to a drastic growth in the number of devices and sensors connected to each other and to the digital world. This has further led to an exponential increase in the amount of data being produced and disseminated throughout such systems. These data has the potential to provide valuable insights into user behavior that can inform a design process. It also comprises an important aspect of an IoT product or service that an end user might interact to gain actionable insights. For example, when to use energy in the home, how to avoid polluted or flooded areas, or to visit the shops at quiet times. These same users may also be one source of the data that is analysed to provide this intelligence. However, in many case more intelligence is gained by combining different data sets. This raises questions about how to help both designers and end-users to get the

most value from the insights acquired through the combination and analysis of IoT data, whilst being sensitive to issues around privacy and security of data contributed by the public. There is currently no clear framework to support designers in navigating through a design process that uses and combines such complex data. The aim of this one day workshop is to explore how to effectively incorporate data into a design process and how to design for more effective interactions between humans and data within IoT technologies. It will also create a roadmap for development of new methods and tools to support responsible, data-driven, co-design of new IoT interactive products and services.

10 JUNE DOCTORAL CONSORTIUM

Complex Intentions: A Methodology for Contemporary Design Practice

Jesse Josua Benjamin

Freie Universität Berlin

In this interdisciplinary research project, I aim to combine philosophy of technology and computer science in order to develop a design methodology for algorithm awareness. The latter has become an emergent field of research due to the increasing influence of automated processes on everyday life. In this abstract, I show how current research is not yet exhaustive and that existing design theories fall short of accounting for the sociotechnical complexities that are at work in complex adaptive systems. Outlining my research apparatus, I illustrate how I will analyze specific case studies and apply results in use cases.

Older Adults Designing Avatars for Socializing

Romina Carrasco

School of Computing and Information Systems, The University of Melbourne

In this research I investigate the design and use of virtual avatars (full body representations of the user) among older adults over 65 years old. This research seeks to understand the avatar's designs made by older adults in relation to the ageing body; and how the use

of these self-representations impact older adults' experience when socializing online. This thesis firstly uses an exploratory approach to understand the current use of online self-representations among older adults, then design workshops to comprehend older adults' visual choices in relation to the design of humanoid avatars and finally a long-term user study where participants use and reiterate avatar designs through multiple virtual reality social sessions. This research will contribute to the understanding of how older adults use self-representations to connect with others in online environments while providing insights of how to expand character creation interfaces to cater visual preferences of those in older age.

Behavior Change Theory and Design: Translational Science Steps and Gaps

Lucas Colusso

University of Washington

Translational Science is the study of the process to turn scientific findings into practical applications. Due to technological and methodological advances, there has been an increase in scientific knowledge output, as well as an expectation by industry, governments, and the public that scientific knowledge should be 'useful.' These aspects could challenge common modes of knowledge dissemination. In my dissertation work, I investigate knowledge dissemination strategies of design-related communities, exploring the complex relationships between inquiry and design. I also design interventions to facilitate dissemination, focusing on the application of behavior change theories into the design.

Trust and Community Engagement in Digital Civics: Exploring Opportunities for Design

Eric Corbett

Georgia Institute of Technology

The work of community engagement performed by public officials in local government provides valuable opportunities for city residents to participate in governance. Technology stands to play an increasingly important role in mediating community engagement;

however, currently the practices and relationships that constitute community engagement are understudied in HCI. Of particular importance is the role trust - either establishing trust, or more frequently, overcoming distrust between public officials and city residents. To address this challenge, my research seeks to understand how trust could inform the design of technology to support the work of community engagement performed by public officials in local government. My research will culminate in a design framework that will inform development of technology for community engagement using trust.

Design, Maintenance, and the Menstruating Body

Sarah Fox

University of Washington

In this submission, I discuss my research on the maintenance of public restrooms and, more specifically, the distribution and stratification of menstrual resources throughout the city of Seattle. Through interviews, technology development, and field engagements, I show how digital artifacts - such as those connected to the Internet of Things - structure experiences of hygiene access and help expose the socioeconomic logics undergirding infrastructures of public life. I use design interventions to further examine the role of technology to cultivate and maintain collective responsibility and forms of participatory infrastructure.

Collaborative Design of Health Educational Materials on Anxiety to Increase Mental Health Literacy

Lutza Ireland

Queensland University of Technology

Conceptualising mental health literacy as a wicked problem, the project uses visual and interaction design principles and evidence based mental health information to develop a health communication resource on anxiety for multiple stakeholders (young people, their loved ones and mental health professionals). This project is a design response to the challenges of providing visual and interactive representations of anxiety and its invisible and abstract processes,

aiming to provide novel ways of engaging with information by designing a new visual language with a shared frame of reference for education and empathy building. To aid the relevance, acceptability and feasibility of resources, the project focuses on using holistic approaches through synthesising and testing a novel, unifying design framework and using collaborative design elements with multiple target audiences. The design outcome will be evaluated from both a design and health perspective.

Rapid Smart Environment Prototyping for Early Conceptual Design

Han-Jong Kim

KAIST

Smart environments involving various IoT devices and people in large spaces have become popular yet challenging subject matters of design. Prototyping smart environments reflecting user experiences is expensive and time consuming. Few methods and tools have been investigated to address the needs of the iterative rapid prototyping of the design subjects involving complex interactions in the early design phases. This doctoral research involves investigating methods and tools for rapid smart environment prototyping in the early phase of a design process. Experimental prototyping systems based on conceptual frameworks for dealing with people's interactions in smart environments are proposed and evaluated with professionals in the design field. This research will add to the knowledge on prototyping tools and methods and contributes to the professional practice of designing inter-connected systems for multiple users in space.

Multiscale Curation: Supporting Collaborative Design and Ideation

Nic Lupfer

Texas A&M University

Design is difficult to learn. Novice designers often suffer from many challenges. This research focuses on addressing these challenges by transforming the ways in which designers collect, organize, and archive their design artifacts. This research proposes collaborative multiscale design curation which uses scale to organize and relate

design artifacts to support creativity. Multiscale design curation will be investigated in a variety of university courses through an iterative, participatory research through design approach.

Connecting Couture: Engaging With the Crafted Textile Interface in an Internet of Things Ecology

Caroline McMillan

Royal Melbourne Institute of Technology

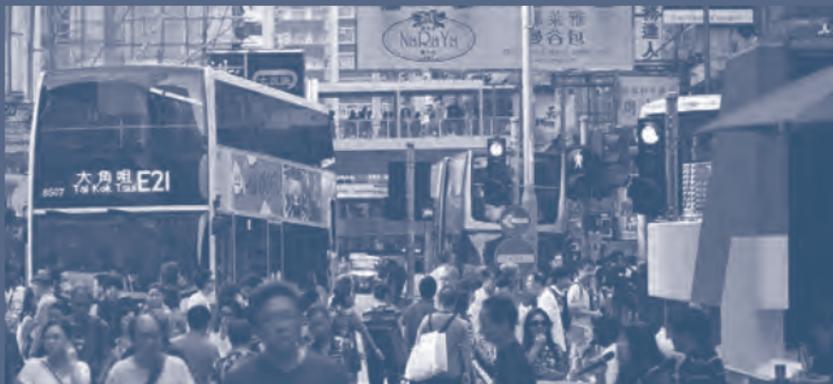
Many smart clothing concepts are appearing in research and industry, encompassing disparate disciplines, inhabiting many forms. However, few situated in the Internet of Things (IoT) ecology. Moreover, adding wireless data processing capability can extend their functionality. Highly stylized, speculative, wearable technology (wearables) garments with technologically augmented function (c.f. [1]) have been difficult to place into a broader social context as fashion.

Hybrid Aesthetics: Design of New Media Practices within Digital Fabrication

Cesar Torres

University of California, Berkeley

Practices are emerging which blend both physical and computational techniques and materials. This thesis contributes a framework for understanding how to compose these hybrid elements into rich, reflective new media practices that expand the aesthetic repertoire and facilitate the adoption, sharing, and teaching of hybrid techniques.



13/F
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EXPERIENCE NIGHT 11 JUNE

- 28 MINI DESIGN EXHIBITION
- 29 PROVOCATIONS and WORK-IN-PROGRESS
- 57 DEMOS

EXPERIENCE NIGHT 11 JUNE 18-20:00

DIS 2018 Experience Night brings together Provocations and Work-in-Progress, Demos, and a small Design Exhibition. Experience night has 14 Demonstrations, 50 Provocations and works-in-progress, and five design works that reflect current interests in interaction design in Hong Kong. The night will offer DIS 2018 a cornucopia of ideas from artists, designers and scientists.

The Night is curated by Michael Fox, who teaches free form classes to interaction design students in Los Angeles and Hong Kong. He is the principal of FoxLin, which practises architecture from its base in Los Angeles to create contemporary, sustainable and interactive spaces are that able to customize themselves in response to human stimuli.

We hope the participants of the conference enjoy experiencing interactive work that is intriguing, beautiful, explorative, provocative and also counter-punctual amidst all of its discords.

13/F
JCIT

V1310 INNOVATION THINK TANK

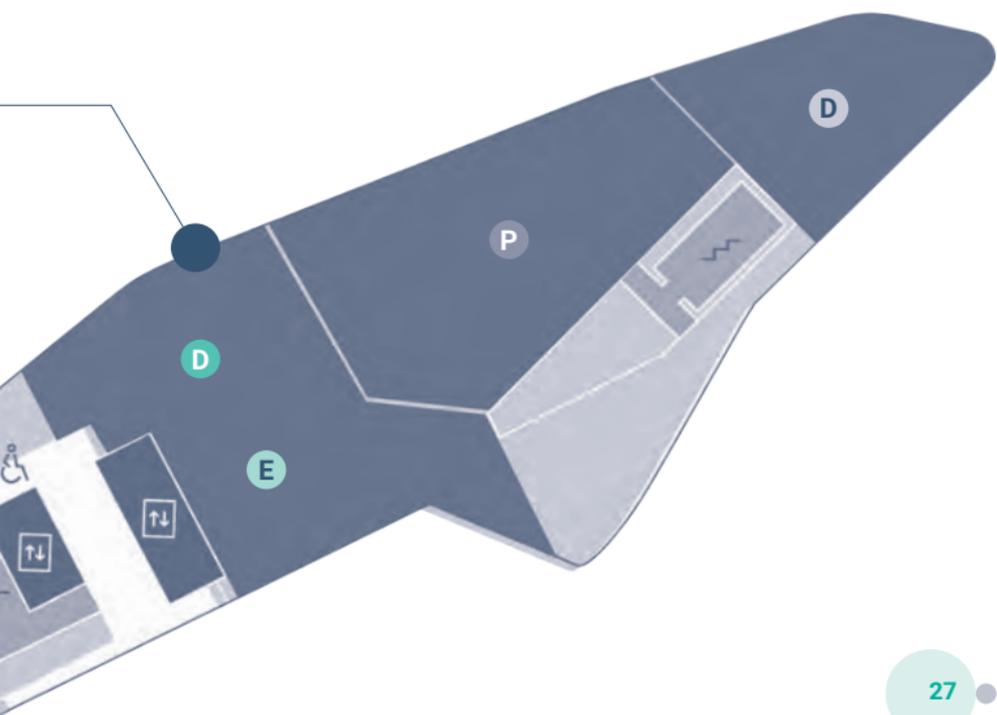
- P** PROVOCATIONS + WORK-in-PROGRESS
- D** DEMOS
- E** MINI DESIGN EXHIBITION
- D** DRINKS & REFRESHMENT

A MYSTERY TALK



Tom Igoe

We are pleased to open the night with a keynote by Tom Igoe, who drifted from theater to design, and teaches physical computing at the highly respected Interactive Television Program of New York University's Tisch School of the Arts. He gives us a Mystery Talk which, we presume, has something to do with physical computing. Tom has written four highly regarded books, *Making Things Talk*, *Physical Computing* (with Dan O'Sullivan), *Beginning NFC* (with Dan Coleman and Brian Jepson), and *Getting Started with RFID*. He is a co-founder of Arduino. He also works with monkeys.



MINI DESIGN EXHIBITION

MORSCOPE BY PHENOMENA

Morse code + Scope: A device which uses water as medium for inputting Morse code. This was the Excellent Award winner of Interactive Art, Asia Digital Art Award Fukuoka 2014, Japan.

Phenomena is a design innovation firm that specializes in concept, design and integration of digital and tangible things. It explores technological possibilities and user experiences that can be brought to life using emerging technologies. Its speciality is interaction with water

AR LIGHT BY



VISIONARIES

AR Light is an Augmented Reality control for Lighting that works with any connected device.

Visionaries 777 engineer, build and deploy pioneering interactive software tools: empowering brands to reach, submerge and engage people globally through emerging technologies.

HONG KONG BEYOND VISION BY



Hong Kong Beyond Vision is a series of Tactile-Audio Interaction System art pieces that features Hong Kong's iconic landmarks, visual cultural elements and authentic objects. The system can enhance mental image-building process and provide multidimensional perspectives of art works for those with compromised vision.

Beyond Vision Projects is a social enterprise that strives to enhance the quality of life of visually impaired and elderly people with low vision. Its tactile and audio interaction systems help these groups to access visual content like art.

RESONATING BODY

BY Wagi

Kulasumpankosol,
Tim Tang,
Dustin Stupp and
Ritesh Sharma

Resonating Body is an interactive installation in the Jockey Club Innovation Tower at the Hong Kong Polytechnic University. It invites people to play and create melodies on a larger-than-life string instrument. It fosters collaboration and discovery and turns the visitors into co-visitors: will create an acoustic space, which sparks interpersonal interaction.



PolyU Design

MDes Interaction Design students,

School of Design, HK PolyU, March-April 2018.

Supervised by Prof. Michael Fox.

PROVOCATIONS and WORK-in-PROGRESS (PWIP)

Visualising the landscape of Human-Food Interaction research

Ferran Altarriba Bertran, Samvid Jhaveri, Rosa Lutz, Katherine Isbister, Danielle Wilde

While conducting a review of food-related technology research, we discovered that activity in this area is skyrocketing across a broad range of disciplinary interests and concerns. The dynamic and heterogeneous nature of the research presents a challenge to scholars wishing to critically engage with prior work, identify gaps and ensure impact. In response to this challenge, we are developing an online visualisation tool: an app that affords diffractive reading of the literature, mapping interferences and differences from varied perspectives. We present our first iteration of the app, which enables scholars to navigate the literature through seven lenses - focus, agency, domain, date of publication, author keywords, and publication venue and type. Here we present the first iteration of the app, toward receiving critical input from concerned researchers, to validate our approach and ensure relevance moving forward.

*Contribution
statement*

A customizable and personalized spatial memory training application for improving users' functional autonomy in China.

SilverCycling: Evaluating Persuasive Strategies to Promote Physical Activity among Older Adults

Maximilian Altmeyer, Seyedmostafa Hosseini, Pascal Lessel, Antonio Krueger

We present “SilverCycling”, a system consisting of an augmented portable bike and a persuasive see-through mirror aimed at encouraging older adults to be physically active. We evaluated the perceived persuasiveness of seven commonly used persuasive strategies (N=9) within SilverCycling in order to elicit the most relevant ones for a field test in future work. We found that social strategies are preferred over non-social ones and that strategies using extrinsic motivators like virtual rewards should be avoided.

Contribution statement | *This paper aims to provoke critical discussion on topics of IoT and agency of things. We explore reciprocal interplay through considering the perceptive qualities of perceptual crossing to our design.*

transFORM - A Cyber-Physical Environment Increasing Social Interaction and Place Attachment in Underused, Public Spaces

Carlos Henrique Araujo de Aguiar, Keith Green

The emergence of social networks and apps has reduced the importance of physical space as a locus for social interaction. In response, we introduce transFORM, a cyber-physical environment installed in under-used, outdoor, public spaces. transFORM embodies our understanding of how a responsive, cyber-physical architecture can augment social relationship and increase place attachment. In this paper we critically examine the social interaction problem in the context of our increasingly digital society, present our ambition, and introduce our prototype which we will iteratively design and test. Cyber-physical interventions at large scale in public spaces are an inevitable future, and this paper serves to establish the fundamental terms of this frontier.

Contribution statement | *This paper establishes fundamental terms to designing inevitable cyber-physical interventions in public spaces. used by different generations living centuries*

A Virtual Environment Gesture Interaction System for People with Dementia

Alexander Bejan, Markus Wieland, Patrizia Murko, Christophe Kunze

As dementia will most likely become an impactful challenge for our future society, it is imperative to maintain the well-being of the diverse group of people with dementia (PwD). Thus, appropriate interventions that effectively trigger identity-stabilizing memories, and at the same time encourage sensorimotor activities, have to be designed and implemented. To that end, we present a novel natural user interface (NUI) system combined with a reminiscence-provoking virtual 3D environment (VE). With it, PwD can delve into memories while interacting with the VE over dementia-fitted gestures. The results of the preliminary evaluations are promising, as they show that most PwD get immersed and cheerfully engage in gesture interactions after a short settling-in period.

Contribution statement | A key contribution is a “pattern language” for this interaction ecology of people, machine, place, and community, serving as a design exemplar of large-scale outdoor HCI.

Investigating the Effects of Legacy Bias: User Elicited Gestures from the End Users Perspective

Ceylan Beşevli, Oğuz Turan Buruk, Merve Erkaya, Oguzhan Ozcan

User elicitation studies are commonly used for designing gestures by putting the users in the designers’ seat. One of the most encountered phenomenon during these studies is legacy bias. It refers to users’ tendency to transfer gestures from the existing technologies to their designs. The literature presents varying views on the topic; some studies asserted that legacy bias should be diminished, whereas other stated that it should be preserved. Yet, to the best of our knowledge, none of the elicitation studies tested their designs with the end users. In our study, 36 participants compared two gesture sets with and without legacy. Initial findings showed that legacy gesture set had higher scores. However, the interviews uncovered that some non-legacy gestures were also favored due to their practicality and

affordances. We contribute to the legacy bias literature by providing new insights from the end users' perspective.

Contribution statement | *An exploration to investigate the need for personalization of movement-based interactions, based on each individual's skills and characteristics in the context of Yoga.*

Towards Multisensory Storming

Maurizio Caon, Leonardo Angelini, Omar ABOU KHALED, Elena Mugellini, Assunta Matassa

Current digital system interfaces are mainly based on vision and hearing. HCI practitioners and researchers need to introduce unconventional senses in interaction design in order to avoid sensory deprivation in digital life and enhance information accessibility. In this paper, we present a novel technique, called Multisensory Storming, which aims at supporting the multisensory interaction design process. Multisensory Storming is a group method enabling the generation of new ideas and design proposals in physical contexts through exercises that allow exploring all the human senses.

Contribution statement | *The provocation contributes an approach to the interaction design of conversational interfaces. It aims to provoke conversations about how design is approached and how experiences are measured.*

Designing Systems in the Digital Immortality Era

Maurizio Caon

Society is undergoing a relentless digital transformation process. This process is creating a digital copy of every entity present in the physical world and these digital goods will be inherited through centuries establishing a direct link between distant generations. Advances in artificial intelligence make the promise for future whole brain emulation enabling the possibility of uploading the human mind on a digital system. This would enable the possibility of interacting with immortal digital clones of deceased people. This paper wants

to start investigating the consequences of the emergence of the concept of digital immortality.

Contribution statement | *Our data visualisation tool enables scholars to navigate literature in the field of Human-Food Interaction through seven lenses - focus, agency, domain, date of publication, author keywords, and publication venue and type.*

Designing Conversational Interfaces to Reduce Dissonance

Meira Chefitz, Nigel Melville, Jesse Austin-Breneman

Conversational interfaces - computer interfaces that use text or voice for human-computer interaction - are one of many interaction modalities in interactive systems. Their use has expanded with the growth and range of products that are both digital and physical in nature. But users' expectations of conversational experiences are not being met. In addition, expectations may not be met in different ways across people. This paper aims to provoke dialogue among design researchers and practitioners regarding the design of an interaction modality that is commonly found in human-to-human interaction. It focuses on the design of conversational interfaces such as virtual assistants to illustrate the quandary. Finally, the paper proposes a phenomenon for the issue - a type of dissonance - and introduces tactics to reduce dissonance. It sheds light on potential approaches to design as well as complications that may occur.

Contribution statement | *This contribution describes the design, implementation and evaluation of a novel virtual environment reminiscence therapy gesture interaction system (RT-GIS) that aims to promote the well-being of people with dementia.*

Once Upon a Future: An Audio Drama Game for Episodic Imagination

Yu-Ting Cheng, Wenn Chieh (Joe) Tsai, David Chung, Rung-Huei Liang

Envisioning the future in a multidisciplinary collaboration continues to be a challenge. This paper presents a tool for engineers and designers to envision applications of emerging technologies. Drawing on the

"suspension of disbelief" in audio drama and episodic memory theory about creativity, we build a four-act board game for creative narration. Participants are guided to enact future application scenarios by using playing cards along with theme music and sound effects. To test the tool, we conducted three workshops to discuss the distinct advantages and challenges of this approach.

Contribution statement

This paper offers a prototype of a digitally enhanced ball run supporting therapy for children with CVI. Design features were identified during a participatory design approach.

Dark Intentions or Persuasion? UX Designers' Activation of Stakeholder and User Values

Shruthi Chivukula, Jason Brier, Colin Gray

Formalized frameworks that reference ethics and values have received increasing attention in the HCI community. These methods emphasize the importance of values in relation to design but provide little guidance to reveal the values that are present or have impact on designers' decision making. In this work-in-progress, we identify the values considered by student UX designers when conducting an authentic design task, allowing for interrogation of the possible intentions that underlie their decision making. Our exploratory analysis revealed that participants had sensitivity towards user values, but often contradicted these values through dark, often tacit, intentions to persuade users, thereby achieving stakeholder goals. We provide provocations for future research on the role of ethics and values in practice and design education.

Contribution statement

We study how play-based interactive systems based on contingent feedback can fulfil therapeutic needs of non-verbal neurodevelopmental disorders children and their therapists, relating to therapy outcomes, engagement, and behavior modification.

Explorations on Reciprocal Interplay in Things Ecology

David Chung, Mathias Funk, Rung-Huei Liang, Lin-Lin Chen

There is growing interest in designing smart things that are both connected (IoT) and also acting local. Yet, the explorative behaviors of such smart things in the context of a connected ecology are not much explored. This study explores perceptive qualities of reciprocal interplay from a perspective of systemic relations. We conducted the HiddenLocal workshop with the outcome of four designed IoT systems which emphasize the complexity of things-to-things interaction in different scenarios. This paper reports on one of the four systems and investigates how reciprocal interplay can be designed in the things community of our designed system.

Contribution statement | *The research proposes implementing blockchain as location-based sensing and collocation devices to extend the use of these devices as social lubricant as well as the proposed networking amenities.*

Pick, Place, And Follow: A Ball Run for Visually Impaired Children

Peter Fikar, Florian Güldenpfennig, Roman Ganhoer

Conventional ball runs are usually made from wood and used with marbles. Their easy handling and comprehensible principle of action and reaction - a marble placed into it will run down the slope - make them a popular therapeutic toy among occupational therapists and related professionals when exercising with impaired children. However, traditional ball runs are often too fast paced and not perceivable for children with low vision, making it impossible to fixate the moving ball with their eyes. We created a virtual ball run with tangible elements to extend it with properties only the digital can afford, for example, magnification of the marbles or change of color or physical behavior of the ball run in order to support visually impaired children in tracking them with their eyes. We report how we conceived the concept in a participatory design process involving four therapists, three children with visual impairment, and one ophthalmologist.

Contribution statement | *We demonstrate an online audio game editor which was conceived to create audio games and to build a community of audio game designers.*

IdleBot: Exploring the Design of Serendipitous Artifacts

Caroline Overgoor, Mathias Funk

We are increasingly surrounded by interactive, connected and engaging “things” that demand attention and convey a sense of continuous pace into our personal spaces. In this work, we explore how things could be designed from this opposite perspective: seemingly aware, but non-engaging. IdleBot is a very furry robotic puppet that is waiting. Unlike many applications in social robotics, IdleBot has neither clear purpose, nor explicit functionality - it merely exists and waits. The subtleness of its interaction, consisting of mostly idle motion, is the starting point to investigate forms of interaction bordering non-interaction situated in a personal context. Using data about human waiting behavior from an observational study, we designed a fully working prototype in two design iterations that embodies different modes of waiting and evaluated this design for its effect and acceptance of idle motions in context.

Contribution statement | *We propose incorporating iterative modifications to existing occupational therapy devices in community centers to benefit both users and practitioners in providing feedback and engagement.*

Exploring Dynamic Expressions on Soft Wearables for Physical Exercises

Çağlar Genç, Merve Erkaya, Fuat Balci, Oguzhan Ozcan

Recent design approaches of wearables for physical exercising are often alienating the data from its specific experiences and/or limited to conventional display modalities for presenting information. As an alternative perspective, the aim of this paper is to explore in-situ social and individual experiences that activity related dynamic changes on garment surfaces might evoke in the context of

exercising at the gyms. To investigate these, we conducted a design workshop (N=11, 3 gymgoers, 5 interaction and 3 fashion designers). Our results provide design insights for further research on how dynamic expression could alter (1) wearer's sense of achievement via solidifying unobservable efforts & achievements and could (2) trigger social interactions.

Contribution statement | *This paper describes a timeline tool for historians exploring digitised historical text collections. An evaluation with historians raised design issues for the value of simple, minimal design in this domain.*

Can Interactive Systems Be Designed for Conviviality? A Case Study **Marc Choueiri, Schuyler Duffy, Sanjay Guria, Conrad McCarthy, Pehuen Moure, Anagha Todalbagi, Yixiao Wang, Carlos Henrique Araujo de Aguiar, Keith Evan Green**

Can interactive systems be designed for conviviality? A response in the affirmative comes in the form of two convivial tools, Helping Hand and Tilting Table, that empower individuals suffering limitations in reaching and dexterity. Our interdisciplinary team developed Helping Hand and Tilting Table as analogues to a home builder's power tools, but here advanced by mechatronics and transported to home and workplace. This paper presents the two tools in the context of routine, domestic and working tasks, speaks to their design and basic behaviors, and offers an overview of their formative user evaluation involving older adults as part of an iterative, human-centered design process. Helping Hand and Tilting Table serve as design exemplars of enabling technologies targeting people with limitations in performing everyday tasks. But more broadly, striving for conviviality is what this paper hopes to encourage in designers.

Contribution statement | *This paper introduces the Multisensory Storming: a group technique aiming at supporting the creative process for the design of multimodal interfaces.*

WiredRadio: A Study of Living with Radio Awareness

Erik Grönvall

This paper reports on early field explorations with WiredRadio. WiredRadio is a device that intercepts 2.4GHz radio activity and based on the received data signal strength activates a motor with a string attached to it. Similar to the classical “dangling sting” installation by Jeremijenko, the more wireless network traffic there is, the more will the string move. The paper discuss insights derived from a field deployment where WiredRadio was installed in a family house for three weeks. The insights deals with the family's perception and understanding of WiredRadio, their relationship with WiredRadio as an artifact and ambient display and how WiredRadio influence their understanding of wireless data traffic and what it may represent.

Contribution statement | *This paper contributes with design considerations for tools leveraging on reminiscence to facilitate co-located social interactions in residential care facilities.*

Visualization Tool for Environmental Sensing and Public Health Data

Yen-Chia Hsu, Jennifer Cross, Paul Dille, Illah Nourbakhsh, Leann Leiter, Ryan Grode

To assist residents affected by oil and gas development, public health professionals in a non-profit organization have collected community data, including symptoms, air quality, and personal stories. However, the organization was unable to aggregate and visualize these data computationally. We present the Environmental Health Channel, an interactive web-based tool for visualizing environmental sensing and public health data. This tool enables discussing and disseminating scientific evidence to reveal local environmental and health impacts of industrial activities.

Contribution statement | *IdleBot addresses our relationship with things and exhibits interaction styles that could de-escalate, defuse or calm stressful situations, create presence in lonely spaces, or engage bystanders.*

MemoryPin: Turning Digitally Co-Present Moments into Tangible Memory Keepsakes

Dianya Hua, Huaxin Wei, Eli Blevis

MemoryPin is a digital keepsake device that - like a photo album - provides tangible access to memories formed during online social interactions. By tangible, we mean that we designed these keepsake physical forms to afford distinctive storage and interactivity for selected digital memories created during an individual's everyday social media experience with others. Through a series of iterative design inquiries, we explored new forms and possibilities for digital-content-bearing artifacts and built our initial prototype in this work in progress.

Contribution statement | A case study presenting four design nuances for Colorado's refugee and immigrant community stemming from student and resource-constrained organization user-centered design collaboration.

Designing for Co-located and Virtual Social Interactions in Residential Care

Francisco Ibarra, Marcos Baez, Francesca Fiore, Fabio Casati

In this paper we explore the feasibility and design challenges in supporting co-located and virtual social interactions in residential care by building on the practice of reminiscence. Motivated by the challenges of social interaction in this context, we first explore the feasibility of a reminiscence-based social interaction tool designed to stimulate conversation in residential care with different stakeholders. Then, we explore the design challenges in supporting an assisting role in co-located reminiscence sessions, by running pilot studies with a technology probe. Our findings point to the feasibility of the tool and the willingness of stakeholders to contribute in the process, although with some skepticism about virtual interactions. The reminiscence sessions showed that compromises are needed when designing for both story collection and conversation stimulation, evidencing specific design areas where further exploration is needed.

Contribution statement

In this provocation, we aim to show that body inspired design techniques can be used to inspire the development process of advanced functional knitting technologies.

Design Challenges for Reconnecting in Later Life: A Qualitative Study **Francisco Ibarra, Grzegorz Kowalik, Marcos Baez, Radoslaw Nielek, Norma Lau, Luca Cernuzzi, Fabio Casati**

Friendships and social interactions are renown contributors to wellbeing. As such, keeping a healthy amount of relationships becomes very important as people age and the size of their social network tends to decrease. In this paper, we take a step back and explore reconnection - find out about or re-contact old friends, an emerging topic due to the increased use of computer-mediated technology by older adults to maintain friendships and form new ones. We report on our findings from semi-structured interviews with 28 individuals from Costa Rica and Poland. The interviews aimed to explore whether there is a wish to reconnect, and the challenges encountered by older adults to reconnect. We contribute with design considerations for tools allowing older adults to reconnect, discussing opportunities for technology.

Contribution statement

Results provide design insights for further research on how dynamic expression could alter (1) wearer's sense of achievement via solidifying unobservable efforts & achievements and could (2) trigger social interactions.

Exploring Augmented Reality Approaches to Real-Time Captioning: A Preliminary Autoethnographic Study **Dhruv Jain, Bonnie Chinh, Leah Findlater, Raja Kushalnagar, Jon Froehlich**

We explore an augmented reality (AR) approach to real-time captioning for people who are deaf and hard of hearing. In contrast to traditional captioning, which uses an external, fixed display (e.g., laptop or large screen), our approach allows users to manipulate the shape, number and placement of captions in 3D space. We discuss

design factors, describe two early prototypes, and report on an autoethnographic evaluation of the prototypes. Preliminary findings suggest that, compared to traditional laptop-based captions, HMD captioning may increase glanceability, improve visual contact with speakers, and support access to other visual information (e.g. slides).

Contribution statement | *We address limitations in feminine hygiene products with two exploratory prototypes using common digital fabrication techniques, which contribute to conversations regarding culturally taboo subjects in HCI and design.*

Walkers' Union: Designing New Urban Walking Rituals with Blockchain

Guowei Jiang, Elisa Giaccardi, Armagan Albayrak

This paper describes a blockchain-enabled system aimed to facilitate urban walking as a lifestyle choice. This work-in-progress is based on an provisional classification of blockchain's social affordances into four core features. These features are used as design materials to enable 'walking contracts' between humans and non-humans as triggers for urban walking.

Contribution statement | *This paper tries to explore the ways that a cognitively playful experience could occur without any direct physical, sensory and social interaction.*

Exploring the Knowledge Creation Practices of UX Designers on Stack Exchange

Yubo Kou, Colin Gray

The contours of user experience (UX) design practice have been developed by a diverse array of practitioners and academics in an array of disciplinary traditions, leaving UX without a coherent and agreed upon body of disciplinary knowledge or a concrete path to become a professional. Consequently, UX designers rely upon online knowledge resources to develop and maintain their competence. In this work-in-progress, we conducted an exploratory investigation

of question and answer (Q&A) communication within the UX Stack Exchange community, analyzing the topics that UX designers have raised in questions and answers. Our preliminary analysis contributes a typology of knowledge needs that were articulated by UX designers as a support for their practice. Drawing on prior work, we discuss three distinctive characteristics of UX knowledge desired by designers.

Contribution statement

This paper examines the disjunct between maker discourse and practice, and discusses how the movement's inclusive rhetoric both masks mechanisms of exclusion for female makers, and may even exacerbate them.

Artifact Mixtape: Curating Music in Personal Tangible Artifacts Daye Kwon, Woohun Lee

The transition from physical to digital and cloud media has enabled more personalized music appreciation. However, it is questionable whether the current media adequately supports music's role in constructing self-identity. To investigate this issue, we conducted exploratory interviews, from which we derived that today's digital music service can discourage listeners from exploring, expressing, and reflecting on themselves with music. We presumed that inducing people to curate the music in personal tangible artifacts can resolve the issue, which is why we devised the concept of Artifact Mixtape. We introduced the design and usage of the system and added our hypotheses about how it will contribute to establishing self-identity with music.

Contribution statement

The value of verbal design as a tool for engaging illiterate community in different forms such as narrative scoping using persona and invisible design has been verified in this paper.

Exploring Cognitive Playfulness Through Zero Interactions

Chang Hee Lee, Dan Lockton

Many emerging technologies, products and services today try to use diverse methods of interaction to provide playful experiences. Increasingly more interactive features and techniques are being introduced to afford users new experiences and enrich our living environment. While many of these playful experiences can be achieved through various types of physical, sensory and social interactions, this paper attempts to focus on how 'no-interaction' can achieve playfulness in relation to our cognitive experience. If there is a way to give someone a playful experience without any physical, sensory and social interactions, where and how can we apply this approach or phenomenon? Here we share a provocation that tries to demonstrate a tangible means whereby such an idea could be used to explore potential user experiences within HCI.

Contribution statement | *This practice-led research investigates the topics discussed in UX designers' Q&A communication on Stack Exchange to contribute to better understandings of what constitutes UX knowledge from the practitioner's perspective.*

An Artistic Provocation to Explore Effects and Opportunities of Virtual Surreal Spaces

Hyelip Lee, Myung Jin Kim, Byungjoo Lee, Andrea Bianchi

The concept of surreal virtual space is used in this paper to describe a space which looks realistic but is impossible to exist in reality. For this project, we developed a 3D virtual space using Google Cardboard and an Android mobile device. Referring to the 2D drawing, "Relativity," of M.C. Escher, the virtual space was designed to have multi-directional but connected stairs. This work was exhibited with other artworks at a gallery for a period of three weeks. Despite some minor sensory confusion, all audiences experienced a degree of place illusion, enjoyment and a sense of self-awareness even though the virtual environment did not provide a visual representation of the audience's own body. For future work, we plan to investigate the

advantages of these effects and apply them to everyday non-virtual environments.

Contribution statement | *We provide provocations for future research on the role of ethics and values in practice and design education.*

Using Experiential-Learning and Iterative Design to Benefit Colorado's Refugees

Jennifer Lee, Lexi Schwartz, Emily Long, Mustafa Naseem

Rising trends of immigration and refugee resettlement is a global concern with reliance on local solutions. To support this population's needs, organizations such as the city of Aurora's Village Exchange Center work to build community and resettle new arrivals in Colorado. This paper presents design nuances for creating a digital information and communication technology (ICT) tool for Village Exchange Center's Natural Helpers program. Human-centered design methodologies were used to develop a digital resource guide based off of a previous paper incarnation. Four unique needs arose from our process: (1) a need for community feedback, (2) flexible service categorization, (3) password lapse considerations, and (4) the need or location context. We also discuss potential benefits of collaboration between students and low-resource organizations. Designing for refugees, immigrants, or similar populations with these considerations can improve users' experience and overall ICT utility.

Contribution statement | *This paper contributes the design of a novel interactive system for curating music collections.*

Neither One is Enough: Exploring the Use of Wrist-worn Activity Trackers to Assist Acute Psychiatric Healthcare

Ya-Fang Lin, Yi-Ju Chung, Chuang-Wen You, Yaliang Chuang, Bo-Fu Liu, Huming Chang, Ming-Chyi Huang

In this study, we conducted a field study involving patients and healthcare workers in an acute psychiatric unit with the aim of identifying the reasons for inconsistencies among measurements

of sleep/awake patterns, the observations of nurses, and the reports of patients. After identifying the reasons for the inconsistencies, we designed an interactive caring system that merges multiple data sources to present a unified view of sleep/awake patterns. In so doing, we were able to leverage observations from nurses and the reports of patients to resolve prior inconsistencies.

Contribution statement | *Bod-IDE is an augmented reality sandbox that allows eFashion designers to experiment with virtual interactive wearables and explore alternate behaviors that arise from on-the-body prototyping.*

Designing Social Playware Mediated Communication with Contingent Feedback Devices

Joana Lobo, Kenji Suzuki

A majority of children with neurodevelopmental disorders struggle to acquire communication and social skills. Different types of therapies apply methodologies to encourage social interaction, speech, and vocalizations for these children; however, these methods are not sufficiently engaging or are not used with the necessary frequency. In this paper, we propose playful experience-based solutions to empower therapies for children with neurodevelopmental disorders using social playware technology. We designed two devices that deliver contingent feedback in accordance with applied behavior analysis and speech therapies for encouraging and monitoring the growth of a child's communication skills. Under a therapeutic support tool scenario to be applied at home or during after-school activities, we discuss the design of the devices and the potential for interactive therapy.

Contribution statement | *An interactive web-based data visualization tool that enables discussing and disseminating scientific evidence to reveal local environmental and health impacts of industrial activities.*

Country Road Finder: Exploring Beauty when Driving Around

Satomi Manzaki, Ayame Kano, Narihiro Haneda, Chihiro Sato, Naohito Okude

Driving around a countryside destination and finding the scenic beauty is an intriguing exposure for metropolitans. Our route planner Country Road Finder proposes a lodge, a farm, and the connecting route, for farm-staying to show initiation of the area's local culture and practice. Our algorithm calculates country-road scores for a pleasant driving around experience, combining destination recommendation system and route navigation system. This research shows the routes in 3 peripheral areas near Tokyo, and discusses findings from initial user studies with metropolitan visitors about the drivers' view and experience.

Contribution statement | *Identifying reasons for the inconsistencies among measurements of sleep/awake patterns, the observations of nurses, and the reports of patients and designing an interactive caring system that merges multiple data sources.*

What's It Mean to "Be Social" in VR?: Mapping the Social VR Design Ecology

Joshua McVeigh-Schultz, Elena Márquez Segura, Nick Merrill, Katherine Isbister

The emerging ecology of commercial social VR currently includes a diverse set of applications and competing models of what it means to be social in VR. This study maps a slice of this ecology, comparing and contrasting ways different applications frame, support, shape, or constrain social interaction. We deploy a method of design-oriented autobiographical landscape research to examine five platforms: Facebook Spaces, Rec Room, High Fidelity, VRChat, and AltspaceVR. We analyze design choices underlying these environments and draw attention to issues of space and place, locomotion, and social mechanics. Drawing on this analysis, we identify key issues and concerns for future research and design in social VR.

Placing Music in Space: A Study on Music Appreciation with Spatial Mapping

Shoki Miyagawa, Yuki Koyama, Jun Kato, Masataka Goto, Shigeo Morishima

We investigate the potential of music appreciation using spatial mapping techniques, which allow us to “place” audio sources in various locations within a physical space. We consider possible ways of this new appreciation style and list some design variables, such as how to define coordinate systems, how to show visually, and how to place the sound sources. We conducted an exploratory user study to examine how these design variables affect users’ music listening experiences. Based on our findings from the study, we discuss how we should develop systems that incorporate these design variables for music appreciation in the future.

Contribution | We evaluated the perceived persuasiveness of seven commonly used persuasive strategies (N=9) among older adults to promote physical activity.

Hacking Occupational Therapy Tools for Center-based Care

Thi Ngoc Tram Nguyen, Shienny Karwita, Liangkun Yan, Yong Jie Sim

Community center-based occupational therapists (OTs) working with a large number of patients daily often have difficulties tracking and recording patient progress, and ensuring patients are motivated and performing exercises correctly. Rather than simply introducing new technologies to address these problems, we propose low-cost hacking of existing equipment available at these centers. This approach is philosophically consistent with the creative, pragmatic approach OTs take in their work, and is likely to lead to better acceptance without sacrificing the quality of the exercises. To illustrate our approach, we modify two existing training devices with simple digital interaction in order to nudge patients to improve movement quality, and to collect data to track progress. We present our preliminary results when employing these modified devices at a community center.

Contribution statement | *We examine in this work gestures performed with two smart rings, for which we propose “Ring x2,” a gesture design approach based on temporal concepts.*

MaxiFab: Applied Fabrication to Advance Menstrual Technologies **Joselyn McDonald, Siyan Zhao, Jen Liu, Michael Rivera**

MaxiFab is a multifaceted collaborative effort aimed to address current shortcomings of menstrual technologies through digital fabrication techniques. We explore using 3D printing to produce customizable frames for sanitary napkins and laser cutting to fabricate fused washable sanitary napkins. Our preliminary explorations create menstrual products that address some of the most pressing problems with current period technologies - namely, access and cost barriers, waste, and lack of customization. Our work aims to reduce stigma regarding menstruation while contextualizing the topic as under-examined in design research.

Contribution statement | *The contribution is a description of a route planner system that takes into consideration other important local cultural elements.*

Ecphoria Player: Exploring, Revisiting, & Living-with a Lifetime of Digital Music **Alireza Mogharrab, William Odom**

With the massive adoption of music streaming services globally, metadata is being generated that captures people’s music listening histories in more precise detail than ever before. These archives offer a valuable and overlooked resource for designing new ways of supporting people in experiencing the music they have listened to over the course of their lives. Yet, little research has demonstrated how metadata can be applied as a material in design practice. We propose the Ecphoria Player, a device that leverages music listening history metadata to support experiences of exploring and living with music from one’s past. We report on our design decisions, rationale, and implications for future design researchers.

Contribution statement | *Our contribution is ARtLens, an Augmented Reality wearable application that allows museum visitors to actively interact with and learn about artifacts. This application enhances learning and engagement in the museum.*

ARtLens: Enhancing Museum Visitors' Engagement with African Art **Christina Pollalis, Amanda Gilvin, Lauren Westendorf, Lauren Futami, Bella Virgilio, Dana Hsiao, Orit Shaer**

We present ARtLens, an Augmented Reality application for the Microsoft HoloLens, which allows museum visitors to actively interact with and learn about artifacts. We designed ARtLens to enhance learning and engagement with museum collections while keeping the focus on the original artifact. ARtLens provides context for an artifact by supplying audio and visual information, and guides visitors in exploring the original artifact. It also allows users to directly manipulate, using gesture-based interactions, holographic representations of related artifacts next to original artifacts in the gallery. We intend to study the impact of ARtLens on object-based learning and engagement of museum visitors in an African Art gallery.

Contribution statement | *We fabricated wrist-worn affective displays for real-time visualization of private affective data. The paper discusses ambiguity, temporal constraints of the displays and private-public tension for affective meaning disclosure.*

Giving up Control - a Speculative Air Pollution Mask to Reflect on Autonomy and Technology Design **Britta F Schulte, Zuzanna Lechelt, Aneesha Singh**

In many metropolitan cities air pollution regularly exceeds safe levels, with numerous consequences for health and well-being. Current technological solutions often aim to give users control over their air pollution exposure by measuring, processing and sharing data about pollutant levels. We created a speculative face mask that opens and

closes autonomously, taking control away from the user. The goal of the speculative design was to highlight the urgency and effect of air pollution on individuals in a tangible and embodied way. Through this critical design object, we question existing solutionist approaches to air pollution and pose questions about autonomy and individual responsibility. In this paper, we share our development process and the conceptual idea behind the mask to inform and inspire other critical objects to address important societal issues at an individual level.

Contribution statement | *The study explored the designable factors that make a drone a more social friendly robot and proposed a social friendly design by implementing new appearance and behaviors of a drone.*

Bod-IDE: An Augmented Reality Sandbox for eFashion Garments **Kevin Ta, Ehud Sharlin, Lora Oehlberg**

Electronic fashion (eFashion) garments use technology to augment the human body with wearable interaction. In developing ideas, eFashion designers need to prototype the role and behavior of the interactive garment in context; however, current wearable prototyping toolkits require semi-permanent construction with physical materials that cannot easily be altered. We present Bod-IDE, an augmented reality 'mirror' that allows eFashion designers to create virtual interactive garment prototypes. Designers can quickly build, refine, and test on-the-body interactions without the need to connect or program electronics. By envisioning interaction with the body in mind, eFashion designers can focus more on reimagining the relationship between bodies, clothing, and technology.

Contribution statement | *We conducted a study to discuss design variables of music appreciation systems that use spatial mapping techniques, by which music can be "placed" anywhere in the space.*

Human - Drone Interaction: Drone Delivery & Services for Social Events

Haodan Tan, Jangwon Lee, Gege Gao

In recent years, there has been an increasing research interest in drones and its applications such as a drone delivery service, ping-pong play companion, and jogging companion. However, despite the growing interest in drones for social scenarios, there are only a few drones have paid attention to factors such as drone's movements, appearance, and comfortable distance for natural human-robot interaction (HRI). In this study, we explore the critical factors for successful human-drone interactions (HDI) in a social scenario, and proposed a social friendly design by implementing new appearance and behaviors of a drone.

Contribution statement | *Proposes and describes a novel device for exploring, re-visiting, and living with the a lifetime of digital music.*

Body Inspired Design for Knitted Body-Protection Wearables

Martijn ten Bhömer, Ruggero Canova, Eva de Laat

In this provocation, we aim to show that body inspired design techniques can be used to inspire the development process of advanced functional knitting technologies. We believe that approaching this area from the perspective of industrial and interaction design spheres, could potentially complement fashion and textile designers' viewpoints. We conclude that interactions with technology go beyond traditional "computer" based systems. In this case, the patterns and functionalities programmed into the material using circular knitting. This is demonstrated by reflecting on an Industrial Design educational module which focused on the design of "Body protection wearables." Students were asked to limit materials by creating designs that could be produced as one single piece, without post-production procedures. Testing their designs with full-scale prototypes at each stage of development, the students could understand potential advantages and drawbacks just by wearing them.

Contribution statement | *We contribute with design considerations for tools allowing older adults to reconnect, discussing opportunities for technology.*

Designing Personalized Movement-based Representations to Support Yoga

Martijn ten Bhömer, Hanxiao Du

An inherent consequence of the turn to a third-wave HCI is the need to design for diversity in interaction and therefore a need for personalization of movement-based interactions, based on each's skills and characteristics. However, one of the major challenges is the question how designers can represent movement. Personalization is an essential issue in Yoga practice because there are no standard movements. The specific actions and poses depend on the individual body conditions of each practitioner. Three movement-based representations for personalized feedback during Yoga were developed (visual, auditory and haptic). Different participants offered different explanations about the feedback they received during the exercises. This leads us to believe that there is indeed a need for personalization of movement-based representations.

Contribution statement | *This study maps a slice of the social VR ecology in order to identify key issues and concerns for future research and design.*

Dynamic Displays at Wrist for Real Time Visualization of Affective Data

Muhammad Umair, Muhammad Hamza Latif, Corina Sas

Emotions are vital to our lives but could be difficult to recognize and understand. Traditional visualizations of emotions tend to be time-series graph on screen displays limiting user engagement in their real-time sense-making. This paper explores the feasibility of smart materials for developing novel dynamic displays on skin for real time visualization of affective data. We report prototyping two such displays and their evaluation with 6 participants, and discuss their

qualities such as ambiguity, slowly unfolding change, and lack of light emission together with their temporal constraints and private-public tension for affective meaning disclosure.

Contribution statement | *We report on a pair of cyber-physical “convivial tools” of our own design, and hope to inspire other designers to strive for conviviality in designing their own interactive systems.*

Building a Community of Audio Game Designers - Towards an Online Audio Game Editor

Michael Urbanek, Florian Güldenpfennig, Manuel T. Schrempf

We introduce the Online Audio Game Editor (OAGE) which we have conceived to: (a) advance our understanding of audio games in general; (b) to investigate the audio game design process; (c) and to build a community of audio game designers. Thus, OAGE constitutes a fully-implemented prototype to create, play, and (later) share audio games online. Our intention is to iteratively extend this process of reflective analysis and adaptations, we aim to uncover more of the very core of audio game design, a genre of computer games which is currently under-researched. In contrast to wide-spread video games, little is known about proper design processes in audio games or valid guidelines to aid their development. We show how OAGE is intended to serve as a research vehicle to recruit audio game designers as participants (a significant challenge due to their small number), to catch up with the state of knowledge about video games, and also to promote audio games.

Contribution statement | *In this paper we present the concept and development of a speculative mask to explore notions of autonomy related to air pollution.*

Text Visualisation Tool for Exploring Digitised Historical Documents **Olivia Vane**

This paper describes a prototype timeline tool designed for humanities researchers exploring digitised historical documents.

The tool visualises keyword instances in context mapped by date, and can be used to explore commentary around themes through time. Through designing the tool and evaluating it with humanities scholars, the role of the designer in the digital humanities is explored. Interview evaluation with historians provides evidence for the tool's capacity to support historical research, but also raises design issues by pointing to the value of simple, minimal design in this domain for interpretability.

Contribution statement | *This paper presents a possible means to build similar ideation tools envisioning different episodic technology futures.*

Ring x2: Designing Gestures for Smart Rings using Temporal Calculus

Bogdan-Florin Gheran, Radu-Daniel Vatavu, Jean Vanderdonckt

We introduce “Ringx2,” a design space for gesture input with two smart rings. Wearing two rings at once opens new input opportunities, unexplored by the community so far, such as bimanual ring gestures or shifting input from one smart ring to the other to effectively manage situational impairments, such as encumbrance. To enable such developments and explorations, we present a formal description of designing two-ring gestures from the perspective of temporal calculus, a logic-based framework for reasoning about events and actions occurring in time, which we exemplify on a dataset of 83 bimanual gestures performed by 24 participants with two rings. We hope that our exploration of two-ring gestures and our design approach rooted in temporal calculus will be provocative and inspiring for the community, leading to new designs of input techniques for smart rings.

Contribution statement | *WiredRadio was deployed in a family home for three three weeks. The study investigates what may happen when we start to make sense out of hidden data in our everyday lives.*

We Are Not All Makers: The Paradox of Plurality In The Maker Movement

Tara Whelan

This paper draws from a critical examination of media and literature surrounding the maker movement, and interviews with 10 women engaged in maker activities. It aims to explore the barriers to women's participation in the maker movement and, in particular, the barriers to women's adoption of a maker identity. Three phenomena are discussed; firstly the problematic disjunct between inclusivity of maker rhetoric and hierarchies in maker practice. Secondly, how the purported eclecticism of materials and techniques in the maker movement may actually lessen the likelihood of women self-identifying as makers. Thirdly, how women tend to have a qualitatively different approach to technological practice as compared to their male peers and the subtle ways in which this runs counter to normative maker values. I suggest that minimising the identity-centric approach of the maker movement may help to ameliorate these barriers, but ultimately, more research must be undertaken to verify or challenge the conclusions drawn here.

Contribution statement | *To explore effects and opportunities of virtual surreal spaces, we developed a space made of an unusual composition of stairs and received users' feedbacks through the exhibition at a gallery.*

MeTAP - A Personalized Spatial Memory Training for Improving Functional Autonomy of Adults with Mild Cognitive Impairments in China

Kevin Winoto, Piao Chen, Yongfu Wang, Pinata Winoto

Motivated by previous studies on increasing the autonomy of older adults with dementia, research on the effectiveness of spaced repetition as a learning strategy, and the ever increasing number of left-behind elderly in Chinese urban and especially rural areas, we develop a customizable spatial memory training mobile application to help improve adults with early dementia and mild cognitive impairments with performing instrumental activities of daily living

by training important spatial information. The mobile application comes with two paired modes: Caregiver mode and Patient mode. It allows caregivers to create virtual rooms in which items are tagged and placed in. The person with dementia can then test his or her recall of the spatial location of items in different rooms with an intuitive touch-based interaction. Data collected during present and past training sessions then determines future training sessions and provide caregivers a way to track performance over time. Additionally, through cloud-based behavioral modeling and remote data sharing, it can enable personalized spaced repetition memory learning and offer real-time behavioral data for the medical specialist and caregivers. Three rounds of evaluation involving interviews and in-field testing had been conducted with promising results.

Contribution statement | *We explored new forms and possibilities for digital-content-bearing artifacts. Our contribution is the creation of mementos from online social interactions using a tangible solution to cross physical and digital boundaries.*

Verbal Design: A Participatory Design Approach with Illiterate Patient User Groups

Khekashan Zeb, Stephen Lindsay, Suleman Shahid, Matt Jones

This paper presents a Participatory Design approach focused on applying primarily Verbal Design techniques working alongside illiterate People with Diabetes (PWD) from low socio-economic groups in Pakistan. After gathering a set of initial findings through classic Participatory Design and encountering several challenges, we discuss the development of our Verbal Design Approach in response which uses Narrative Scoping and Persona along with Invisible Design videos to structure and drive discussion and document design. Preliminary work showed that the approach resonated with our illiterate participants.

Contribution statement | *Gesture control is a developing HCI method. We aim for the gap caused by prior gesture elicitation studies by testing with end users and provide insights about legacy bias phenomena.*

Tangible Interactive Upper Limb Training Device

Yang Zou, Jie Sun, Shiqi Lu, Ping Cai, Shengjia Niu

To regain motor abilities, stroke patients should persist regular and intense rehabilitation exercises but in reality they are usually demotivated by boringness and frustration of repetitive exercises. Researches have highlighted video games-based exercise as an approach to increasing patient engagement. However, it might not be appropriate for elderly patients. They are generally not familiar with video games and as growing old, they are suffering from decreased learning ability. This project aims to provide a tangible interactive device to better assist elderly patients in the upper limb rehabilitation process. We have integrated three types of exercise (forearm, wrist and finger) into one single device and adopted physical stimulation like light, sound and vibration. Each exercise has been redesigned in order to engage and motivate patients in the recovery process.

Contribution statement | (1) A new 3D augmented reality approach to provide real-time captioning for DHH users, (2) empirical results from an autoethnographic evaluation, and (3) design factors and recommendations for future work.

DEMOS

The “Choose Your Own Beverage” Table: Swing Compass in the Wild

Kenny Chow, Michael Kin Wai Siu

Swing Compass is a configurable recommendation system that turns tablet computers into a compass-like device whose interface shows recommended items at different directions. Turning the compass 90 degrees results in different sets of options. Based on the concept of embodied metaphor and choice architecture theory, the design

aims to prompt people to reflect on their choices. The first instance of Swing Compass comes with a designed wooden case, turning one single tablet computer into a personal handheld compass. The second instance includes a designed round table, repurposing five tablet computers for a tabletop compass to be placed in public space. This paper describes and proposes a prototype demonstration of the Swing Compass table situated next to a café. The featured items include different kinds of drinks and containers, with connection to their destinations in the environment. The goal is to elicit reflection on the environmental impacts of choices of beverage.

Contribution statement | *To investigate how people respond to an unfamiliar installation with novel interface and curious interactions in a familiar public space and how it may stimulate people's reflection on their choices.*

Gaze Controlled Interface For Limited Mobility Environment **Jeevithashree DV, Kamalpreet Saluja, Pradipta Biswas**

This paper investigates design constraints for developing GUI (Graphical User Interfaces) in limited mobility environments. In particular, we have presented a gaze controlled interface for users with severe physical impairment and for pilots in military aviation who are constrained by situational impairment. We have developed and implemented algorithms to investigate visual search pattern and improve pointing and selection tasks in eye gaze controlled GUI. User studies in both environments show that for situational impaired users, there is improved flying performance and significant reduction in pointing and selection times for secondary mission control tasks compared to existing interaction systems.

Contribution statement | *Appropriately designing a screen layout based on user's visual search pattern can improve the efficiency of Human Computer Interaction.*

The Living Tree : Using Surface Transducers to Explore the Secret Life of Trees through Sonic Interactions

**Frederik H. Westergård, Jonathan Komang-Sønderbek,
Malthe Emil Blichfeldt, Jonas Fritsch**

This paper presents the demo of the interactive listening installation The Living Tree, where surface transducers were deployed in a real-life setting to design immersive and affectively engaging sonic interactions exploring the life of trees. The surface transducer technology emits vibrations through whatever material you press it against, turning the material into a speaker. We present the design of the project which we will demo at DIS and elaborate on how surface transducers can be used as a design material for creating rich interactive experiences.

Contribution statement | *The paper and demo present examples of how surface transducers can be used as a design material to create affectively engaging sonic interactions and rich interactive experiences.*

LightSight: A Dice to Meet the Eyes

**Hana Salihodzic, Konstantin Zilberburg, Niloufar Chakhmaghi,
Florian Güldenpfennig, Peter Fikar, Roman Ganhoer**

This paper introduces LightSight, a new interactive toy for children with cerebral visual impairment (CVI). Since affected children face different challenges in their perception and processing of information, it is important to provide them with appropriate tools to train their vision skills and related competencies. To address this need, we designed a tangible and illuminated dice, which wirelessly communicates with a game running on a tablet (dice and game together form LightSight). This concept should provide a playful way for the children to train their vision and a range of related motor and cognitive skills (e.g. manipulating the device with their hands, learning shapes etc.). Understanding this interactive toy is simple enough for children who are below the age of 6 years. The paper concludes by discussing the system's design motivations and observations from field deployments.

Contribution statement | *We demo LightSight, a new interactive toy for children with cerebral visual impairment. It aims at providing appropriate stimuli to train vision skills and related competencies.*

SketchStudio: Experience Prototyping with 2.5-Dimensional Animated Design Scenarios

Han-Jong Kim, Chang Min Kim, Tek-Jin Nam

It is challenging to visualize the end-user experiences of large and complex systems involving various spatial elements and multiple-user interactions. To support experience prototyping of these systems in the early design phases, we present SketchStudio, a prototyping tool for producing animated design scenarios of large and complex systems. The tool allows designers to specify the user experience over time and space by simply composing a node graph. It instantly generates unique 2.5D animated design scenarios by blending 2D sketches and 3D characters. Further, the tool supports virtual reality mode for immersive views of the created scenario prototype.

Contribution statement | *We present SketchStudio, a rapid prototyping tool for animated design scenarios involving multiple users and components. It features journey-based authoring for defining the spatiotemporal experience and animating 2.5D virtual space.*

UMorph: Self-Change Tracker to Reflect Yourself to the Future and Past

Tetiana Parshakova, Daniel Saakes

Taking photos has become not only a daily but also an automatic activity. But how do we use all these pictures? Storage and retrieval are certainly not as well developed as capturing. Storage systems organize photos in the temporal dimension, for example, the Facebook service "Year in Review" or in visual diaries, but typically do not support a systematic comparison. That was the inspiration for this demonstration, employing automatically taken photographs

and arranging them so that one could easily go back in time to reflect oneself to the future and past. This is useful for tracking well-being and body changes using time physicalization with a natural interface, as well as an unobtrusive way for systematic capturing of facial images over time.

Contribution statement | *We present a novel concept and prototype to browse through huge amounts of photos of oneself and provide new meaning and value in an aggregated dynamic presentation.*

Expansion of Textile Expression Utilizing Op Art Methods and Transmissive Liquid Crystal Film, and Progress toward Its Use in Garments

Masato Sekine, Naoya Watabe, Miki Yamamura, Hiroko Uchiyama

In this study, we describe the development of new textiles and garments created through the cross-fertilization of op art methods and smart materials. We have developed a pattern expression method that involves layering transmissive liquid crystal film into which dot patterns have been cut and modifying the pattern by changing the level of the film's transparency. In addition, we demonstrated that it is possible to express a greater variety of patterns by combining this with a printed pattern. Furthermore, as an application, the design of garments is proposed.

Contribution statement | *We will exhibit textiles and dresses using the latest liquid crystal film and propose new possibility of clothing expression.*

HeartMe: ThermoChromic Display as An Expression of Heart Health

Manlin Song, Katia Vega

The amplification of biodata through dynamic textile displays opens the potential for novel ways of communicating our emotions, health and of understanding others. In this paper, we present HeartMe: a provocation of awareness in heart disease by using thermoChromic displays. We present our design process to create three displays

with different thermochromic textile patterns and heating circuits. Different variables were used such as heating up timing, cooling down timing and temperature in order to create dynamic and controllable interfaces with thermochromic inks. They interact with user's heartbeat rates, exploring the possibilities of thermochromic as social displays.

Contribution statement | *HeartMe presents three displays of thermochromic patterns, heating circuits and different variables such as heating-up timing, cooling-down timing and temperature to create dynamic and controllable interfaces with users' heartbeat rates.*

CutCAD - An Open-source Tool to Design 3D Objects in 2D

Florian Heller, Jan Thar, Dennis Lewandowski, Mirko Hartmann, Pierre Schoonbrood, Sophy Stoenner, Simon Voelker, Jan Borchers

Laser cutters are 2D tools, but their speed and compatibility with a variety of affordable materials also makes them a frequent choice to create 3D objects. We propose CutCAD, a tool to easily construct simple 3D objects from 2D faces, inspired by the process of paper modeling and magnetic construction kits. The user creates her 3D model by drawing or loading existing 2D shapes, and connecting their edges in the software. CutCAD then automatically resolves the resulting constraints, and folds the faces up into a 3D model that is previewed live. CutCAD also automatically creates the required finger joints based on thickness of the material and dihedral angles, for smooth assembly. Cutouts are easy to add by importing their outlines as vector drawings, and placing them onto faces. After the faces have been cut, CutCAD provides assembly instructions. Observations and feedback from using CutCAD show the resulting process to be easier to understand than traditional 3D modelling. CutCAD is open-source, and has been downloaded over 2,000 times.

Contribution statement | *CutCAD is an application to design 3D-objects from 2D-faces. It automatically aligns sides and computes finger joints to connect faces, which can then be laser-cut and assembled for rapid prototyping.*

SenseCenser: an Interactive Device for Sensing Incense Smoke & Supporting Memorialization Rituals in Japan

Daisuke Uriu, William Odom, Mei-Kei LAI, Sai Taoka, Masahiko Inami

SenseCenser is a device that senses the act of placing incense chips into it and, subsequently, the volume of incense smoke produced as the chips burn. These values can be connected to various applications, such as lighting equipment, sound systems, showing (moving) images, and more specific installations at particular rituals (e.g., a funeral ceremony). We designed SenseCenser to investigate the potential role and place of interactive technologies in supporting for Japanese funeral and memorialization rituals. This paper introduces its technical architecture and also how it will be demonstrated at the DIS2018 conference.

Contribution statement | *This paper contributes to the HCI community, providing a new interactive device that supports people's memorialization rituals.*

Monitoring the Emotional Flow of Blind People by Using Physiological Sensors and Smart Glasses

Chen Wang, Xintong Zhu, Xiguang Wang, Xiaomeng Yan, Zhenzheng Wang, Yong Wang, Jing JU, Yusong Yang

Visually impaired people are difficult to communicate effectively with their environment. In particular, their emotional states are difficult to be captured. In order to better understand the affective states of blind people and assist blind people to access their surroundings, we design and develop an emotional system by using physiological sensors and smart glass, where both emotional flow and visual perception can be visualized on a digital display. The system was first applied at press screenings held by the movie "Blind Road."

Contribution statement | *We design and develop an emotional system by using physiological sensors and smart glass, where both emotional flow and visual perception can be visualized on a digital display.*

MagicPAPER: An Integrated Shadow-Art Hardware Device Enabling Touch Interaction on Paper

**Qin Wu, Sirui Wang, Jiayuan Wang, Jia-shuo Cao, Xing-Yuan Huang,
Rung-Huei Liang**

Touch interaction is usually implemented on a computer screen or a projected surface. However, tactile quality of paper is attractive and intuitive for people to manipulate in traditional paintings and storytelling. In order to enable touch interaction on paper, we present MagicPAPER, a shadow-art device that consists of a pen, kraft paper, a projector, a gesture sensing device, and a software system. With the purpose of illustrating how MagicPAPER effectively integrates the art-design process with the computer and communication technology, we have developed eight interactive applications simply based on kraft paper and mark pen: the Dimension Door, Balls, Palette, Flat Cube, Piano, Color potion, Fast mask- changing, and Candle. Finally, we experimented with MagicPAPER and demonstrated its interactive effects by detecting the gesture of a finger and pen on kraft paper and projecting it into eight interactive applications. Our research results show that MagicPAPER successfully carries out paper-based touch interactions.

Contribution statement | *The method presented in this demo will allow us to develop a new interactive approach to touch interaction with traditional paper media about HCI.*

RIPT: Improvising with an Audience-Sourced Performance Robot

**Tiffany Wun, Claire Mikalauskas, Kevin Ta, Joshua Horacsek,
Lora Oehlberg**

Improvisational theatre (improv) actors develop narratives in real-time as they perform unscripted scenes together. Audience suggestions build engagement and introduce randomness into the scene; however, actors have difficulty mediating or responding to audience suggestions at scale. We present Robot Improv Puppet Theatre (RIPT), a system for short-form improv where a performance robot (Pokey) performs gestures and dialogue provided by audience members via a mobile interface. Improvisers' narratives are shaped

in response to the robot's actions, guiding narratives into unexpected directions.

Contribution statement | *RIPT is a system where a robot performs audience-sourced dialogue and gestures in short-form improv scenes with human actors. We evaluated RIPT in a rehearsal with professional improvisers.*

Choreographing the Expression of Social Robots

Harvey Bewley, Laurens Boer

The design of social robots typically does not focus on their kinetic expression, and often follows the assumption that their appearance should be human or animal like. To encourage a broader understanding of the possibilities for design of social robots, and as an inquiry into alternative relations with them, we present two robots, the Lat-Sac and the Blo-Nut, which are purposefully moving away from typical social robot design. We present how we engaged performance experts in the choreographic sketching of their elastic expression, and how we staged the robots as a design fiction to create a discursive space for reflection on emerging relations. Based on these encounters we discuss how acknowledging the otherness of social robots can be valuable in designing as well as growing intriguing relations with them.



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PAPER SESSIONS

	TRACK A V322	TRACK B V312	TRACK C V302
11 JUNE 11-12:30	Trust and Responsibility	Experiencing Virtual Reality	Personal Health & Wellness
14-15:30	Making Diversity	Augmenting Reality	Therapeutic Design
16-17:30	Expanding Domestic Design	Supporting Designers	Aging and Changing
12 JUNE 9-10:30	Things of Inquiry & Knowledge Creation	Designing with Machine Learning [Track C]	Places of Interaction [Track B]
11-12:30	Fingers, Gestures & Bodies	Co-performing with Machines	Reflection, Remembrance & Connection
14-15:30	Design Research Methods	Interacting with Conversational Agents [Track C]	Immersive Experiences, Scenarios & Technologies [Track B]
16-17:30	Animals & Wilderness	Design Issues in the Wild	PANEL 1: Designing for Social Change
13 JUNE 9-10:30	Sports and Training	Exploring Interaction Design	PANEL 2: Educating Designers
11-12:30	Crafting Fabrication Action	Design for Collective Action	Micro-Sites of Interaction
14-15:30	Creativity and Design	Measurements and Guidelines	Values & Ethics

PAPER SESSIONS INCLUDING NOTES AND PICTORIALS

Monday 11 June Morning sessions 11-12:30

ROOM
V322

TRACK

A

Trust & Responsibility

Session Chair David Kirk

11
JUNE

Exploring Trust in Digital Civics

Eric Corbett, Christopher Le Dantec

Digital civics research seeks to understand how technology can create new forms of relationships and services between public officials and citizens in governance. To accomplish this, design in digital civics emphasizes the importance of relationships based on dialogue, empowerment, and participation; all of which are contingent upon the existence of trust. Currently, however, these relationships are most often characterized by entrenched distrust which problematizes opportunities for dialogue and participation. In this paper, we explore how design might support trust in the relational aims of digital civics. To do so, we led 13 public officials in a large US city through a design-based inquiry centered around the role of trust in their various efforts to engage communities. In our findings, we discuss four strategies for supporting trust in digital civics.

Beyond the Prototype: Maintenance, Collective Responsibility, and Public IoT

Sarah Fox, Rafael de Silva, Daniela Rosner

This paper describes the reparative Internet of Things (Riot), a project investigating the role of IoT devices in maintaining public resource accessibility. Drawing on a mix of interviews, technology development, and ethnographic engagements, we explore the distribution and stratification of menstrual hygiene resources in Seattle, WA. We redesigned menstrual product dispensers placed in public settings by outfitting them with networked sensor inserts to

make them easier to stock by custodial staff and easier to access by members of the public. We use this case to show how such newly connected devices structure experiences of hygiene access and help expose important consequences of integrating those devices into the socioeconomic logics and infrastructure of public life. Our interventions further examine the role of public IoT devices once they pass the proof-of-concept stage, revealing their capacity to cultivate and maintain collective responsibility.

Designing Future Employment Applications for Underserved Job Seekers: A Speed Dating Study

Tawanna R. Dillahunt, Jason Lam, Alex Lu, Earnest Wheeler

Modern Information and Communication Technologies (ICTs) support job searches, resume creation, career development, and professional self-presentation. However, these technology tools are often tailored to high-income, highly educated users and white-collar professionals. It is unclear what interventions address the needs of job seekers who have limited resources or education, or who may be underserved in other ways. We gathered insights from the literature and generated ten tangible design concepts to address the needs of underserved job seekers. We then conducted a needs validation and speed dating study to understand which concepts were most viable among our population. We found that the three most preferred concepts immediately addressed job seekers' social and personal needs, where addressing social needs meant mediating job seekers' connections to others and supporting job seekers' limited access to strong ties.

Designing for Intersections

Marisol Wong-Villacres, Arkadeep Kumar, Aditya Vishwanath, Naveena Karusala, Betsy DiSalvo, Neha Kumar

In response to the recent call for a more intersectionally-aware field of human-computer interaction (HCI), we aim to operationalize intersectionality for technology design in HCI. To do this, we develop

our lens of intersectionality based on the work of Rita Kaur Dhamoon and use it to analyze data collected from seven low-resource learning environments in the Indian states of Maharashtra, Tamil Nadu, and West Bengal. Through our multi-sited ethnographic study, we aim to foreground constraints and assets to “imagine points of intervention.” Our research contributions are thus threefold. First, we extend conversations in intersectional HCI by expanding its scope from understanding users to recognizing social processes. Second, we stress the importance of focusing on both constraints and assets when conducting research in underserved communities. Third, we leverage situated comparisons to identify pathways for the design of interactive systems across intersectionally diverse environments.

ROOM
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B**Monday 11 June Morning sessions 11-12:30****Experiencing Virtual Reality**Session Chair **Andrés Lucero****VMotion: Designing a Seamless Walking Experience in VR**
Misha Sra, Xuhai Xu, Aske Mottelson, Pattie Maes

Physically walking in virtual reality can provide a satisfying sense of presence. However, natural locomotion in virtual worlds larger than the tracked space remains a practical challenge. Numerous redirected walking techniques have been proposed to overcome space limitations but they often require rapid head rotation, sometimes induced by distractors, to keep the scene rotation imperceptible. We propose a design methodology of seamlessly integrating redirection into the virtual experience that takes advantage of the perceptual phenomenon of inattentive blindness. Additionally, we present four novel visibility control techniques that work with our design methodology to minimize disruption to the user experience commonly found in existing redirection techniques. A user study (N = 16) shows that our techniques are imperceptible and users report significantly less dizziness when using our methods. The illusion of unconstrained walking in a large area (16 x 8m) is

maintained even though users are limited to a smaller (3.5 x 3.5m) physical space.

Attending to Breath: Exploring how the cues in a virtual environment guide the attention to breath and shape the quality of experience to support mindfulness

Mirjana Prpa, Kivanç Tatar, Jules Françoise, Bernhard Riecke, Thecla Schiphorst, Philippe Pasquier

Busy daily lives and ongoing distractions often make people feel disconnected from their bodies and experiences. Guided attention to self can alleviate this disconnect as in focused-attention meditation, in which breathing often constitutes the primary object on which to focus attention. In this context, sustained breath awareness plays a crucial role in the emergence of the meditation experience. We designed an immersive virtual environment (iVE) with a generative soundtrack that supports sustained attention on breathing by employing the users' breathing in interaction. Both sounds and visuals are directly mapped to the user's breathing patterns, thus bringing the awareness researched. We conducted micro-phenomenology interviews to unfold the process in which breath awareness can be induced and sustained in this environment. The findings revealed the mechanisms by which audio and visual cues in VR can elicit and foster breath-awareness, and unfolded the nuances of this process through subjective experiences of the study participants. Finally, the results emphasize the important role that a sense of agency and control have in shaping the overall quality of the experience. This can in turn inform the design specifications of future mindfulness-based designs focused on breath awareness.

Your Place and Mine: Designing a Shared VR Experience for Remotely Located Users

Misha Sra, Aske Mottelson, Pattie Maes

Virtual reality can help realize mediated social experiences where distance disappears and we interact as richly with those around the

world as we do with those in the same room. The design of social virtual experiences presents a challenge for remotely located users with room-scale setups like those afforded by recent commodity virtual reality devices. Since users inhabit different physical spaces that may not be the same size, a mapping to a shared virtual space is needed for creating experiences that allow everyone to use real walking for locomotion. We designed three mapping techniques that enable users from diverse room-scale setups to interact together in virtual reality. Results from our user study (N = 26) show that our mapping techniques positively influence the perceived degree of togetherness and copresence while the size of each user's tracked space influences individual presence.

VRSpinning: Exploring the Design Space of a 1D Rotation Platform to Increase the Perception of Self-Motion in VR

Michael Rietzler, Teresa Hirzle, Jan Gugenheimer, Julian Frommel, Thomas Dreja, Enrico Rukzio

Current approaches for locomotion in virtual reality are either creating a visual-vestibular conflict, which is assumed to cause simulator sickness, or use metaphors such as teleportation to travel longer distances, lacking the perception of self motion. We propose VRSpinning, a seated locomotion approach based around stimulating the user's vestibular system using a rotational impulse to induce the perception of linear self-motion. In a first study we explored the approach of oscillating the chair in different frequencies during visual forward motion and collected user preferences on applying these feedback types. In a second user study we used short bursts of rotational acceleration to match the visual forward acceleration. We found that this rotational stimulus significantly reduced simulator sickness and increased the perception of self-motion in comparison to no physical motion.

A Situated Exploration of Designing for Personal Health Ecosystems through Data-enabled Design

**Sander Bogers, Janne van Kollenburg, Eva Deckers,
Joep Frens, Caroline Hummels**

This paper presents a design case study from industry that explores designing for personal health ecosystems. Following on from previous work on ecologies that gives a predominantly theoretical perspective, we present a more applied and design-oriented perspective. To do so, we build on our previously-developed data-enabled design approach, which utilizes contextual, behavioral and experiential data from situated design experiments as creative material. This approach comprises two steps, of which this paper presents the first (contextual) step. We introduced a small adaptable ecosystem of multiple artifacts, in four family homes over a period of eight weeks, through which we explored and further expanded on valuable ecosystem relationships. The insights gained were translated into three design opportunities that inform a future second step. We highlight and discuss practical examples from our situated explorations, and discuss how our data-enabled design approach served in designing for the complexity and versatility inherent to these ecosystems.

Social Support Mosaic: Understanding Mental Health Management Practice on College Campus

Sun Young Park

Mental health wellness concerns are a significant issue among emerging adults due to the compounded stressors of life changes, new responsibilities, and career-related burdens. Due to a lack of support and the stigma associated with seeking help, they often do

not receive adequate professional care. In this paper, we show how emerging adults seek help managing their mental wellness through social support. We conducted 19 interviews with students at a large university in the U.S. Midwest. Our study identifies that students maintain different social support groups, selectively sharing their concerns based on each groups' role, benefits, and limitations. We call this support network the Mosaic of Social Support. We discuss opportunities for technology design that enhances the Mosaic of Social Support, allowing it to be more accessible, safe, and sustainable, thus providing tailored help to serve the students' unmet needs.

Examining Self-Tracking by People with Migraine: Goals, Needs, and Opportunities in a Chronic Health Condition

Jessica Schroeder, Chia-Fang Chung, Daniel Epstein, Ravi Karkar, Adele Parsons, Natalia Murinova, James Fogarty, Sean Munson

Self-tracked health data can help people and their health providers understand and manage chronic conditions. This paper examines personal informatics practices and challenges in migraine, a condition characterized by unpredictable, intermittent, and poorly-understood symptoms. To investigate how people with migraine track and use data related to their condition, we surveyed 279 people with migraine and conducted semi-structured interviews with 13 survey respondents and 6 health providers. We find four distinct goals people bring to tracking and data: 1) answering questions about migraines, 2) predicting and preventing migraines, 3) monitoring and managing migraines over time, and 4) enabling motivation and social recognition. Each goal suggests different needs for the design of tools to support migraine tracking. We also find needs resulting from an individual's goals evolving over time, their varied personal experiences, and their communication and collaboration with providers. We discuss these goals and needs in terms of opportunities for personal informatics tools to facilitate learning to: 1) avoid common pitfalls; 2) support customization and flexibility; 3) account for burden, negativity, and lapsing; and 4) support management with uncertainty.

Exploring Self-Defining Memories in Old Age and Their Digital Cues

Corina Sas

Self-defining memories represent significant emotional events capturing the most important concerns in our lives. While much HCI work on memory technologies has focused on autobiographic memories and lifelogging technologies for capturing them, there has been little exploration of self-defining memories and how they may be supported by appropriate cues. This is important as such memories are key in the development and maintenance of the sense of self, particularly in old age. We report on interviews with 8 older adults in their homes. Findings advance the understanding of self-defining memories and their possible cues with new insights into their relationship with self-identities and cues' specific qualities supporting richer emotional recall. Our findings led to several design implications such as novel technologies for curating self-defining memories and their cues, for embedding layered meaning in such cues across the lifespan, for crafting them, and sensitive design for their physical handling.

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Making DiversitySession Chair **Sarah Fox****Making Grooves With Needles: Using E-textiles to Encourage Gender Diversity in Embedded Audio Systems Design****Rebecca Stewart, Sophie Skach, Astrid Bin**

Historically, women have been excluded from engineering and computer science disciplines, and interactive audio is no exception. Relatively few women are involved with the designing and building of embedded audio systems with traditional tools such as microprocessors, but when embedded audio systems are built using e-textiles, much larger proportions of women become engaged

with technology. In this paper we review theories for this gender disparity and the barriers women face in working with audio technology, and then present a comparison of survey data between an e-textile audio workshop and an audio platform user group. Extrapolating from the case study and the surveyed literature, we propose that flexibility in learning, communal dissemination of knowledge, and gendering of tools are prominent reasons why women engage with technology via e-textiles.

Open Design, Inclusivity and the Intersections of Making

David P Green, David Kirk

This paper presents insights from an ethnographic study with a diverse population of makers in the city of Newcastle upon Tyne, UK. By engaging individuals, groups and communities who “make” in different contexts, we reveal under-explored perspectives on “making” and highlight points of intersection between different kinds of making across the city. We reflect on the dynamics of these intersections and connect our observations to emerging discourses around “open design.” In doing so, we argue for a renewed focus on “inclusivity” and highlight a need for new infrastructure to support iterative, collaborative making within - and across - interconnected networks of makers.

Statement Making: A Maker Fashion Show Foregrounding Feminism, Gender, and Transdisciplinarity

Johanna Okerlund, Madison Dunaway, Celine Latulipe, David Wilson, Eric Paulos

Maker culture has been increasingly pervasive in a variety of communities and contexts, in particular devoted spaces such as Makerspaces, Hackerspaces and Fab Labs. Several people, however, have pointed out that while one of the values of these spaces is radical inclusion, the general Maker culture can be exclusive to some

based on gender, race, and socioeconomic status. With the goal of disrupting existing Maker culture by developing, diversifying, and empowering our own university Maker community, we created a semi-structured making experience that we call Statement Making. Statement Making is a Maker Fashion show that we invited anyone from the community to participate in by “making a statement” for them or a friend to wear in a runway show. We report outcomes and experiences of those who participated. We then discuss the key aspects of the event, especially surrounding its performative aspect, using design principles of Feminist HCI to argue that events with similar aspects might also be successful at disrupting existing culture.

Exploring Aesthetic Enhancement of Wearable Technologies for Deaf Women

Danielle Wilde, Patrizia Marti

The Quietude project uses making, participation and co-design to collectively imagine a more sustainable, aesthetically enriched future for deaf women, by developing wearables that respond to the women’s needs and desires: those that are well known, and those that may be only dimly glimpsed. We present our motivation and process, and describe our first workshop that brought together deaf women, ethicists, makers, designers and technology experts. The workshop led to the design and development of an ecology of jewellery products: fashionable accessories that enhance the experience of deaf women by translating sounds into vibration, light patterns and shape change. We reflect on the opportunities and challenges of developing aesthetically rich wearables for deaf women, using experimental participatory design methods, and the value of considering disability as an opportunity for wearables design, rather than as an issue that needs to be addressed or solved.

Interweaving Visual and Audio-Haptic Augmented Reality for Urban Exploration**Yi-Ta Hsieh, Valeria Orso, Salvatore Andolina, Manuela Canaveras, Diogo Cabral, Anna Spagnolli, Luciano Gamberini, Giulio Jacucci**

While ordinary touchscreen-based interfaces on urban explorer applications draw much of a user's attention onto the screen, visual and audio-haptic augmented reality interfaces have emerged as the two main streams for enabling direct focus on the surroundings. However, neither interface alone satisfies users in the highly dynamic urban environment. This research investigates how the two complementary augmentation can coexist on one system and how people adapt to the situation by selecting the more suitable interface. A prototype was deployed in a field experiment in which participants explored points of interest in an urban environment with both interfaces. The engagement with the surroundings was compared with a touchscreen-based application. Most participants spontaneously switched between the two interfaces, which manifests the value of the availability of both interfaces on one system. The results point at the situated advantages of either interface and reveal the users' preferences when both interfaces are available.

Scale Impacts Elicited Gestures for Manipulating Holograms: Implications for AR Gesture Design**Tran Pham, Jo Vermeulen, Tony Tang, Lindsay MacDonald Vermeulen**

Because gesture design for augmented reality (AR) remains idiosyncratic, people cannot necessarily use gestures learned in one AR application in another. To design discoverable gestures, we need to understand what gestures people expect to use. We explore how

the scale of AR affects the gestures people expect to use to interact with 3D holograms. Using an elicitation study, we asked participants to generate gestures in response to holographic task referents, where we varied the scale of holograms from desktop-scale to room-scale objects. We found that the scale of objects and scenes in the AR experience moderates the generated gestures. Most gestures were informed by physical interaction, and when people interacted from a distance, they sought a good perspective on the target object before and during the interaction. These results suggest that gesture designers need to account for scale, and should not simply reuse gestures across different hologram sizes.

Bare-Handed 3D Drawing in Augmented Reality

John J Dudley, Hendrik Schuff, Per Ola Kristensson

Head-mounted augmented reality (AR) enables embodied in situ drawing in three dimensions (3D). We explore 3D drawing interactions based on uninstrumented, unencumbered (bare) hands that preserve the user's ability to freely navigate and interact with the physical environment. We derive three alternative interaction techniques supporting bare-handed drawing in AR from the literature and by analysing several envisaged use cases. The three interaction techniques are evaluated in a controlled user study examining three distinct drawing tasks: planar drawing, path description, and 3D object reconstruction. The results indicate that continuous freehand drawing supports faster line creation than the control point based alternatives, although with reduced accuracy. User preferences for the different techniques are mixed and vary considerably between the different tasks, highlighting the value of diverse and flexible interactions. The combined effectiveness of these three drawing techniques is illustrated in an example application of 3D AR drawing.

Body as a Canvas: An Exploration on the Role of the Body as Display of Digital Information

Thuong N Hoang, Hasan Shahid Ferdous, Frank Vetere, Martin Reinoso

Human body in HCI is often seen as an actuator for issuing commands and providing input to digital systems. We present the concept of the body as a canvas, in which the body acts as both an actuator and a display for information. Body as a canvas creates an interaction loop where interaction with information causes changes in the body, which in turn changes the display of information. Our qualitative study using an on-body projection system in a public exhibition investigates this concept with regards to body characteristics, types of body input, interactions between multiple bodies, and comparison to other display technologies. Our findings show that body as a canvas create connectedness between the body and information. Finally, we discuss how body characteristics and appearances can complement the information, when the body acts as a canvas.

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Monday 11 June Afternoon sessions 14-15:30

Therapeutic Design

Session Chair **Bart Hengeveld**

Designing Interactive Visual Supports for Children with Special Needs in a School Setting

Issey Takahashi, Mika Oki, Baptiste Bourreau, Kenji Suzuki

Visual support (VS) is one of an effective way to help activities of children with Neurodevelopmental Disorders (ND). This paper reports on how interactive VS, which is provided by a large-scale floor projection system in an augmented gymnasium called FUTUREGYM, were designed for children with ND. The study focuses on students' cleaning, and two interactive VS, MOP GAME, an exergame of instrumental activities, and MOP GUIDE, a VS for

leaning about instrumental activities, were designed with the teachers with the aim of motivating students towards cleaning and help them acquiring fundamental cleaning skills. The study attempts to design VS for cleaning that are suitable for the students by conducting an empathic design approach, which helps to know what is a problem, to obtain new perspectives, to gather ideas into demonstrative prototype by sharing values and thoughts with the teachers and their students. This is a case study of deploying an empathic design approach in a special needs school setting.

Design Artefacts to Support People with a Disability to Build Personal Infrastructures

Ravihansa Rajapakse, Margot Brereton, Laurianne Sitbon

A person with a disability has to assemble support services and technologies from different organisations in order to live well, which may require help from family. We call this assembling of services and technologies personal infrastructuring, the process of learning about how to navigate the world, what support is available, and how to obtain and design new support through various organisational infrastructures. Such infrastructures include disability services organisations, the health sector, community organisations, and friend and family networks. Our vision was to explore how a person with a disability might engage in design with volunteer designers to meet their unique needs that were not met by their existing infrastructure of organisations, products and services. Through codesign with two people and their families, we developed design artefacts such as user profiles and video stories to support communication, mutual learning, need finding and need expression. We discovered that these design artefacts were used beyond their immediate purposes of design to further support their personal infrastructuring. In this paper, we discuss how understandings of infrastructure and infrastructuring from Science and Technology Studies and Information Systems translate into familial contexts and the concept of personal infrastructuring.

The Use(fulness) of Therapeutic Toys: Practice-derived Design Lenses for Toy Design

Peter Fikar, Florian Güldenpfennig, Roman Ganhoer

Early Intervention Services support children with disabilities in their development from early age on. To this end, therapeutic toys are regularly employed within training sessions. These toys often draw on interactive elements to make exercising more appealing, and hence, to motivate the children. While there is some research about interactive therapeutic toys in HCI, these works are often standalone design deployments, exploring specific health or rehabilitation applications. In contrast, this paper offers different lenses for investigating qualities of therapeutic toys to highlight the following aspects: therapeutic and playful/motivational efforts, the potential of technology in supporting suitable affordances, ease of use, flexibility and improvisation. The lenses enable guided explorations of existing toys or novel design proposals, resulting from a thematic analysis of a) in-situ observations of therapeutic exercises (n=18), b) in-depth/informal interviews with Early Intervention Specialists (combined n=16), and c) demonstrations of their favorite toys (n=21).

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Identifying Children's Fidget Objects Preferences Toward Exploring the Impacts of Fidgeting and Fidget-Friendly Tangibles

Suzanne da Câmara, Rakshit Agrawal, Katherine Isbister

Fidgeting involves interacting with objects using repetitive hand movements. Before you can study its effects, you must first study the objects with which people choose to fidget. We present the findings of our five-phase three-month study with 28 children, 24 parents, and 2 teachers examining fidget material qualities and inherent interactions children gravitate towards when fidgeting and what, if any, connections can be made between their emotional state or activity when fidgeting and their fidget interactions/materials preferences. Our study included structured interviews, observations during usage, and design workshops. We present novel insights concerning fidget object preferences, across factors including materials, interactions, stealth, durability and sound, which together can act as guidelines

in the development of educational, experimental and utility tangibles for children. For example, children tend to prefer a fidget item with inherent squeezing interactions when they are angry and clicking/pressing/tapping interactions when they are bored.

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Expanding Domestic DesignSession Chair **Ron Wakkary****Designing for an Other Home: Expanding and Speculating on Different Forms of Domestic Life****Doenja Oogjes, William Odom, Pete Fung**

We report on the design and deployment of a probe study aimed at understanding the values, practices, and perspectives of people that actively embrace living situations that could be considered "alternative" to normative domestic dwellings. In response to the returned probes, the pictorial describes and unpacks speculative interpretations and design responses that (i) propose alternative ways technology could be designed for the home, (ii) embody different ideas of where home is located, (iii) explore how home is constructed, re-made, curated, and pursued, and (iv) productively question material, technological, and social boundaries between the home and the outside world.

ActuEating: Designing, Studying and Exploring Actuating Decorative Artefacts**Sara Nabil, Aluna Everitt, Miriam Sturdee, Jason Alexander, Simon Bowen, Pete Wright, David Kirk**

Actuating, dynamic materials offer substantial potential to enhance interior designs but there are currently few examples of how they might be utilized or impact user experiences. As part of a designed exploration, we have prototyped (Wizard-of-Oz) an actuating,

dining table runner (ActuEater1), and then developed a fully-interactive fabric version that both changes shape and colour (ActuEater2). Four in-situ deployments of “ActuEaters” in different dinner settings and subsequent “design crits” showed insights into how people perceive, interpret and interact with such slow-technology in interesting (and often unexpected) ways. The results of our “ActuEating” studies provide evidence for how an actuating artefact can be simultaneously a resource for social engagement and an interactive decorative. In response, we explore design opportunities for situating novel interactive materials in everyday settings, taking the leap into a new generation of interactive spaces, and critically considering new aesthetic possibilities.

Designing the IoT Sandbox

Joep Frens, Mathias Funk, Bastiaan van Hout, Joep le Blanc

This pictorial describes the design and design process of the IoT Sandbox: a (scale model of a) smart home which is equipped with actuators and a modular interface that controls the smart home. This modular interface can respond to changes in the functionality of the smart home whereby it offers unique possibilities for designers to explore different avenues of physically rich interaction in domestic personal spaces. We demonstrate that also physically rich interfaces can respond adequately to the dynamics of home IoT systems. We conclude with insight from the design process and a concise discussion and outlook to future work.

Exploring Hygge as a Desirable Design Vision for the Sustainable Smart Home

Rikke Jensen, Yolande Strengers, Dimitrios Raptis, Larissa Nicholls, Jesper Kjeldskov, Mikael B. Skov

In this paper, we present an exploratory study of hygge as a low-energy design vision for the smart home. Hygge is a Danish concept that embodies aesthetic experiences related to conviviality, often

shaped by orchestrating atmospheres through low-level lighting. To explore this vision, we probe two Australian households that already live with smart home lighting technology. We report on household reflections of embedding hygge into everyday life. We conclude by outlining future directions for exploring desirable and sustainable smart home visions.

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B**Supporting Designers**Session Chair **Gary Hsieh****Generating Mobile Application Onboarding Insights Through Minimalist Instruction****Brendan Strahm, Colin M. Gray, Mihaela Vorvoreanu**

Mobile application designers use onboarding task flows to help first time users learn and engage with key application functionality. Although some guidelines for designing onboarding flows have been offered by practitioners, a systematic, research-informed approach is needed. In this paper, we present the creation of a method for designing mobile application onboarding experiences. We used the minimalist instruction framework to engage twelve university students in an iterative set of design and evaluation activities. Participants interacted with a physical prototype of an educational badging mobile application through a semi-structured exploration and reflection activity, bookended by structured mini-interviews. We found that this method facilitated engagement with participants' meaning-making processes, resulting in useful design insights and the creation of an onboarding task flow. Research opportunities for integrating instructional design and learning approaches in HCI in the context of onboarding are considered.

How Do Sketching and Non-Sketching Actions Convey Design Intent?

Senthil Chandrasegaran, Devarajan Ramanujan, Niklas Elmqvist, Niklas Elmqvist

Sketches are much more than marks on paper; they play a key role for designers both in ideation and problem-solving as well as in communication with other designers. Thus, the act of sketching is often enriched with annotations, references, and physical actions, such as gestures or speech - all of which constitute meta-data about the designers' reasoning. Conventional paper-based design notebooks cannot capture this rich meta-data, but digital design notebooks can. To understand what data to capture, we conducted an observational study of design practitioners where they individually explore design solutions for a set of problems. We identified sketching and non-sketching actions that reflect their exploration of the design space. We then categorized the captured meta-data and mapped observed physical actions to design intent. These findings inform the creation of future digital design notebooks that can better capture designers' reasoning during sketching.

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Designing for Situational Visual Impairments: Support Early-Career Designers of Mobile Content

Garreth W Tigwell, Rachel Menzies, David Flatla

Mobile devices are a substantial part of our lives, supporting communication, work, and play. However, situational visual impairments (SVIs) can make completing tasks a challenge (e.g., browsing online in bright sunlight) and poorly designed content can cause or exacerbate SVIs. We surveyed 43 mobile content designers and ran four follow-on interviews to understand what designers currently do regarding SVIs, what resources they know of, and what is required to best support them in designing to reduce SVIs. Our findings highlight key similarities and differences between accessibility and designing to reduce SVIs. Our participants requested improved guidelines, education, and digital design tools for SVIs. To accommodate the growing number of people affected

by SVIs and improve the inclusion of accessibility in design, we introduce recommendations that leverage the overlap between accessibility and SVIs to minimise the effort required in extending current design processes.

From Hyperlinks to Hypercues: Entity-Based Affordances for Fluid Information Exploration

Khalil Klouche, Tuukka Ruotsalo, Giulio Jacucci

We introduce the concept of hypercues, a complement to the hyperlink in the form of an interactive representation of real-world entities, e.g. persons, places, concepts, providing personalized access points to information. As a pendant to the hyperlink, hypercues create opportunities to flexibly discover, store and share information, organize one's thoughts and gain insights of the data. We explore the design space of interaction techniques supporting entity-based information exploration by reviewing recent examples of such work. We reflect on these through the lens of eight essential features of exploratory search systems, to devise generalizable design principles. Our main contribution is a design template describing the hypercues. It has a minimal set of affordances that address all important features for supporting exploratory search, while leaving enough space to facilitate integration within many systems. We describe the rationale behind the design template and discuss its implications.

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Monday 11 June Afternoon sessions 16-17:30

Aging and Changing

Session Chair **Ki-Young Nam**

Designing Connected Resources for Older People

Iohanna Nicenboim, Elisa Giaccardi, Lenneke Kuijjer

In this pictorial, we illustrate steps towards a novel approach that situates connected technologies for older people as resources. In

contrast to mainstream approaches in gerontechnology that consider elderly as frail and passive, we aim to complement older people's vital competences by designing technologies that can be used in less prescriptive, and broader ways. The pictorial describes our design process in which resourceful strategies were identified through thing ethnography and used as inspiration to create a series of new connected objects conceived as resources.

Conducting Qualitative Fieldwork with Ageing Saudis: A Visual Diary **Soud Nassir, Tuck Leong**

This pictorial offers a visual diary of our qualitative fieldwork to understand aging people's experiences in Saudi Arabia. It provides insights gained through conducting qualitative fieldwork with aging Saudis. We present a range of cultural considerations that shaped the design of the fieldwork and highlight opportunities, challenges, and issues that we faced when conducting interviews and deploying research probes. In particular, we highlight the power and effectiveness of using probes to elicit participants' values, views and desires when working within the sociocultural norms of Saudi Arabia.

Designing the Lost Self: Older Adults' Self-representations in Online Games **Romina Carrasco, Jenny Waycott, Steven Baker, Frank Vetere**

Older adults are increasingly engaging in online activities, including games, with other people. Many online environments require the user to create some form of self-representation, ranging from a simple user name through to a full body avatar. These self-representations not only enable access to online activities, but also provide an opportunity for expressing both the real and ideal identity. We wanted to better understand the impacts of later life on the construction of self-representations when playing online games. Our study used gameplay observations and semi-structured interviews with 10 older adult gamers aged from 65 to 95 years. We found they

designed their player self-representations to project aspects of their lost (former) self and to embrace their present older selves. This engagement with self-representations as a form of self-expression suggests that designers need to consider older gamers, and their diverse preferences, when creating tools for customizable self-representations in online games.

Investigating Gamification for Seniors Aged 75+ **Maximilian Altmeyer, Pascal Lessel, Antonio Krager**

Gamification, the use of game elements in non-game contexts, has been successfully used to motivate people to reach their goals more efficiently or turn unpleasant tasks into fun ones. However, most gamified systems are conceptualized for a younger audience and do not account for age-specific changes in the motivation to play or the perception of game elements. To inform the design of gamified applications targeting elderly people (aged 75+), we investigated their gaming experiences, what affects them positively while playing and their attitudes towards the most commonly used game elements. We report findings from semi-structured interviews and a storyboard-based game element assessment (N=18, mean age=84.61), indicating that the main motivation to play is socializing, that participants avoid competition and prefer collaboration and care-taking as well as that badges and points are considered meaningless and provide a level of visibility that puts participants under pressure.

An Annotated Portfolio on Doing Postphenomenology through Research Products

Sabrina Hauser, Doenja Oogjes, Ron Wakkary, Peter-Paul Verbeek

In this paper, we argue for framing the crafting and studying of research products as doing philosophy through things. We do this by creating an annotated portfolio of such Research through Design (RtD) artifact inquiries as postphenomenological inquiries. In our annotated portfolio, we first provide an account of the postphenomenological commitments of 1) taking empirical work as the basis of the inquiry, 2) analyzing structures of human-technology relations and 3) studying technological mediation. Secondly, we trace these commitments across six RtD artifact inquiries. We conclude with a discussion on how research products can be seen as an experimental way of doing postphenomenology and how HCI design researchers can work with that. As a result, the presented philosophical framing can be leveraged in HCI research to form a deeper and more dimensional understanding of the human-technology relations we craft and study. This also adds a methodological path to moving beyond foci of use, utility, interaction, and human-centeredness.

Understanding Craft-Based Inquiry in HCI

Raune Frankjar, Peter Dalsgaard

Over the last decade, a number of craft-based approaches to research have emerged within the field of Human-Computer Interaction (HCI). In this paper, we examine the roots of crafting as they apply to these approaches, which blend analog crafts with digital technology, and we outline three defining characteristics: the integration of analog and digital crafting processes, the creation of highly refined products, and the creation of a deep and embodied

knowledge. Moreover, we demonstrate how Richard Sennett's tripartite deconstruction of the crafting process can be applied to support analysis of the types and processes of knowledge generated in craft-based approaches to HCI.

Bricks, Blocks, Boxes, Cubes, and Dice: On the Role of Cubic Shapes for the Design of Tangible Interactive Devices

Kevin Lefeuvre, Soren Totzauer, Michael Storz, Albrecht Kurze, Andreas Bischof, Arne Berger

12 JUNE

Cubic shapes play an astonishing role in the design of tangible interactive devices. Due to our curiosity for this widespread design preference lasting over thirty years, we constituted a literature survey of papers, books and products since the late 1970s. Out of a corpus of forty-eight papers, books and products that propose cubic shapes for tangible interactive devices we trace the origins of cubicle tangibles and highlight the rationale for their application. Through a comparative study, we analyze the properties of this shape for tangible interaction design and classify these along the themes of: Manipulation as Input, Placement in Space as Input, Arrangement, Multifunctionality, Randomness, Togetherness & Variations, Physical Qualities, Container, and Pedestal for Output. We propose a taxonomy for cubic shaped tangible interactive devices based on the reviewed contributions, in order to support researchers and designers in their future work of designing cubic shaped tangible interactive devices.

Making Things Apart: Gaining Material Understanding

Martin Murer

This pictorial explores the material resources that can unfold through taking things apart. We describe a workshop program and according exercises designed around four particular modes of disassembling (interactive) artefacts. These exercises aim to provide low-threshold engagements with artefacts and the materials those artefacts are composed of. Based on a series of workshops we

conducted following this program, we depict nine different forms of material resources that are unveiled through taking things apart. With this distinction we aim to contribute to the understanding of how the material histories of components and the rules that were governing their previous relations, are carried over to new compositions during reuse or reinterpretation.

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Tuesday 12 June Morning sessions 9-10:30

Places of Interaction

Session Chair **Carman Neustaedter**

12 JUNE

Words Become Worlds: The LIT ROOM, a Literacy Support Tool at Room Scale

George Schafer, Keith Green, Susan Fullerton, Ian Walker, Amith Vijaykumar

Illiteracy is a global problem impacting the growth and development of individuals and society. Studies indicate that picture book reading within a facilitated storytime setting is an important tool for children's language acquisition. In the research reported here, we hypothesized that literacy, in an increasingly digital society, can be cultivated in a robot-embedded environment that is physical, digital and evocative of the picture book being read. Words become worlds. To test our hypothesis, we designed, prototyped, and implemented the LIT ROOM, a cyber-physical room for literacy. As a Research through Design [RtD] exemplar for interactive systems at habitable scale, the LIT ROOM featured a multi-phase, iterative process of design and evaluation for usability and efficacy. Evaluations with 35 children and 6 librarians in a public library serving a population with grave literacy challenges suggest that our reconfigurable learning environment facilitates a diversity of children's literary responses during the dialogical reading of picture books.

Deepening Visitor Engagement with Museum Exhibits through Hand-crafted Visual Markers

Susan Ali, Boriana Koleva, Ben Bedwell, Steve Benford

Visual markers, in particular QR codes, have become widely adopted in museums to enable low cost interactive applications. However, visitors often do not engage with them. In this paper we explore the application of visual makers that can be designed to be meaningful and th at can be created by visitors themselves. We study both the use of t hese markers as labels for portraits that link to audio recordings and as a mechanism for visitors to contribute their own reflections to the exhibition by drawing a marker and linking an audio comment. Our findings show visitors appreciated the use of the aesthetic markers and engaged with them at three levels - physical placement, aesthetic content and digital content. We suggest that these different levels need to be considered in the design of future visiting systems, which make use of such markers, to ensure they are mutually supporting in shaping the experience.

12 JUNE

TouchBranch: Understanding Interpersonal Touches in Interactive Installation

Seungki Kim, Jiwoo Hong, Jaeyeon Lee, Hyun-Sook Choi, Geehyuk Lee, Woohun Lee

Interpersonal touch, one of the most primitive social languages, is an excellent design element frequently utilized in interaction design. In this study, we present a richer understanding of it by using spatial factors and social relations among people, which has rarely been explored in interactive systems. We designed an interactive installation called "TouchBranch" where players can move light between branches placed at various distances by connecting their bodies. The user studies were conducted with 21 groups consisting of intimates, acquaintances, and strangers. We could observe the change of interpersonal touch pattern and touch tolerance according to each factor. Interestingly, the effect of the social relation was dramatic, but that of the spatial factor was not quantitatively

significant. Nevertheless, we found the potential that spatial factor can influence the interpersonal touch experience. Based on the results, we discussed the influence of two factors on the interpersonal touch that stands out in the context of interactive systems.

Unlocking the Interactive Office: Concurrent Prototyping Approach Tomasz Jaskiewicz, Aadjan van der Helm

In this pictorial we present a project case, where an interactive office environment was designed following concurrent prototyping embedded in an iterative design approach. The case illustrates how concurrent prototyping supports designing complex interactions between multiple people and multiple interactive objects, while innovating in both social and technological realm. Identified variables of the involved process allow steering the design towards a variety of possible solution qualities. We propose this approach as a viable strategy for dealing with the complexity of designing in the domain of Human-Building Interaction.

12 JUNE

ROOM
V312

TRACK
C

Tuesday 12 June Morning sessions 9-10:30

Designing with Machine Learning

Session Chair **Tek-jin Nam**

“It’s hard to argue with a computer:” Investigating Psychotherapists’ Attitudes towards Automated Evaluation

**Tad Hirsch, Christina Soma, Kritzia Merced, Patty Kuo,
Aaron Dembe, Derek Caperton, David Atkins, Zac Imel**

We present CORE-MI, an automated evaluation and assessment system that provides feedback to mental health counselors on the quality of their care. CORE-MI is the first system of its kind for psychotherapy, and an early example of applied machine-learning in a human service context. In this paper, we describe the CORE-MI system and report on a qualitative evaluation with 21 counselors and

trainees. We discuss the applicability of CORE-MI to clinical practice and explore user perceptions of surveillance, workplace misuse, and notions of objectivity, and system reliability that may apply to automated evaluation systems generally.

Grounding Interactive Machine Learning Tool Design in How Non-Experts Actually Build Models

Qian Yang, Jina Suh, Nan-Chen Chen, Gonzalo Ramos

Machine learning (ML) promises data-driven insights and solutions for people from all walks of life, but the skill of crafting these solutions is possessed by only a few. Emerging research addresses this issue by creating ML tools that are easy and accessible to people who are not formally trained in ML (non-experts). This work investigated how non-experts build ML solutions for themselves in real life. Our interviews and surveys revealed unique potentials of non-expert ML, as well several pitfalls that non-experts are susceptible to. For example, many perceived percentage accuracy as a sole measure of performance, thus problematic models proceeded to deployment. These observations suggested that, while challenging, making ML easy and robust should both be important goals of designing novice-facing ML tools. To advance on this insight, we discuss design implications and created a sensitizing concept to demonstrate how designers might guide non-experts to easily build robust solutions.

Investigating How Experienced UX Designers Effectively Work with Machine Learning

Qian Yang, Alex Sciuto, John Zimmerman, Jodi Forlizzi, Aaron Steinfeld

Machine learning (ML) plays an increasingly important role in improving a user's experience. However, most UX practitioners face challenges in understanding ML's capabilities or envisioning what it might be. We interviewed 13 designers who had many years of experience designing the UX of ML-enhanced products and services.

We probed them to characterize their practices. They shared they do not view themselves as ML experts, nor do they think learning more about ML would make them better designers. Instead, our participants appeared to be the most successful when they engaged in ongoing collaboration with data scientists to help envision what to make and when they embraced a data-centric culture. We discuss the implications of these findings in terms of UX education and as opportunities for additional design research in support of UX designers working with ML.

12 JUNE

Interaction Challenges in AI Equipped Environments Built to Teach Foreign Languages Through Dialogue and Task-Completion

Rahul R. Divekar, Jaimie Drozdal, Yalun Zhou, Ziyi Song, David Allen, Robert Nojan Rouhani, Rui Zhao, Shuyue Zheng, Lilit Balagozyan, Hui Su

As cities around the world become more diverse in culture and language, there is a growing need for learning foreign languages. To further this excitement, we have built a human-scale, immersive room with a virtual AI agent that aids foreign language learning. Our system aids the language learning process through task-completion exercises using multi-modal dialogue. The Cognitive and Immersive Room (CIR) is developed as an immersive Chinese restaurant to teach Mandarin, but the interaction challenges and solutions can be reasonably generalized to other languages taught using similar techniques. As users interact with the immersive environment and the virtual AI agent, they face several user interaction challenges. These challenges arise from new learners' lack of proficiency in the foreign language. By studying user interactions in the CIR, we were able to articulate some of the interaction challenges. We have enhanced the AI agent, virtual environment, and the on-boarding process for new users to mitigate these challenges. The enhancements and the results which show that they were effective are discussed here.



Tuesday 12 June Morning sessions 11-12:30

Fingers, Gestures & Bodies

Session Chair Young-Woo Park

12 JUNE

Designing for Multiple Hand Grips and Body Postures within the UX of a moving Smartphone

Rachel Eardley, Anne Roudaut, Steve Gill, Stephen Thompson

In this paper we explore how screen-based smartphone interaction can be enriched when designers focus on the physical interaction issues surrounding the device. These consist of the hand grips used (Symmetric bimanual, Asymmetric bimanual with thumb, Single handed, Asymmetric bimanual with finger), body postures (Sitting at a table, Standing, Lying down) and the tilting of the smartphone itself. These physical interactions are well described in the literature and several research papers provide empirical metrics describing them. In this paper, we go one step further by using this data to generate new screen-based interactions. We achieved this by conducting two workshops to investigate how smartphone interaction design can be informed by the physicality of smartphone interaction. By analysing the outcomes, we provide 14 new screen interaction examples with additional insights comparing outcomes for various body postures and grips.

Gestures for Smart Rings: Empirical Results, Insights, and Design Implications

Bogdan-Florin Gheran, Jean Vanderdonckt, Radu-Daniel Vatavu

We present empirical results about users' gesture preferences for smart rings by analyzing 672 gestures from 24 participants. We report an overall low consensus (mean .112, maximum .225 on the unit scale) between participants' gesture proposals, and we point to the challenges of designing highly-generalizable ring gestures across users. We also contribute to the practice of gesture elicitation studies by discussing how a priori conditions (e.g., participants' traits, such as creativity and motor skills), commitment and behavior

during the experiment (e.g., their thinking times), but also a posteriori aspects (the experimenter's choice of criteria to group gestures into categories) affect agreement. We offer design guidelines for ring gestures informed by our empirical observations, and present a collection of gestures reflective of our participants' mental models for effecting commands using smart rings.

Interactive and Situated Guidelines to Help Users Design a Personal Desk that Fits Their Bodies

Bokyoung Lee, Joongi Shin, Hyoshin Bae, Daniel Saakes

In this paper, we explored the application of human factor guidelines in personal fabrication. This is useful for several Do-It-Yourself (DIY) scenarios, including users adjusting workstation configurations or designing a desk to fit a single person. We identified a dependency map between the user's anthropometrics, ergonomic pose recommendations, and design dimensions. Based on this, we developed situated and interactive guidelines to assist users in design applications. We applied these guidelines in a Virtual Reality (VR) system that lets users customize their desk and provides real-time feedback and feedforward on pose and design. We evaluated the system with six participants, had each one design a personal desk, fabricated their desks, and let them work on their desks for four hours. The design and evaluation contribute to fabrication tools as it helped users be aware of their pose and ergonomic knowledge, and design for their bodies and needs.

EMGuitar: Assisting Guitar Playing with Electromyography

Jakob Karolus, Hendrik Schuff, Thomas Kosch, Paweł Woźniak, Albrecht Schmidt

Mastering fine motor tasks, such as playing the guitar, takes years of time-consuming practice. Commonly, expensive guidance by experts is essential for adjusting the training program to the student's proficiency. In our work, we showcase the suitability of Electromyography to detect fine-grained hand and finger postures

in an exemplary guitar tutor scenario. We present EMGuitar, an interactive guitar tutoring system, that assists students by reporting on play correctness and adjusts playback tempi automatically. We report person-dependent classification utilizing a ring of electrodes around the forearm with an F1 score of up to 0.89 on recorded calibration data. Furthermore, our system was received well by neither diminishing ease of use nor being disruptive for the participants. Based on the received comments, we identified the need for detailed play accuracy feedback down to individual chords, for which we suggest an adapted visualization and an algorithmic approach.

ROOM
V312**Tuesday 12 June Morning sessions 11-12:30**TRACK
B**Co-performing with Machines**Session Chair **Joep Frens****Improvising with an Audience-Controlled Robot Performer****Claire Mikalauskas, Tiffany Wun, Kevin Ta, Joshua Horacsek, Lora Oehlberg**

In improvisational theatre (improv), actors perform unscripted scenes together, collectively creating a narrative. Audience suggestions introduce randomness and build audience engagement, but can be challenging to mediate at scale. We present Robot Improv Puppet Theatre (RIPT), which includes a performance robot (Pokey) who performs gestures and dialogue in short-form improv scenes based on audience input from a mobile interface. We evaluated RIPT in several initial informal performances, and in a rehearsal with seven professional improvisers. The improvisers noted how audience prompts can have a big impact on the scene - highlighting the delicate balance between ambiguity and constraints in improv. RIPT's openness allows for multiple interpretations of how to perform with Pokey, including conversations and multi-performer scenes. Pokey lacks key qualities of a good improviser, but improvisers found his dialogue and gestures rewarding.

Reconfiguring the Appearance and Expression of Social Robots by Acknowledging their Otherness

Laurens Boer, Harvey Bewley

Both a provocative artistic object and research artefact, Blo-nut is part of a project where we explore novel robotic behaviour away from the mimicry of complex human expressions more commonly associated with robotic form and movement. In this pictorial we start by outlining our underlying design principles for the design process and use images to describe the making, real-time GUI and the 'choreographic sketching' of Blonut's movement characteristics. Finally, we argue for embracing novel and provoking 'otherness' in form and material when exploring interaction and communication with social robots.

12 JUNE

Designing Expressions of Movement Qualities

Jeroen Peeters, Ambra Trotto

Tango is a form of partner dancing in which two bodies sense one another, and move accordingly, in a dynamic, physical dialogue that is known for its subtle complexities, beauty and intimate experience. In MoCap Tango, we explore how we can build on our skills as designers to highlight and unravel these embedded qualities and use them as inspiration in designing interactions. In this pictorial, we invite the reader to actively participate in the designerly engagement that turns objective data into subjective expressions; highlighting the qualities embedded in the movements of professional dancers.

Aeroquake: Drone Augmented Dance

Heesoon Kim, James A. Landay

As drone-based entertainment grows popular, researchers have explored different forms of expression and systems to support drone performances. However, most of these systems are pre-programmed and do not interact with the body movement of dancers in real-time. In response, some have presented drone performances using

bulky camera systems to track the performer's body movement. We introduce Aeroquake, an augmented dance system that uses simple wearable microphones to enhance a dancer's body movement with sound and control the movement of drones in real-time. Dancers experience a simulation of "quaking" the space around them: upon stomping, the movement is translated into sound and vertical motion across multiple drones. Aeroquake allows dancers to improvise choreography and explore their creativity in the space in which they choose to dance. We worked with a dancer to validate our system by performing for a live audience.

ROOM
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C**Tuesday 12 June Morning sessions 11-12:30****Reflection, Remembrance & Connection**Session Chair **Eli Blevis****Towards Materials for Computational Heirlooms: Blockchains and Wristwatches****Mehmet Aydın Baytaş, Aykut Coşkun, Asım Evren Yantaç, Morten Fjeld**

This paper explores the contrasting notions of "permanance and disposability," "the digital and the physical," and "symbolism and function" in the context of interaction design. Drawing from diverse streams of knowledge, we describe a novel design direction for enduring computational heirlooms based on the marriage of decentralized, trustless software and durable mobile hardware. To justify this concept, we review prior research; attempt to redefine the notion of "material"; propose blockchain-based software as a particular digital material to serve as a substrate for computational heirlooms; and argue for the use of mobile artifacts, informed in terms of their materials and formgiving practices by mechanical wristwatches, as its physical embodiment and functional counterpart. This enables mobile and ubiquitous interactive systems for the storing, experiencing, and exchanging value throughout multiple human lifetimes; showcasing the feats of computational sciences and crafts; and enabling novel user experiences.

Design Inspirations from the Wisdom of Years

Eli Blevis, Shunying Blevis

Some recently emergent themes in HCI include adapting to changing conditions by simplifying life, learning skills of adaptation, and finding balance between the digital world and an authentic physical world. These themes imply that design is best understood as ontological - that is, design concerns lifestyles and ways of being. This pictorial celebrates the delight the authors take in nuclear family and the wisdom of their parents' simpler lifestyle. This case may be understood more generally as an instrument of inspiration to help find balance between the potentials of technology and traditional notions of a life worth living. Our images are accompanied by inspirations for thinking about interaction design differently.

12 JUNE

Respectful Disconnection: Understanding Long Distance Family Relationships in a South Korean Context

Euijin Hwang, Reuben Kirkham, Andrew Monk, Patrick Olivier

We report upon the conduct and findings of an investigation into technology design for long-distance relationships (LDRs), where South Korean culture raises specific challenges. Through two qualitative studies we explore inter-generational LDRs from the perspective of South Korean students based in the United Kingdom. We identify and document the particular nuances within, and challenges that arise from, these relationships, before turning to the pragmatics of technology design for LDRs. Through both an extended diary study and interviews with students, we illustrate the impact of Korean familial obligations on intergenerational LDRs, and the mistrust and anxiety on both sides (parents and students) arising from limitations in communication channels. From our findings, we develop the notion of "respectful disconnection" which we propose as a framework for designing interactions that appropriately support LDRs within this specific South Korean context.

Understanding Automatic Conveyor-belt Columbaria: Emerging Sites of Interactive Memorialization in Japan

Daisuke Uriu, William Odom, Hannah Gould

Focusing on the design of technology for mourning and memorialization, we describe the emergence of Automatic Conveyor-belt Columbaria, locally developed in Japan, as an example of an interactive system combining physical and digital remains, and discuss its user experiences and social influences. It concludes with implications for future HCI research and practice with a focus on future grave sites and memorialization sites in dense urbanized regions.

12 JUNE

ROOM
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Tuesday 12 June Afternoon sessions 14-15:30

TRACK

A

Design Research Methods

Session Chair **Margot Brereton**

Revealing Tensions in Autobiographical Design in HCI

Audrey Desjardins, Aubree Ball

While self-usage has long been regarded as a questionable approach in human-computer interaction (HCI) research, recent projects have shown the successful use of autobiographical design as a method to investigate long-term and intimate relations between people and technologies in everyday life. In an effort to continue the development of methodological best practices, we need to acknowledge with more nuance the tensions that arise in use. In this paper, we articulate such tensions by examining two first-hand accounts of using autobiographical design and four autobiographical design projects of other HCI researchers. Our findings address: genuine needs, design participation, intimacy, reflexivity, and authorial voice. Our contribution is constituted of critical insights into the complexities of using autobiographical design and recommendations for researchers interested in using this method.

Living Without a Mobile Phone: An Autoethnography

Andrés Lucero

This paper presents an autoethnography of my experiences living without a mobile phone. What started as an experiment motivated by a personal need to reduce stress, has resulted in two voluntary mobile phone breaks spread over nine years (i.e., 2002-2008 and 2014-2017). Conducting this autoethnography is the means to assess if the lack of having a phone has had any real impact in my life. Based on formative and summative analyses, four meaningful units or themes were identified (i.e., social relationships, everyday work, research career, and location and security), and judged using seven criteria for successful ethnography from existing literature. Furthermore, I discuss factors that allow me to make the choice of not having a mobile phone, as well as the relevance that the lessons gained from not having a mobile phone have on the lives of people who are involuntarily disconnected from communication infrastructures.

12 JUNE

Photography as a Design Research Tool into Natureculture

Szu-Yu Liu, Jeffrey Bardzell, Shaowen Bardzell

We use photography as a research method to cultivate a designerly sensibility of the theoretical concept natureculture, a provocation to transgress the dichotomy of nature and culture. We investigate the visual language of natureculture through an iterative practice of creating, editing, organizing, and reflecting on images. Specifically, we explore natureculture as spatiotemporal movements, sediment-like layers, heterogeneous gatherings, formal homonyms, emotional experiences, and aestheticized expressions of style. Each of these has a materioformal concreteness and symbolic density that supports design ideation on topics such as environmental sustainability, agroecological systems, human-animal cohabitation, urban informatics, and more.

Behavior Change Design Sprints

Lucas Colusso, Tien Ngoc Do, Gary Hsieh

While numerous design methods used in industry help designers rapidly brainstorm design ideas, few help them to use theory in the design process. Behavior change theories can support such design activities as understanding, ideating, sketching, and prototyping. We present the Behavior Change Design Sprint (BCDS), a design process for applying behavior change theories to the design process and for prototyping behavior change technologies. BCDS facilitates the application of theories into the design process through a series of exercises that help designers identify intervention placement and project behavioral outcomes, conduct more focused ideation, and advocate for their design rationale. We present our process to create the sprint and findings from a series of sprint deployments.

12 JUNE

ROOM
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B

Tuesday 12 June Afternoon sessions 14-15:30

Immersive Experiences, Scenarios, & Technologies

Session Chair **Mathias Funk**

Viking VR: Designing a Virtual Reality Experience for a Museum

Guy Schofield, Gareth Beale, Nicole Beale, Martin Fell, Dawn Hadley, Jonathan Hook, Damian Murphy, Julian Richards, Lewis Thresh

Viking VR is a Virtual Reality exhibit through which viewers can experience the sights and sounds of a 9th Century Viking encampment. Created as part of a major museum exhibition, the experience was developed by an interdisciplinary team consisting of artists, archaeologists, curators and researchers. In this paper, approaches to the design of authentic, informative and compelling VR experiences for Cultural Heritage contexts are discussed. We also explore issues surrounding interaction design for the long-term deployment of VR experiences in museums and discuss the challenges of VR authoring workflows for interdisciplinary teams.

Immersive Design Fiction: Using VR to Prototype Speculative Interfaces and Interaction Rituals within a Virtual Storyworld

Joshua McVeigh-Schultz, Max Kreminski, Keshav Prasad, Perry Hoberman, Scott Fisher

Immersive design fiction is a novel approach that embeds speculative interactions within a rich virtual reality (VR) storyworld. Immersive design fictions use VR to translate new design opportunities into story-driven, embodied experiences by positioning the participant as a character in a narrative world. This paper presents a case study of an immersive design fiction that depicts a fictionalized reimagining of an industry partner's work practices. This VR experience explores speculative interfaces for creative work and collaboration in the context of a fictional workplace environment. By placing design fictions within rich immersive contexts such as room-scale VR, researchers and practitioners can go beyond prototyping imagined interfaces to also speculate about the interaction rituals and surrounding social context within an experiential storyworld. This approach makes methodological and theoretical contributions to design fiction research by demonstrating a toolkit for exploring and reflecting upon the intersections between speculation, embodiment, and narrative context.

12 JUNE

SketchStudio: Experience Prototyping with 2.5-Dimensional Animated Design Scenarios

Han-Jong Kim, Chang Min Kim, Tek-Jin Nam

Recent subject matters of design have become complex systems involving various elements and multiple users' interactions in large-scale spaces. In addition, visualizing these complex design subjects without preparing heavy resources in the early design phases is challenging. In this paper, we present SketchStudio, a prototyping tool for generating, sharing, and reviewing an animated design scenario involving complex design subjects. The tool allows designers to define the user experience by simply creating a node graph of the user's journey over time and space. SketchStudio instantly generates unique 2.5D animated

design scenarios by blending 2D sketches and 3D characters. In addition, the tool supports the virtual reality mode for immersive views of the created scenario prototype. We also report on the result of a user study with nine potential users in the design practice and education fields. Based on our tool-developing experiences as well as on the study results, we discuss possible applicable areas and points for further improvement.

12
JUNE

How Display Shapes Affect 360-Degree Panoramic Video Communication

Zhengqing Li, Shio Miyafuji, Toshiki Sato, Hideki Koike, Naomi Yamashita, Hideaki Kuzuoka

Field-of-view limitation has been a long-standing issue in video communication systems. With the advancement of omnidirectional panoramic technology, the omnidirectional camera, which can provide a 360 degree field of view, has become increasingly popular in the last few years. Previous research indicated that one-way video communication systems with a wider field of view improve task efficiency. Therefore, we propose to utilize omnidirectional cameras in a symmetrical video communication system and study how this configuration affects remote collaboration. In this study, we conducted experiments based on two conditions, which are an omnidirectional camera with a spherical display and an omnidirectional camera with a horizontally placed 2D flat display. Under these conditions, we analyzed how the display types affected remote collaboration. Our results show that participants marginally preferred the spherical display to the 2D flat display. We also show the advantages and disadvantages of each display. The findings contribute to our understanding of how to design an environment for remote collaboration that captures and shows a 360 degree panoramic view of a remote site.

“Hey Alexa, What’s Up?”: A Mixed-Methods Study of In-Home Conversational Agent Usage**Alex Sciuto, Arnita Saini, Jodi Forlizzi, Jason Hong**

In-home, place-based, conversational agents have exploded in popularity over the past three years. In particular, Amazon’s conversational agent, Alexa, now dominates the market and is in millions of homes. This paper presents two complementary studies investigating the experience of households living with a conversational agent over an extended period of time. First, we gathered the history logs of 75 Alexa participants and quantitatively analyzed over 278,000 commands. Second, we performed seven in-home, contextual interviews of Alexa owners focusing on how their household interacts with Alexa. Our findings give the first glimpse of how households integrate Alexa into their lives. We found interesting behaviors around purchasing and acclimating to Alexa, in the number and physical placement of devices, and in daily use patterns. Participants also uniformly described interactions between children and Alexa. We conclude with suggestions for future improvement for intelligent conversational agents.

Intimate Futures: Staying with the Trouble of Digital Personal Assistants through Design Fiction**Marie Louise Juul Søndergaard, Lone Koefoed Hansen**

While digital personal assistants (DPAs) are moving into our homes, managing our everyday lives and providing help in the household, we have barely begun to understand them. Design fiction can be a method for contextualizing the social and cultural implications for adoption of future technologies like DPAs. In this paper, we present an analytical perspective on gender issues arising when a DPA moves into our home Through a critical feminist design

methodology, the design fiction project “Intimate Futures” focuses on how a DPA’s character and functions are often gendered and what it means for the design and adoption of a DPA. We argue that the gender issues of DPAs are interwoven with our collective imaginings of DPAs, and that design fiction is a method to explore and “trouble” our collective imaginings of DPAs. The paper contributes with an analysis of gender issues of DPAs, and a methodological way of “staying with the trouble” of future technologies through design fiction.

Designing for Workplace Reflection: A Chat and Voice-Based Conversational Agent

**Rafał Kocielnik, Daniel Avrahami, Jennifer Marlow, Di Lu,
Gary Hsieh**

Conversational agents stand to play an important role in supporting behavior change and well-being in many domains. With users able to interact with conversational agents through both text and voice, understanding how designing for these channels supports behavior change is important. To begin answering this question, we designed a conversational agent for the workplace that supports workers’ activity journaling and self-learning through reflection. Our agent, named Robota, combines chat-based communication as a Slack Bot and voice interaction through a personal device using a custom Amazon Alexa Skill. Through a 3-week controlled deployment, we examine how voice-based and chat-based interaction affect workers’ reflection and support self-learning. We demonstrate that, while many current technical limitations exist, adding dedicated mobile voice interaction separate from the already busy chat modality may further enable users to step back and reflect on their work. We conclude with discussion of the implications of our findings to design of workplace self-tracking systems specifically and to behavior-change systems in general.

Evaluating and Informing the Design of Chatbots

Mohit Jain, Pratyush Kumar, Ramachandra Kota,
Shwetak N. Patel

Text messaging-based conversational agents (CAs), popularly called chatbots, received significant attention in the last two years. However, chatbots are still in their nascent stage: They have a low penetration rate as 84% of the Internet users have not used a chatbot yet. Hence, understanding the usage patterns of first-time users can potentially inform and guide the design of future chatbots. In this paper, we report the findings of a study with 16 first-time chatbot users interacting with eight chatbots over multiple sessions on the Facebook Messenger platform. Analysis of chat logs and user interviews revealed that users preferred chatbots that provided either a “human-like” natural language conversation ability, or an engaging experience that exploited the benefits of the familiar turn-based messaging interface. We conclude with implications to evolve the design of chatbots, such as: clarify chatbot capabilities, sustain conversation context, handle dialog failures, and end conversations gracefully.

12 JUNE

The Emerging Nature of Participation in Multispecies Interaction Design

Clara Mancini, Jussi Lehtonen

12 JUNE

Interactive technology has become integral part of daily life for both humans and animals, with animals often interacting with technologized environments on behalf of humans. For some, animals' participation in the design process is essential to design technology that can adequately support their activities. For others, animals' inability to understand and control design activities inevitably stands in the way of multispecies participatory practices. Here, we consider the essential elements of participation within interspecies interactions and illustrate its emergence, in spite of contextual constraints and asymmetries. To move beyond anthropomorphic notions of participation, and consequent anthropocentric practices, we propose a broader participatory model based on indexical semiosis, volition and choice; and we highlight dimensions that could define inclusive participatory practices more resilient to the diversity of understandings and goals among part-taking agents, and better able to account for the contribution of diverse, multispecies agents in interaction design and beyond.

BubbleTalk: Enriching Experience with Fish by Supporting Human Behavior

Donghyeon Ko, Daye Kwon, Eunjin Kim, Woohun Lee

Despite the popularity of fish as pets, there is little knowledge available about the fishkeeping experience and the related interactions. In this regard, this study aims to look into the experience of fishkeeping by supporting people's actions through a tech-mediated system. Based on the results, an interactive system called BubbleTalk was developed to help people to convey their actions using bubbles into a fish tank. A

user study was conducted with BubbleTalk, and the results showed that the interaction through BubbleTalk varied people's behavior, prolonged their interaction and thus reshaped their relationship with fish. Beyond the implications for fishkeeping, we believe that our findings could serve as insight and further motivation for overcoming interactions limited by this physically disconnected environment.

Confronting People's Fears about Bats: Combining Multi-modal and Environmentally Sensed Data to Promote Curiosity and Discovery

Matej Kaninsky, Sarah Gallacher, Yvonne Rogers

Bats are often disliked and feared by people. How might we enable the general public to learn more about the true nature of these creatures, and even to like them? In this paper, we introduce PlayBat, a physical public display, which combines a multi-modal interface, a constrained narrative structure and real-time IoT environmentally sensed bat call data. The aim of our research is to investigate whether promoting curiosity and discovery through enabling people to explore real-life data, answer quiz-like questions and engage with a multi-modal interface, is effective at engaging people and confronting their fears. We report on the design process and implementation of PlayBat, and the findings from an in-the-wild study. We discuss how tapping into multiple senses can draw people in, evoke curiosity and even change their views.

Hiking Hacks: Workshop Model for Designing Wilderness Interactions

Andrew Quitmeyer

This paper describes a methodology for conducting interaction design research workshops within wilderness locations. In biological field expeditions, scientists travel to areas with minimal infrastructure to conduct research in environments featuring unique, naturalistic interactions. Digital interaction design is growingly important to field biologists as a way to develop new forms of

scientific exploration and experimentation. Ideally field biologists would create their own interactive, scientific tools based upon their developing research questions. In practice, however, time and training constraints mean design is typically outsourced to specialized practitioners in dedicated laboratories. The Hiking Hack model unites biologists and designers in collaborative, outdoor workshops. Hiking Hacks combine experiences and techniques from biological expeditions with Research Through Design methodologies. This model has been refined and analyzed throughout several Hiking Hack expeditions. The result is an adaptable workshop structure considering gear, practices, and syllabi for exploring interaction design situated within wild environments.

ROOM
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Tuesday 12 June Afternoon sessions 16-17:30

TRACK
B

Design Issues in the Wild

Session Chair **Corina Sas**

Social Media Is Polarized, Social Media Is Polarized: Towards a New Design Agenda for Mitigating Polarization

Matti Nelimarkka, Salla Laaksonen, Bryan Semaan

Social media platforms have often been described as online spaces supporting political discourse. However, online discussions are often polarized; people tend to commune with those who are ideologically similar to them. The HCI response to this phenomenon has been to purposefully expose people to diverse viewpoints. This common design agenda is supported through analysis of link sharing, yet little attention has been paid to how users discuss these links. Therefore, the common design agenda may not mitigate polarization. We study the emergent discourse in 10 Finnish migration-related Facebook groups and examine how the same links are shared and discussed across anti- and pro-migration camps. Qualitative analysis of the posts and comments revealed that shared media links do not bridge polarized groups with regard to worldviews and opinions. We then

demonstrate alternative design opportunities to resolve this issue and begin to develop a new design agenda to mitigate polarization.

Grumble to Policy Need: Deriving Public Policy Needs from Daily Life on Social Media Platform

Chorong Kim, Haesung Yang, Sukwoo Jang, Ki-Young NAM

This research explored ways of utilizing social media to engage non-activist users in public policy development using a design intervention. The intervention was designed to enable the users to derive policy needs from their daily life contents. We implemented the intervention in Facebook by posting stimuli on a Facebook page and collecting user comments. A qualitative analysis shows that the users' playful grumbles on daily life could evolve into collective needs on public policies. We identified social media functions that facilitated the intervention. We discuss how social media systems could be developed to engage non-activist users for bottom-up public policy development.

12 JUNE

Caller Needs and Reactions to 911 Video Calling for Emergencies

Samarth Singhal, Carman Neustaedter

Emergency services in North America have relied on the use of audio calls to the phone number, 9-1-1, since the late 1960s. In the coming years, 9-1-1 services will move to integrate media-rich calling capabilities such as video-based calling. We explore how video calling services should be designed through an interview study with people who have called 9-1-1 in the past. Our results show the potential for video calling to help people who are calling 9-1-1 describe their location to call takers, show the situation at hand, receive video-based instructions, and assist in cases with language barriers. Yet video calling raises issues around anonymity, consent, culture and gender-based biases, and camera work. 9-1-1 video calling is best thought of as a collaborative act where camera work is negotiated between callers and call takers where callers are willing to hand over control of the call if their privacy concerns can be met.

POSEIDON - Passive-acoustic Ocean Sensor for Entertainment and Interactive Data-gathering in Opportunistic Nautical-activities

Marko Radeta, Nuno Nunes, Dinarte Vasconcelos, Valentina Nisi

Recent years demonstrate an increased interest in Passive Acoustic Monitoring (PAM) applications when studying cetaceans. However, they remain expensive underwater systems and targeted for industrial and military purposes. While the usage of smartphones as acoustic sensors has been observed in terrestrial environments, ocean and nautical PAM applications remain greatly unexplored. This paper presents the design, deployment and testing of a POSEIDON system, used for real-time augmentation of whale-watching experiences. We collect and use cetaceans' vocal call acoustic samples (clicks, moans and whistles) and apply machine learning for offline model training and prediction. When discriminating the calls, we find that Extra Trees and Gradient Boosting outperform other classifiers (>0.95 confidence threshold). Collected samples are at disposal to citizen scientists and marine biologists. Future studies involve real-time on-boat user testing.

12 JUNE

PANEL
1

ROOM
V302

Tuesday 12 June Afternoon sessions 16-17:30

Session Chair

Designing for Social Change

Ilpo Koskinen

Goal of Panel

Open up a conversation and debate about possibilities, potential, and limits of future work in this area.

Panelists

Tawanna Dillahunt, Sarah Fox, Tad Hirsch, Phoebe Sengers, Daisy Yoo

Assessment of Perceptual-Cognitive Abilities among Athletes in Virtual Environments: Exploring Interaction Concepts for Soccer Players

Markus Wirth, Stefan Gradl-Trautvetter, Dino Poimann,
Hannes Schaeffe, Julia Matlok, Harald Koerger, Bjoern Eskofier

Cognitive skills and their assessment gain increasing importance in soccer. In the past, athletes' perceptual-cognitive capabilities were only assessed using 2D media with its limitations. We used a virtual reality 360 degree video environment, where 15 high-skilled and 15 low-skilled soccer players (age 24+-3 years) experienced nine real-life soccer scenes from varying perspectives. The experience was frozen at crucial time points where they had to decide for one of three soccer actions. The recognition-action time and risk-level for decision were determined. Furthermore, six different interaction concepts were evaluated with respect to user experience, presence and immersion to find the most adequate and appealing one for assessment and training in soccer. Results show that high-skilled players had a significantly lower overall recognition-action time. Risk-values for decisions did not differ significantly between skill levels.

Flow State Feedback Through Sports Wearables: A Case Study on Tennis

Hayati Havlucu, Terry Eskenazi, Baris Akgun, Mehmet Cengiz Onbaşlı, Aykut Coskun, Oguzhan Ozcan

Flow state is a psychological state of optimal performance. To experience flow state, one needs to receive unambiguous feedback. Previous studies have described activities with internalized feedback modalities (e.g. visual). However, they do not offer any appropriate

feedback modality for the activities that may benefit from external feedback, such as opponent-based sports. Addressing the issue, we adopted a research through design process and considered tennis as our case, in which players can benefit from attaining flow. This pictorial reveals our approach to design 6 wearable device concepts under 3 design themes as future directions for design practitioners and researchers.

Movement Correction in Instructed Fitness Training: Design Recommendations and Opportunities

Laia Turmo Vidal, Elena Márquez Segura, Annika Waern

13 JUNE

The use of technology to assist in instructed fitness training in collocated social settings is underexplored. Here we focus on how technology can be designed to fit within, leverage, and be part of the strategies and tools that fitness trainees and instructors use to detect and correct performance errors.

Drawing on ethnomethodological approaches and using the concept of correction to focus our analysis, we scrutinize the interaction between instructor and trainees in two fitness activities, AntiGravity Fitness and Pilates. We identify social configurations and resources employed in instances of correction. We also present an analytical tool useful for deconstructing such correction processes, highlighting the strategies and resources used by the social actors, and their impact on performance. Based on insights gained from our analyses, we propose design recommendations and identify design opportunities that capitalize on existing tools and collaborative correction strategies, such as scaffolding the correction process.

Exploring Interaction DesignSession Chair **Colin Gray****Botanical Printer: An Exploration on Interaction Design with Plantness**

Yuan-Yao Hsu, Wenn-Chieh Tsai, Wan-Chen Lee, Rung-Huei Liang

Thing-centered design has suggested analyzing our product-scape through the metaphor of agency. However, interaction design with plant-related agency usually animates plants to simulate human behavior. We intend to make interactive things with the ontological nature of plants. Through workshops including guided annotation of six artifacts and situated probes, the senses of the “plantness” of an artifact emerge. Drawing on these understandings, we built and deployed Botanical Printer, which lives with us slowly responding to natural and electronic climates. We present rich results including conceptual, situated, and interactive plantness. Empirical data allow us to explore the future of object-oriented speculation in greater depth.

13 JUNE

Designing Blo-nut: Design Principles, Choreography and Otherness in an Expressive Social Robot

Harvey Bewley, Laurens Boer

Both a provocative artistic object and research artefact, Blo-nut is part of a project where we explore novel robotic behaviour away from the mimicry of complex human expressions more commonly associated with robotic form and movement. In this pictorial we start by outlining our underlining design principles for the design process and use images to describe the making, real-time GUI and the “choreographic sketching” of Blonut’s movement characteristics. Finally, we argue for embracing novel and provoking “otherness” in form and material when exploring interaction and communication with social robots.

Multiscale Design Strategies in a Landscape Architecture Classroom

Nic Lupfer, Hannah Fowler, Alyssa Valdez, Andrew Webb,
Jeremy Merrill, Galen Newman, Andruid Kerne

We derive a theory of multiscale design through a study of a landscape architecture studio classroom. We find that processes of designing, to meet a site's situated needs, involve creating and connecting representations across levels, such as overview and detail. We introduce multiscale design theory, which works to understand how designers explore, juxtapose, and synthesize relationships across levels of scale. We identify three design strategies landscape architecture students use to work with scale: multiply, map, and shift perspective. We combine these strategies with prior literature, across fields, to initiate a theory of multiscale design.

13 JUNE

PANEL
2

ROOM
V302

Wednesday 13 June Morning sessions 9-10:30

Educating Designers

Session Chair

Eli Blevis

Goal of Panel

Open up a conversation about opportunities and challenges of introducing emerging technologies, new design paradigms and/or design trends into design curricula.

Panelists

**Huaxin Wei, Ron Wakkary, Silvia Lindtner,
Eli Blevis, Audrey Desjardins, Bart Hengeveld**

Crafting FabricationSession Chair **Audrey Desjardins****Plain2Fun: Augmenting Ordinary Objects with Interactive Functions by Auto-Fabricating Surface Painted Circuits****Tianyi Wang, Ke Huo, Pratik Chawla, Guiming Chen, Siddharth Banerjee, Karthik Ramani**

The growing makers' community demands better supports for designing and fabricating interactive functional objects. Most of the current approaches focus on embedding desired functions within new objects. Instead, we advocate repurposing the existing objects and rapidly authoring interactive functions onto them. We present Plain2Fun, a design and fabrication pipeline enabling users to quickly transform ordinary objects into interactive and functional ones. Plain2Fun allows users to directly design the circuit layouts onto the surfaces of the scanned 3D model of existing objects. Our design tool automatically generates as short as possible circuit paths between any two points while avoiding intersections. Further, we build a digital machine to construct the conductive paths accurately. With a specially designed housing base, users can simply snap the electronic components onto the surfaces and obtain working physical prototypes. Moreover, we evaluate the usability of our system with multiple use cases and a preliminary user study.

Design with Minimal Intervention: Drawing with Light and Cracks**Nir Dick, Naama Glauber, Adi Yehezkeili, Moran Mizrahi, Shani Reches, Maiayn Ben-Yona, Anna Carmi, Amit Zoran**

Industrial design focuses on minimizing fabrication variability, aiming for identical products, while craft practice often results in unpredictable outcomes. We rely on crackle, an explicit pottery phenomenon that renders a pattern of cracks in ceramic glazing,

to produce craft-unique outcomes in a moderately controlled design process. With the help of a dedicated CAD tool and a laser machine, we embed artificial decorations in a crackle pattern. By pre-processing the clay and post-processing the glaze, we demonstrate a technique to partially control the typical size of cracks in a given area, thus embedding visual forms in the glaze.

PARAMETRIC HABITAT: Virtual Catalog of Design Prototypes

Rony Ginosar, Hila Kloper, Amit Zoran

Generative tools contribute new possibilities to traditional design, yet formal representation of digital procedures can be counterintuitive to some makers. We envision the use of catalogues in parametric design, replacing abstract design procedures with a given set of visual options to select from and react to. We review the research challenges in realizing our catalog vision. We contribute an embryonic catalog generated from a formal list of parameters, demonstrated on a parametric mushroom. We also present a simple user study where students engaged in a design task relying on a catalog of prototypes generated by parametric design.

CutCAD - An Open-source Tool to Design 3D Objects in 2D

Florian Heller, Jan Thar, Dennis Lewandowski, Mirko Hartmann, Pierre Schoonbrood, Sophy Stoenner, Simon Voelker, Jan Borchers

Laser cutters are 2D tools, but their speed and compatibility with a variety of affordable materials also makes them a frequent choice to create 3D objects. We propose CutCAD, a tool to easily construct simple 3D objects from 2D faces, inspired by the process of paper modeling and magnetic construction kits. The user creates her 3D model by drawing or loading existing 2D shapes, and connecting their edges in the software. CutCAD then automatically resolves the resulting constraints, and folds the faces up into a 3D model that is previewed live. CutCAD also automatically creates the required finger joints based on thickness of the material and dihedral angles, for smooth assembly. Cutouts are easy to add by importing their

outlines as vector drawings, and placing them onto faces. After the faces have been cut, CutCAD provides assembly instructions. Observations and feedback from using CutCAD show the resulting process to be easier to understand than traditional 3D modelling. CutCAD is open-source, and has been downloaded over 2,000 times.

ROOM
V312

Wednesday 13 June Morning sessions 11-12:30

TRACK
B

Design for Collective Action

Session Chair **Austin Toombs**

Roaming Objects: Encoding Digital Histories of Use into Shared Objects and Tools

Anton Fedosov, William Odom, Marc Langheinrich, Ron Wakkary

An increasing number of non-profit groups and organizations have formed “libraries” of shared things to leverage the collaborative use of underutilized resources (e.g., power tools) for the benefit of local communities. Their key challenges are the transience and anonymity of their members, and how to nurture creative interactions among them. We designed and developed Roaming Objects, an interactive system aimed at supporting the capture and sharing of equipment-use experiences among these members. We deployed the system for two months in a tool-sharing cooperative to explore how it may help to address these challenges. We offer insights into how resource sharing cooperatives and collectives could be better supported, by proposing design opportunities that facilitate sharing both physical objects and digital information about their use.

13 JUNE

ShareBox: Designing A Physical System to Support Resource Exchange in Local Communities

Matthew V Law, Mor Naaman, Nicola Dell

Indirect resource exchange (IRE), where individuals share physical items with one another but do not receive direct benefits

(e.g. payment), has the potential to increase communities' access to resources, reduce consumption and waste, and bootstrap social ties. Although social technologies could play a key role in realizing this potential, significant barriers have emerged to the adoption of IRE services, including concerns related to trust, reciprocity, and coordination. To explore these issues, we designed and iterated on a concept called ShareBox, a system that enables IRE through a smart lockbox. We developed ShareBox as a technology probe following a set of design guidelines including: creating a physical-virtual system, enabling asynchronous and anonymous exchange, allowing for low-entry-barrier interactions, and emphasizing affordability and flexibility. We explore the benefits and trade-offs of these design guidelines through short deployments and semi-structured interviews with community members, and present findings that highlight both the potential and the remaining challenges of our design.

13 JUNE

Pinsight: A Novel Way of Creating and Sharing Digital Content through 'Things' in the Wild

Can Liu, Ben Bengler, Danilo DI Cuia, Katie Seaborn, Giovanna Nunes Vilaza, Sarah Gallacher, Licia Capra, Yvonne Rogers

Existing platforms for sharing locative digital content rely on the use of mobile phones for accessing the content. This can be a major deterrent to wider public access and also hinders immediacy and "in the moment" discoverability. Building on previous work in situated public installations, we developed Pinsight, a novel platform for enabling end-users, such as local communities, to create and share digital content in-situ with public audiences through physical interactive devices. Pinsight is based on a set of design principles that focus on supporting both the expressiveness of content creators and the appeal to public audiences. This paper describes the design of the platform and how it supports sharing knowledge in ways different to conventional media. Through preliminary evaluations and two in-the-wild studies, we explore how such a situated technology can be used by different user groups (content designers, history communities, local residents) for sharing content with public audiences (visitors, pedestrians, residents) in different contexts.

Stop the Noise! Enhancing Meaningfulness in Participatory Sensing with Community Level Indicators

Saskia Coulson, Mel Woods, Michelle Scott, Drew Hemment, Mara Balestrini

In this paper we examine ways to make data more meaningful and useful for citizens in participatory sensing. Participatory sensing has evolved as a digitally enabled grassroots approach to data collection for citizens with shared concerns. However, citizens often struggle to understand data in relation to their daily lives, and use them effectively. This paper presents a qualitative study on the development of a novel approach to Community Level Indicators (CLIs) during two participatory sensing projects focused on noise pollution. It investigates how CLIs can provide an infrastructure to address challenges in participatory sensing, specifically, making data meaningful and useful for non-experts. Furthermore, we consider how this approach moves towards an ambition of achieving change and impact through participatory sensing and discuss the challenges in this way of working and provide recommendations for future use of CLIs.

13 JUNE

ROOM
V302

Wednesday 13 June Morning sessions 11-12:30

TRACK
C

Micro-Sites of Interaction

Session Chair Anthony Tang

GazeForm: Dynamic Gaze-adaptive Touch Surface for Eyes-free Interaction in Airliner Cockpits

Sylvain Pauchet, Catherine Letondal, Jean-Luc Vinot, Mickaël Causse, Mathieu Cousy, Valentin Becquet, Guillaume Crouzet

An increasing number of domains, including aeronautics, are adopting touchscreens. However, several drawbacks limit their operational use, in particular, eyes-free interaction is almost impossible making

it difficult to perform other tasks simultaneously. We introduce GazeForm, an adaptive touch interface with shape-changing capacity that offers an adapted interaction modality according to gaze direction. When the user's eyes are focused on interaction, the surface is flat and the system acts as a touchscreen. When eyes are directed towards another area, physical knobs emerge from the surface. Compared to a touch only mode, experimental results showed that GazeForm generated a lower subjective mental workload and a higher efficiency of execution (20% faster). Furthermore, GazeForm required less visual attention and participants were able to concentrate more on a secondary monitoring task. Complementary interviews with pilots led us to explore timings and levels of control for using gaze to adapt modality.

13
JUNE

WristOrigami: Exploring Origami-inspired Foldable Design for Multi-Display Smartwatch

Kening Zhu, Morten Fjeld, Ayça Ünlüer

We present WristOrigami, an origami-inspired design concept and system extending the interaction with smartwatches through a foldable structure with multiple on-wrist displays. The current design provides extra affordances via folding, flipping, and elastic pulling actions on a multi-display smartwatch. To motivate the design of WristOrigami, we developed a taxonomy that could be useful for analyzing and characterizing the origami-inspired multi-display smartwatch interaction. Through a participatory-design study with a set of prototypes with different levels of fidelity, we investigated users' perception of WristOrigami in a wide range of applications with the presented features, and summarized a list of common shape configurations. We summarized our findings into seven design recommendations, to inform the future design of foldable smartwatch interactions. We further developed a set of application demonstrations as proofs-of-concept.

Pressure or Movement? Usability of Multi-Functional Foot-Based Interfaces

Taeyong Kim, Hao Ju, Jeremy R Cooperstock

Despite considerable prior work exploring foot-based interaction techniques, direct comparisons of the performance of these approaches have been lacking. Here, we compare the performance of the two most common approaches found in previous studies: rocking (applying pressure to different parts of the foot) versus rotating and sliding, considering the use case of a hands-free interface intended for seated musicians. Participants performed a number of representative operations, such as setting the tempo of a metronome, using the two strategies. Results indicate superiority of the rotating and sliding approach, both in completion time and responses to NASA TLX questionnaires, although rocking was preferred by some participants due to its ergonomics and subtle movements required for parameter-controlling tasks. Beyond the comparison itself, the decisions we faced related to menu design and feedback for our use case may offer helpful insight for the design of future foot-based interfaces.

13 JUNE

Traffico: a Tangible Timetable Delivering Transportation Information between Schedules

Juntae Kim, James Self, Young-Woo Park

We introduce Traffico, a tangible timetable representing dematerialized schedule and transportation information. It delivers a user's schedules in chronological order along with transportation information between schedules. Placed on the user's desk, Traffico suggests required transportation times using four options - walking, bicycling, bussing, and driving a car - and through an e-ink display. To investigate the advantages that Traffico provides to users, we conducted an in-field study of 10 participants over five days. The results revealed the potential that Traffico supports the planning of moving times in a day through displaying transportation options on each schedule. We also found that Traffico provides better schedule reminders with event notifications in a sequential order, along with rotating interaction for

checking events. Through this type of tangible interaction, Traffico provides possibilities to reflect dematerialized digital information into a physical form and to adopt a new way of scheduling and handling time.

ROOM
V322

TRACK
A

Wednesday 13 June Afternoon sessions 14-15:30

Creativity and Design

Session Chair **Kim Halskov**

Twenty Years of Creativity Research in Human-Computer Interaction: Current State and Future Directions

Jonas Frich, Michael Mose Biskjaer, Peter Dalsgaard

Creativity has been a growing topic in the ACM community since the 1990s; however, no clear overview of this trend has been offered. We present a thorough survey of 998 creativity-related publications in the ACM Digital Library collected using keyword search to determine prevailing approaches, topics, and characteristics of creativity-oriented Human-Computer Interaction (HCI) research. A selected sample based on yearly citations yielded 221 publications, which were analyzed using constant comparison analysis. We found that HCI is almost exclusively responsible for creativity-oriented publications; they focus on collaborative creativity rather than individual creativity; there is a general lack of definition of the term "creativity"; empirically based contributions are prevalent; and many publications focus on new tools, often developed by researchers. On this basis, we present three implications for future creativity-oriented HCI research: develop and employ clearer definitions of creativity; go beyond in-vitro studies of novel tools; and move toward interdisciplinary research collaborations.

13
JUNE

Guardians of Practice: An Ethnographic Study of Failure-Mitigation Strategies within Creative Practices

Cesar Torres, Sarah Sterman, Molly Nicholas, Richard Lin, Eric Pai, Eric Paulos

Failure, whether it be “complete-and-utter” or “a minor setback”, occurs in a variety of different creative practices, yet how it is perceived, handled, and recovered from is a lesser explored design space. Failing to address these perceptions of failure can have psychological repercussions, discourage users from continuing a practice, and form cultural stigma such as those associated with STEM fields. However, mediating practices to develop a culture of resiliency and perseverance is key to sustaining a (lifelong) practice and reshaping pedagogical strategies. In this work, we outline the design space of “guardians”, or elements of a creative practice that mitigate the psychological effects of failure. Through contextual inquiry, we contribute an inventory of failure-mitigation strategies from a variety of creative disciplines. We synthesize guidelines for the design of new guardians and present a preliminary exploration of guardians for the laser cutting practice - effigies and test tags.

13 JUNE

“More than just Space”: Designing to Support Assemblage in Virtual Creative Hubs

Jandy Luik, Jenna Ng, Jonathan Hook

This paper aims to understand interactions at creative hubs, and how this understanding can be used to inform the design of virtual creative hubs - i.e., social-technical infrastructures that support hub-like interactions amongst people who aren't spatially or temporally co-located. We present findings from a qualitative field study in UK creative hubs, in which we conducted seventeen observations and ten interviews in three sites. Our findings reveal a range of key themes that define interactions within creative hubs: smallness of teams; neutrality of the hubs; value of the infrastructure; activities and events; experience sharing; and community values and rules. These interactions together form a network and elements that influence

one another to make a creative hub more than just physical space. We employ the concept of Assemblage introduced by Deleuze and Guattari to explore this network of interactions and, in doing so, reveal implications for the design of virtual creative hubs that seek to replicate them.

Prism: Enhancing Graphic Designers' Visual Research with Interactive Search Trails

Volodymyr Dziubak, Andrea Bunt

Graphic designers often use the Web to collect images to use as inspiration and references for their work. Their resulting collections of images, however, typically do not retain important aspects of their visual research, such as their thought process when searching and all explored design avenues. Guided by an exploratory study with 14 expert graphic designers, we developed Prism - a system that supports a graphic designer's visual research on the Internet by automatically capturing all inspected images and annotating them with the designer's search trails. We evaluated Prism through a two-week field study with 11 expert designers. Our findings suggest that Prism's capture and display capabilities helped the designers to reify their design thinking, to better reflect on and compare alternative design ideas, and to collaborate with their colleagues and clients.

13 JUNE

ROOM
V312

TRACK
B

Wednesday 13 June Afternoon sessions 14-15:30

Measurements and Guidelines

Session Chair **Tone Bratteteig**

Investigating Proactive Search Support in Conversations

Salvatore Andolina, Valeria Orso, Hendrik Schneider, Khalil Klouche, Tuukka Ruotsalo, Luciano Gamberini, Giulio Jacucci

Conversations among people involve solving disputes, building common ground, and reinforce mutual beliefs and assumptions.

Conversations often require external information that can support these human activities. In this paper, we study how a spoken conversation can be supported by a proactive search agent that listens to the conversation, detects entities mentioned in the conversation, and proactively retrieves and presents information related to the conversation. A total of 24 participants (12 pairs) were involved in informal conversations, using either the proactive search agent or a control condition that did not support conversational analysis or proactive information retrieval. Data comprising transcripts, interaction logs, questionnaires, and interviews indicated that the proactive search agent effectively augmented the conversations, affected the conversations' topical structure, and reduced the need for explicit search activity. The findings also revealed key challenges in the design of proactive search systems that assist people in natural conversations.

Measuring the Learnability of Interactive Systems using a Petri Net Based approach

Andrea Marrella, Tiziana Catarci

A learnable system allows a user to know how to perform correctly any task of the system after having executed it a few times in the past. In this paper, we propose an approach to measure the learnability of interactive systems during their daily use. We rely on recording in a user log the user actions that take place during a run of the system and on replaying them over the system interaction models, which describe the expected ways of executing system tasks. Our approach identifies deviations between the interaction models and the user log and assesses their weight through a fitness value. By measuring the rate of the fitness value for subsequent executions of the system we are able not only to understand if the system is learnable with respect to its tasks, but also to quantify its degree of learnability over time and to identify potential learning issues.

A Multi-Phased Co-design of an Interactive Analytics System for MOBA Game Occurrences

Quan Li, Ziming Wu, Peng Xu, Huamin Qu, Xiaojuan Ma

To ensure the playability of Multiplayer Online Battle Arena (MOBA) games, designers strive to balance different game occurrences. Although machine learning (ML) can help classify matches into different occurrence categories, designers demand more flexible input, interpretable output, and interactive collaboration with ML to facilitate analysis in breadth and depth. To this end, we work closely with a game company to design a visual occurrence analytics system through a stepwise co-design process. We first identify bottlenecks in game designers' conventional practices and their concerns about ML

via an observational study. Then, we develop the single-match module of the visualization system to familiarize users with interactive analytics. Next, we incorporate ML models to recommend match segments of interest during occurrence classification and streamline the cross-match analysis.

Empirical studies confirm the efficacy of our system. Experts' feedback suggests that our stepwise co-design process indeed helps them better embrace collaboration with machines.

13 JUNE

Design Guidelines for Assistance Systems Supporting Sustainable Purchase Decisions

Nico Herbig, Gerrit Kahl, Antonio Kraeger

While shoppers increasingly value sustainable products, considering sustainability can be difficult and time-consuming while shopping. In an expert workshop with 22 stakeholders, we gathered requirements for an assistance system supporting customers in identifying the sustainability of products at the point of sale. We integrated the resulting demands in a first mockup prototype, which was tested and discussed with a focus group. From the workshop and the focus group discussion, we deduced a set of ten guidelines for sustainability-oriented assistance systems. These guidelines were transferred into a prototypical mobile application, which allows customers to specify their personal understanding of multiple dimensions of sustainability.

According to this profile, they receive easily understandable ratings for scanned products while shopping. A user study in a real supermarket strengthens the deduced guidelines and indicates that such a system can support customers to make more sustainable product choices.

ROOM
V302

Wednesday 13 June Afternoon sessions 14-15:30

TRACK

C

Values & Ethics

Session Chair **Paul Dourish**

An Interface without A User: An Exploratory Design Study of Online Privacy Policies and Digital Legalese

James Pierce, Sarah Fox, Nick Merrill, Richmond Wong, Carl DiSalvo

Privacy policies are critical to understanding one's rights on online platforms, yet few users read them. In this pictorial, we approach this as a systemic issue that is part a failure of interaction design. We provided a variety of people with printed packets of privacy policies, aiming to tease out this form's capabilities and limitations as a design interface, to understand people's perception and uses, and to critically imagine pragmatic revisions and creative alternatives to existing privacy policies.

13 JUNE

When BCIs have APIs: Design Fictions of Everyday Brain-Computer Interface Adoption

Richmond Y. Wong, Nick Merrill, John Chuang

In this paper, we use design fiction to explore the social implications for adoption of brain-computer interfaces (BCI). We argue that existing speculations about BCIs are incomplete: they discuss fears about radical changes in types of control, at the expense of discussing more traditional types of power that emerge in everyday experience, particularly via labor. We present a design fiction in which

a BCI technology creates a new type of menial labor, using workers' unconscious reactions to assist algorithms in performing a sorting task. We describe how such a scenario could unfold through multiple sites of interaction: the design of an API, a programmer's question on StackOverflow, an internal memo from a dating company, and a set of forum posts about laborers' experience using the designed system. Through these fictions, we deepen and expand conversations around what kinds of (everyday) futures BCIs could create.

Metaphor Cards: A How-to-Guide for Making and Using a Generative Metaphorical Design Toolkit

Nick Logler, Daisy Yoo, Batya Friedman

13 JUNE

Generative metaphorical design while rich in possibility, is not easy to do. In response, we have developed Metaphor Cards, a toolkit for supporting metaphorical design thinking. In this pictorial, we introduce Metaphor Cards and provide a how-to-guide for design researchers to make and use their own sets. To demonstrate this process, we provide a case study documenting our development of a set of Metaphor Cards for designing information systems for international justice. We conclude with reflections on the benefits and limitations of the Metaphor Card toolkit and suggestions for how to adapt Metaphor Cards to other domains and technologies.

Washing with the Wind: A Study of Scripting towards Sustainability

Rikke Jensen, Dimitrios Raptis, Jesper Kjeldskov, Mikael B. Skov

Within sustainable HCI research, we have witnessed a growing interest in studying interaction designs that support households to 'shift' energy usage to times when it is sustainably favourable. In this paper, we investigate shifting through a purposely provocative and scripted design, which challenges the idea that renewable electricity is an always-available resource for households to consume. To do so, we made electricity for washing laundry either free or not available. We conducted a detailed qualitative study with four families that experienced our intervention for a month. We present five themes

that illustrate how families adapted, reflected, and formed new routines and expectations related to washing practices. We discuss the broader implications of combining scripting and provocation as a means to intervene, disrupt and understand energy consuming practices within the home.

13 JUNE

POST-CONFERENCE PROGRAM 14 JUNE

DAY TRIP TO SHENZHEN CHINA

After the conference, we organize a trip to Shenzhen, China. The city is China's high-tech and hacker culture capital and its vibrant lifestyle reflects its low average age of 28.

We will visit two technology companies, including Tencent, and have lunch at OCT Loft Creative Culture Park.

(<http://www.octloft.cn/about/oct-loft/>)

KEY POINTS OF THE ITINERARY

08:30



Meeting at HK PolyU Fountain Square, at the main entrance of the PolyU campus at the corner of Chatham Rd and Cheong Wan Rd.

18:45

Return to HK PolyU

You MUST have a visa to enter China!

JCC (HK) Travel Co. Ltd organizes the trip and does not accept passengers without it.



LOCAL INFORMATION

General

Hong Kong wakes up late and goes to bed late. Most shops open around 10 am, but stay open until 8 pm. Tourist markets stay open until about 10-11pm. Banks are open from 9 am to 4:30 pm, and on Saturdays from 9 am to noon. Kiosks open usually at 7 am, and many are open 24/7. Restaurants open around 8 am and close very late. You can drink on the street in Hong Kong. Open Rice is THE app for looking up restaurants in Hong Kong. Use it to find the location but don't believe too much in the ratings. They are heavily manipulated. Worried you will get lost during a hike? Use TrailWatch app as your guide on hiking trails. My HK Guide is the official tourist app created by the Hong Kong Tourist Board. Contains information on most tourist attractions and events.

SIM cards, Wifi, Apps

Most SIM cards cost around 100HKD for a week's worth of data and calls. We recommend buying a SIM card from a service provider such as 3 or SmarTone, rather than from a convenience store. WiFi in Hong Kong is generally available at tourist attractions, shopping malls, government buildings, MTR stations, 7-Elevens and Circle K. Use Wi-Fi.hk to find free WiFi spots in Hong Kong. You don't need to be online to use it (once you have downloaded it). The search is via street name.

Octopus Card

Get an Octopus Card ASAP! Octopus is a smart card electronic payment system used widely across Hong Kong and is very convenient. You can use it for small transactions like transportation, retail and fast food. You can buy an Octopus card at any MTR station from the information desk. Don't buy it from a convenience store. An adults card costs 150HKD: 50HKD is a deposit, and your card comes loaded with 100HKD. You can collect your deposit by returning the card, but a 9HKD handling fee will be charged. You can top it up in MTR stations and in any 7-Eleven or Circle K kiosk.

Tipping

You don't usually tip in HK, but it is not offensive either. Just leave the coins and 10HKD bills to the table or to the cab driver. If you have Octopus, you don't need them anyway.

Food

Local food website:

<https://www.openrice.com/en/hongkong>

Vegetarian food:

<https://www.happycow.net>

Hong Kong matches Paris in terms of quality and variety in food. Forget the idea of a three course meal,

however. Chinese food is served when it is ready, and you mix, sample, balance and talk about tastes. Food comes quick, service is no frills, most restaurants are noisy and brightly lit, and you order by lifting your hand high up. This is food in HK!

A few tips for navigating the scene. In the vicinity of the conference venue are thousands of restaurants. Choose your cuisine and be adventurous; the quality of food is usually excellent. Avoid seafood from street stalls, however, just to play safe. If you crave for Western food, go to Knutsford terrace, but avoid Western style restaurants in East Tsim Sha Tsui: they are expensive and cater for tourists. The exception are Australian style steak houses.

Foreigners usually love spicy Sichuan food, Beijing style duck, and all kinds of noodles and dumplings from various parts of China. Price range is from 30 HKD to thousands per meal, and better places usually require reservations days or weeks ahead. Keep in mind that the best food is often served in places that are not fancy at all, and Hong Kong has Michelin star restaurants in which you can eat with 10 USD.

Asian food in Hong Kong is of course excellent, but beware of bones. Bones are seldom removed in HK, so be prepared to eat slow and spit fish and chicken bones onto the table in cheaper restaurants.

Hong Kong kitchen routinely uses sweetbread, intestines, chicken feet, box jellyfish, bitter gourds, and many types of fungus – and much more. If in doubt, ask before you order, but also seize the opportunity to expand your mind. Canton is one of the world's great food cultures!

Destinations: Tsim Sha Tsui as a whole - Mong Kok - SoHo (South of Hollywood Road) - Wan Chai - Causeway Bay

Traditional dim sum: Lin Heung (MTR Sai Ying Pun). Chinese desserts: Leaf Dessert (Central). Wonton: Mak's Noodle (Central). Roasted goose: Yet Lok Goose (Central). Roasted meats: Joy Hing BBQ (MTR Wan Chai). Peking duck: American Restaurant (Wan Chai), Spring Deer (Tsim She Tsui). Famously bad service: Australian Dairy Company (MTR Jordan). Beef noodles: Kau Kee (MTR Central). HK Style Stir Fry: Mui Kee (Tsim She Tsui). Vegetarian: Gingko House (Central), Kung Tak Lam (Tsin She Tsui), the nunnery of Chi Lin (MTR Diamond Hill).

Night life and rooftop bars: Lan Kwai Fong (MTR Central), Soho (MTR Central). Some rooftop places are Felix (MTR TST), Ce La Vi (MTR Central), SEVVA (MTR Central), and Ozone (Kowloon Station). Ozone is very expensive, but it has a bizarre interior and the views from floor 118 are incredible.

Chinese Garden on campus has excellent dim sum, siu mai, Sichuan fish and Sichuan chicken.

Travel

Hong Kong's public transportation system is excellent and cheap to use. Buy an Octopus card from any MTR station from the information desk. It costs 150HKD (the card 50HKD, 100HKD value). You can top it up in MTR stations and in any 711 or Circle K kiosk. We highly recommend getting it. You can use it practically everywhere in Hong Kong to pay meals and small items.

MTR is easy to navigate and runs at least from 6 am to midnight. Hong Kong's bus system requires local knowledge, and we do not recommend using minibuses unless you have local companion.

Taxi services in Hong Kong are cheap and although the drivers drive fast and seem to follow their own traffic code, they are very reliable. Be prepared to pay in cash! Please note there are three colors of taxis: red taxis can go anywhere in Hong Kong (except to the Big Buddha), green taxis can only stay within the New Territories, and blue taxis can only stay in certain places of Lantau Island (Big Buddha).

Places to visit

Hong Kong consists of several very different ecologies. You get the big city feeling on Hong Kong Island and in Kowloon; subtropical high-rise feeling in "new towns" in New Territories; village feeling in islands and beaches; and nature on mountains. If you have extra days to spend, we recommend visiting:

The town of Stanley buses 6 from Exchange Square in Central. Try getting a seat on the upper deck in front or on the right side for views.

Lamma island ferry from Central Pier.

Lantau's Big Buddha at Ngong Ping MTR to Tung Chung and cable car (try one with a glass floor).

Shek O a lovely small village and beach on the east coast of Hong Kong Island: MTR Shau Kei Wan, bus 9.

Tai O in Lantau is a lovely fishing village. Walk beyond the main village and make sure you reserve enough time for your return trip. MTR Tung Chung, bus 11.

Wetland Park MTR Tin Shui Wai, street car to the park.

Sai Kung area for archipelago: MTR Diamond Hill, bus 92. If you are adventurous, try red minibus from Dundas Street in Mong Kok. Sai Kung is the last stop.

The Peak we recommend taking bus 15 from Exchange Square in Central and when getting down, taking Peak Tram (funicular). You can also take

Peak Tram from Cotton Tree Drive, but queues tend to be long. On the peak, walk along Lugard Rd to some of the most amazing urban sights in the world.

If you plan to go Sai Kung, Shek O or to Lamma, pack your swimming gear. DIS2018 takes place in the height of subtropical summer and the waters should already be in the 25-27C range. To swim in Sai Kung, you need to take a boat to one of the beaches. When you walk at the pier, don't worry: someone will come to sell you boat tickets.

Hiking in Hong Kong is always a pleasure. See dis2018.org > [Venues](#) > [Getting around Hong Kong](#)

Museums and temples

The best museums are Hong Kong History Museum next to PolyU. Skip to the second floor for colonial history. Hong Kong Heritage Museum has an emphasis on art & creative/performance culture (MTR Shatin)

Interesting temples are Wong Tai Sin (MTR Wong Tai Sin), Man Mo Temple (MTR Sheung Wan), Chi Lin Nunnery (MTR Diamond Hill), Che Kung Temple (MTR Che Kung Temple), and 10,000 Buddhas Temple (MTR Shatin).

Shopping

Hong Kong is often described as the largest shopping center of the world. This is no doubt true; if you do not believe, walk to Canton Road. Luxuries aside, the DIS community may be interested in Sham Shui Po for electronics and Mong Kok for cameras. Walk into places like Golden Computer Arcade in Sham Shui Po and Sim City in Mong Kok to get a feeling.

Shanghai and Portland Streets are designer favorites for their amazing collection of materials. Don't let the front of the shop deceive you. A shop that looks small may have several floors and it may turn out to be a virtual maze.

Tourist destinations are Ladies Market for cheap knockoffs, Jade Market for jade & souvenirs, Temple St for random stuff (avoid eating there; avoid also the areas between the booths and the buildings after dark), Antique Street for antiques & souvenirs, Flower Market with the bird market up behind, and Goldfish Market for fish, reptiles, and other pets.

Some locals go to places like Kwai Chung Plaza. Kwai Fong MTR, exit D and Argyle Centre, Mong Kok MTR, exit D1 or D2.

Do not forget that shopping in Hong Kong happens on many floors: you may find shops on more than 20 floors.

Visiting Shenzhen and Guangzhou

Those who have booked the post-conference visit to Shenzhen, China, depart from PolyU Fountain Square at 8:30 am. The visit will be over by 6:45 pm.

Going to Shenzhen on your own is easy if you have a visa to China. Go to Hung Hom station right next to the PolyU campus, take East Rail to Lo Wu and cross the border. Make a plan though; Shenzhen is a very big city.

Most nationalities can get a 5-day visa at two of the borders (Luohu and Huanggang Port) but you won't be able to travel outside of Shenzhen (to Guangzhou for example). You will need to bring your passport. Application forms are available at the border, and the immigration officer will take your photo during the process. Get renminbi (RMB) from Hong Kong to pay for the visa. In May 2018, the prices were: 956 renminbi (RMB) for US nationals, 304 RMB for UK nationals, and 168 RMB for most others. Check your eligibility by searching "Shenzhen visa."

Beyond Shenzhen, a day trip to Guangzhou (Canton) is doable in one day. Trains leave from Hung Hom station and take about 1,5 hours. Guangzhou is the traditional capital of South China, and its new financial district around Tianhe worth seeing for its sheer size. On your way, you see the largest industrial area in the

history of mankind and a part of the largest continuous urban area in the world. If you want to stay for longer or travel further, you will need to apply for the correct visa through an agent in Hong Kong. Your hotel can assist you, otherwise we recommend China Travel Services (CTS) <http://www.ctshk.com/english/>.

A day in Macau

For another way to spend an extra day, consider a visit to Macau. Casinos dot the horizon around the old town, but the old town still gives you a hint of Portuguese times. Fast ferries and catamarans take about 90 minutes. Consider taking a sea sick pill. Go to Hong Kong Macau Ferry Terminal at Shun Tak Center in Central/Sheung Wan or China Ferry Terminal at China Hong Kong City in Tsim Sha Tsui. Visa is not required, but bring your passport.