
Reshaping Touch Communication: An Interdisciplinary Research Agenda

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Abstract

This workshop aims to generate an interdisciplinary research agenda for digital touch communication that effectively integrates technological progress with robust investigations of the social nature and significance of digital touch. State-of-the-art touch-based technologies have the potential to supplement, extend or reconfigure how people communicate through reshaping existing touch practices and generating new capacities. Their possible impact on interpersonal intimacy, wellbeing, cultural norms, ways of knowing and power relations is far-reaching and under-researched. Few emerging devices and applications are embedded into everyday touch practices, limiting empirical exploration of the implications of digital touch technologies in everyday communication. There is, thus, a real need for methodological innovation and interdisciplinary collaboration to critically examine digital touch communication across social contexts and technological domains, to better understand the social consequences of how touch is digitally remediated. This agenda-setting workshop will bring together HCI researchers and designers with colleagues from sociology, media & communications, arts & design to address key research challenges and build the foundations for future collaborations.

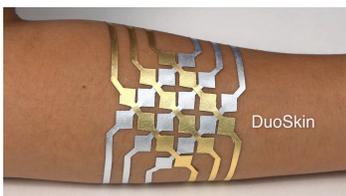


Figure 1: DuoSkin, a fabrication process that enables customizable functional devices that can be attached directly to the skin.

Cindy Hsin-Liu Kao / MIT Media Lab

Hsin-Liu (Cindy) Kao, Christian Holz, Asta Roseway, Andres Calvo, and Chris Schmandt. 2016. DuoSkin: rapidly prototyping on-skin user interfaces using skin-friendly materials. In Proceedings of the 2016 ACM International Symposium on Wearable Computers (ISWC '16). ACM, New York, NY, USA, 16-23

Author Keywords

Digital touch; communication; haptic; affective haptics; sensory embodiment; methods

ACM Classification Keywords

H.5.2. Information interfaces and presentation (e.g., HCI): User interfaces: K.4m Computers and Society

Background

We are at a tipping point for digital communication: moving beyond “ways of seeing” to include “ways of feeling”. Much as optical technologies transformed sight and the visual (e.g. from the telescope and microscope, the X-ray, photography, film, computer graphics, MRIs to Google Glass), the rapid expansion in digital touch technologies is set to reconfigure touch and the tactile in significant ways. Advances in haptics, virtual reality (VR) and bio-sensor applications are re-shaping what can be touched, as well as when and how it can be touched, changing existing ways of knowing and leading to new forms of knowledge about the world.

With this comes a fundamental shift in forms and modes of communication in co-located and remote interaction, between humans, humans and robots, and human-object relations. Across a range of social contexts and technological domains, touch-based technologies promise to supplement, heighten, extend and reconfigure how people (and machines) communicate, leading to new touch-based capacities and practices.

The centrality of touch to both human experience [3] and communication [7, 6, 11] underpins the need to understand the social consequences of how touch is digitally remediated. However, research to date has tended to focus on technological progression, rather

than social implications. Accordingly, Obrist et al. [12] point to the lack of vocabulary in communicating about or describing haptics, which has implications for developing applications with tactile interfaces. With the exception of some medical devices and tele-robotics applications, much of the technological development for touch communication is still in its infancy, and few emerging devices or applications are embedded into everyday practices. Nevertheless, touch plays a vital role in human life – from forming and maintaining intimate social bonds, to the transmission of skills, and general well-being – and digital touch technology has the opportunity to support this vital role by allowing for new forms of interaction and by providing insights into touch practices. We are, therefore, at a crucial and timely point in the history of digital touch technology development to bring important interdisciplinary focus to this research field.

Our proposed workshop takes as its key challenge the study of the social implications of digital touch technologies in user contexts that are changing, emerging, and/or imagined. It seeks to understand the role of touch practices in communication, examine future scenarios and engagement with emergent designs through studies with prototypes, and importantly, to reframe current methodological, technological and design practice to more firmly integrate important questions for society, questions that go beyond immediate sensations or psychological responses to also consider wider socio-cultural practices. We argue this can be achieved through the collaboration of computer science and HCI with researchers and practitioners from the arts and social sciences, including sociology, anthropology and media.



Figure 2: The Tactile Sleeve for Social Touch (TaSST) was designed to allow two individuals to engage in social touch at a distance (Huisman et al., 2013).

Photography by Local Androids

The workshop aims to:

- Bring together an interdisciplinary group of researchers and designers from academia and industry to present emerging technologies and identify key trends in digital touch communication;
- Facilitate discursive engagement with questions and concepts around digital touch communication in relevant domains, such as health & wellbeing, personal and social relationships, work and leisure;
- Develop an agenda for interdisciplinary research around the design, development and implementation of digital touch technologies;
- Build the foundation for future interdisciplinary collaborations that explore emerging digital touch communication in different social contexts.

What do we mean by touch technology?

In the context of “digital touch for communication”, we begin by considering touch broadly as touching with your hand/body or being touched somewhere on the body, in a way that constitutes a communicative act (i.e. that conveys meaning).

For the purposes of this workshop, much of what we would consider digital touch technologies can be classified under haptics. According to Huisman, “the field of haptics is concerned with investigating human-machine communication through the sense of touch in interactions where we can not only use our sense of touch for input, but also receive computer generated touch output.” [8: 391] Haptic technologies are employed or designed to convey human touch sensations (contact location, pressure, slip, vibration, temperature) and kinesthetic perception (position, orientation, force).

However, a distinction can be made between contact and non-contact haptics and, arguably, non-contact haptics is still about questions of “touch”, albeit what is being touched may be less tangible. Contact haptic technologies use specific input and output devices, such as data gloves and joysticks, for users to feel different, often mechanically generated, sensations (e.g. Fig. 4). Non-contact haptics include reverse electrovibration and ultrahaptics. The former is an augmented reality (AR) technology that generates a weak electric field around the user’s skin, allowing them to perceive textures and contours of remote objects, without the use of gloves or specialized devices [e.g. 2, 10]. Ultrahaptics uses ultrasound to create air pressure changes around the user [e.g. 12].

Beyond haptics, advances in wearables and biosensing technologies, facilitated through contact with skins and bodies, equally generate new ways of knowing and communicating, as well as new ways to capture the quality of touch. For example, textile sensors can be designed to supplement the loss of touch, e.g. the Touch Glove [13], or wearable devices can heighten and extend touch to communicate connection across distance (Fig. 2-3), e.g. Ring*U, a touch ring that provides vibrotactile feedback through an embedded eccentric mass vibration motor to “hug” the wearer’s finger [4], or through stroking someone wearing digitally augmented clothing [14], or new ways of sensing the intention of, e.g. soft, touch from the way the hands move or the muscle activates through electromyography or even-related potential [15].

Why ask social questions?

Beyond the largely positive discourses of design labs, digital touch has elicited more sceptical discourses of



Figure 3: Wearable textile sensors can be used to detect socially relevant touches (Huisman et al., 2013).

Photography by Local Androids

concern and loss within the social sciences. The digital is associated with the removal of touch from the material sensory landscape, producing an era of “touch-deprivation” [5], “sensory impoverishment” and “loss of physicality” [1], with the “chilling concept of sensory extinction” associated with a quieting or displacement of the body’s senses [9]. The digital is often seen as a part of social distancing and alienation, in which people are comforted by the illusion of “relentless connection”, masking the unsettling of relationships, community, and intimacy, and leading to “a new solitude” [16]. Yet without empirical and interdisciplinary dialogue, these evaluations risk appearing as little more than theoretical dystopia. They do not engage with the situated social, sensory and psychological experiences of potential users in emerging socio-technological contexts. This workshop aims to bring these considerations into conversation with designers and developers to take the field of digital touch into meaningful directions for human communication.

Workshop themes

In order to focus discussion and generate meaningful exchange between different domains, workshop discussions will be framed around 3 key themes: touch and sensory embodiment; affective communication; and ethical and methodological challenges in HCI design. These are cross cutting themes relevant to the different contexts of digital touch technology development, such as health & wellbeing, personal relationships, work and leisure.

Organizers

The organizing committee itself comprises of an interdisciplinary group of scholars, including HCI,

Robotics, Social Semiotics and Communication, Anthropology, Design and Computer Science.

Sara Price is a Professor of Digital Learning at UCL Knowledge Lab. Her research focuses on how novel technologies mediate new forms of interaction and cognition. She has led interdisciplinary research projects involving the design, development and evaluation of mobile, tangible and sensor technologies. She is Co-I on ERC-funded IN-TOUCH project, UCL PI on NSF/Wellcome/ESRC-funded Move2Learn project, and Co-I on EU-funded WeDRAW project. Her work has been internationally published in the field of HCI.

Kerstin Leder Mackley is a Senior RA on the IN-TOUCH project at UCL Knowledge Lab. She specialises in visual and sensory ethnographies of the role of digital technologies in everyday life. Her work has been published internationally, incl. in *TOCHI* and *Personal & Ubiquitous Computing*, and she is co-author, with Pink et al., of *Making Homes: Ethnography and Design*. Kerstin co-organised the CHI '13 workshop “Methods for Studying Technology in the Home”.

Carey Jewitt is Professor of Technology and Education and Director of UCL Knowledge Lab. Her research focuses on methodological innovation and how technologies mediate new forms of interaction and communication. She has led interdisciplinary research projects involving the design and evaluation of mobile, tangible and sensor technologies. She is currently PI on the ERC-funded IN-TOUCH project and directed the ESRC Node: Multimodal Methods for Digital Environments. Her work has been internationally published, primarily in social science journals and conferences.



Figure 4: Kissenger device by Adrian Cheok, Emma Zhang, Hamizah Shahroom, Charles Thomas, Shogo Nishiguchi, 2015

“High precision force sensors are embedded under the silicon lip to measure the dynamic forces ... of your lips during a kiss. The device sends this data to your phone, which transmits it to your partner over the Internet in real time. Miniature linear actuators ... reproduce these forces on your partner's lips, creating a realistic kissing sensation. ... You can also feel your partner's kiss on your lips when they kiss you back.”

kissenger.mixedrealitylab.org

Gijs Huisman is a postdoctoral researcher at the Human Media Interaction group, University of Twente. His research focuses on haptic technology for social and affective interaction in mediated communication and in interactions with artificial social entities, such as virtual agents and social robots. He is the initiator of the Dutch national meeting on social and affective touch (“Dutch Touch”) and has organized workshops on haptic technology and social touch conferences. He is partner and head of R&D at House of Haptics, a startup company working on haptic communication devices.

Bruna Petreca is a postdoctoral design researcher investigating how to support designers in exploring and expressing the multisensory aspects of our touch experience of materials, both in physical and digital environments. Her research is currently based at the intersection of the Materials Experience Lab & the Connected Everyday Lab, at the Delft University of Technology. She leads the project for establishing the Material Base and is a research advisor for the Design & Immersive Experiences Lab, at the Centro Universitário Belas Artes de São Paulo, Brazil. **Nadia Berthouze** is a Professor in Affective Computing and Interaction at University College London Interaction Centre. She has pioneered the field of Affective Computing, investigating body movement and touch behavior as means to recognize, measure and steer the quality of the user experience. She was PI and Co-I in various nationally and internationally funded projects in the context of affective interaction. She is currently UCL PI on the EU-funded WeDRAW project and she was Co-I on the EPSRC Digital Sensoria project.

Domenico Prattichizzo is a Professor of Robotics at the University of Siena. He is lead of a research group

in SIRSLab, with research interests that include robotic grasping, haptics, mobile robots, and robotic vision. He is co-ordinator of the EU funded WEARHAP: WEARable HAPTics for Humans and Robots.

Vincent Hayward is professor at the Université Pierre et Marie Curie (UPMC) in Paris, Visiting Professor of Tactile Perception and Technology at the School of Advanced Studies of the University of London (supported by a Leverhulme Trust Fellowship), and Chief Scientific Officer of Actronika SAS, Paris. He is an expert in tactile device design and human touch perception. He has co-founded three successful spin-off companies, received several best paper/research awards, and recently completed an ERC Advanced Grant, “Computational Theory of Haptic Perception”.

Website

The website, intouchchi.wordpress.com, will contain the CfP, workshop outlines, schedules, participant position papers, and space for workshop outputs, including images, notes, and collaborative documents. It will stay in place after the workshop for communication, information and dissemination purposes.

Pre-workshop plans

Participant recruitment

We aim to recruit 15-20 participants working in the area of digital touch communication, from academia and industry. Workshop participants will be recruited through an open call for papers through the CHI website, the In-Touch project website and intouchchi.wordpress.com, relevant HCI and social science mailing lists, and social media platforms. Organizers will also personally invite researchers,

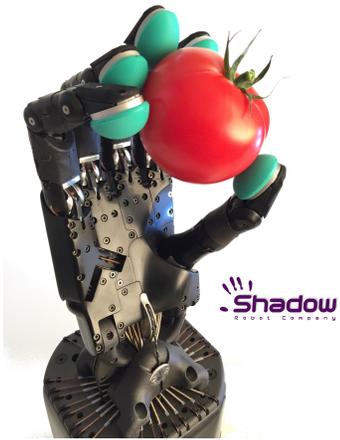


Figure 5: Shadow Robots' "Dexterous Hand" demonstrating levels of touch sensitivity.

The Shadow Robot Company
www.shadowrobot.com

practitioners and industry colleagues likely to be interested in the workshop.

Participant selection

Position papers of 2-4 pages in the ACM SIGCHI Extended Abstract format that describe original research and/or digital demos, and outline a person's interest and experience in workshop topic, will be solicited. Participants will be selected by the organizers on the basis of quality and relevance to the scope and goals of the workshop. We aim to accept a multidisciplinary group of participants to foster critical engagement in the key research challenges and issues the workshop aims to address. Accepted papers will be available on the workshop webpage before and after the workshop, providing opportunity for participants to become familiar with all papers prior to the workshop.

Workshop structure

This will be a one-day 6-hour workshop, and will consist of a combination of short presentations, demos, small group discussions and a plenary session. Small group discussions will be framed around 3 key themes: touch and sensory embodiment; affective communication; and ethical and methodological challenges in HCI design. Groups will be organized to ensure a mix of disciplines and/or perspectives to foster lively and stimulating discussion. Each discussion will be one hour with a 15-minute feedback session with all participants, to identify collective and critical research questions, methodological challenges, and practical proposals for future directions raised in each group. A preliminary schedule looks as follows:

9:30-10:30

- **INTRO/PRESENTATIONS (1 hour)** Two-minute quick fire presentations from all participants, followed by a keynote from the workshop organizers, framing the scope and goals of the workshop.

10:30-11:15

- **DEMO SESSION (45 min)** Demos will provide examples of digital touch communication technologies to provide shared concrete ideas to facilitate subsequent small group discussions with diverse backgrounds and experience.

11:15-11:30 Coffee break

11:30-12:30

- **THEME 1: Touch and sensory embodiment (1 hour)** Participants will discuss and explore existing and changing touch practices, ways of knowing and the perceived role of new sensory potentials in communication. How do emerging touch technologies reshape, replace or extend people's sense of embodiment, and how might this affect human-human and human-robot communication? How can embodied knowledge be "digitized", and what might be gained from doing so?

12:30-13:30 Lunch

13:30-14:30

- **THEME 2: Affective communication (1 hour)** Participants will discuss and explore how emerging touch-based technologies have the potential to reframe sensory-embodied, affective and communicative human relationships, including adult relationships and parent-child interactions, communication in co-located and remote interaction. What are the opportunities for touch technologies to detect or convey emotion, and how are these perceived? In which ways might new forms of touch achieve "closeness" or "intimacy"?

14:30-15:30

- **THEME 3: Ethical and methodological challenges in HCI design (1 hour)** Participants will identify and explore ethical and methodological challenges that the communicative potentials of digital touch technologies raise in HCI design, both for human-human communication and robot-human or human-robot communication. What kinds of research methods and approaches are required to research new sets of touch experiences and their impact? What issues of trust, privacy and cultural practice are at stake in remote touch applications?

15:30-15:45 Coffee break

15:45-16:30

- **PLENARY (45min)** Organizers will build on the three discussion themes to facilitate group consensus of proposed research directions in order of criticality to the research field, and identify future projects.

16:30-17:00

- **NEXT STEPS (30 min)** Identify potential papers for SI Journal, and key groups /individuals to initiate and take forward collaborative plans.

Post workshop plans

There will be four key outputs:

- 1) Generate an interdisciplinary research agenda for digital touch communication that effectively integrates technological progress with robust investigations of the social nature and significance of digital touch, and publish in a Special Issue .
- 2) Identify and mobilise strategies for developing a cross-disciplinary community, that forms the basis for subsequent collaboration. Set up mechanisms for continuing communications across participants and outreaching beyond.

- 3) Establish plans for a special issue journal publication in a leading HCI journal.
- 4) Set up a working group to explore the potential for creating a new journal to focus on digital touch communication, with an interdisciplinary focus.

Call for participation

Submissions are invited for “*Reshaping Touch Communication: An Interdisciplinary Research Agenda*” (<https://intouchchi.wordpress.com>). This one-day workshop brings together an interdisciplinary group of researchers and designers to examine new forms of touch communication enabled by digital touch technologies, address key social questions and challenges for HCI, reshape future research agendas, and build a cross disciplinary community that fosters subsequent collaboration. The workshop will focus on three themes: touch and sensory embodiment; affective communication; and ethical and methodological challenges in HCI design, to discuss and explore digital touch communication in various contexts (e.g. health, wellbeing, personal relationships, work and leisure). It will provide opportunities to share ongoing work, with a view towards setting an interdisciplinary research agenda for digital touch communication that effectively integrates technology progression with robust interrogation of societal implications of digital touch.

Submission details

2-4 page position papers in *CHI Extended Abstract format* (<https://chi2018.acm.org/chi-proceedings-format/>) should be submitted to intouchucl@gmail.com by 2/2/18. Papers must outline authors’ research or device development around digital touch (demos welcome), key research questions, and methodological

or ethical challenges that arise in their work. Submissions should go beyond *touch screens* to include other forms of sensory interfaces.

Selection criteria

Submissions will be selected on overall quality and relevance to workshop themes, innovativeness, ethical or methodological reflexivity, aiming for a range of disciplines, technologies or user contexts.

(Notifications: 22 February 2018)

Additional requirements

At least one author must register for the workshop and one day of the CHI 2018 conference. Position papers will be available to participants prior to the workshop.

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