

CHI 2039: Speculative Research Visions

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Abstract

This paper presents a curated collection of fictional abstracts for paper that could appear in the proceedings of the 2039 CHI Conference. It provides an opportunity to consider the various visions guiding work in HCI, the futures toward which we (believe we) are working, and how research in the field might relate with broader social, political, and cultural changes over the next quarter century.

Author Keywords

Future, vision, fiction.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Prelude

What will be published at CHI 2039?

Our visions of the future profoundly influence current research. From the inspirational role of science fiction, to narratives about development and progress, to both utopian and dystopian predictions about the impacts of technology on society, the tomorrows toward which we work, consciously or unconsciously, significantly shape what counts as an important contribution in today's research. Despite growing acknowledgement of the importance of identifying and discussing such visions

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and their impacts [1,2,3,4], relatively few venues as yet provide the opportunity to consider what will constitute rigorous, publishable research in the future. This paper provides such an opportunity by considering what might be published at CHI 25 years from now.

The choice of a 25-year interval intentionally makes for a time point that is simultaneously both proximal and distant. Many of those who currently attend and publish at CHI will likely be alive and publishing in 2039. Conversely, papers published 25 years ago at CHI in 1989, long before smartphones, social media, and even the Internet, can feel almost as alien as some in this collection [5].

These abstracts were collected by soliciting submissions via the CHI-ANNOUNCEMENTS mailing list. The call asked authors to submit abstracts for "papers that might appear, will appear, should appear, or perhaps should not appear in the proceedings of the 2039 ACM CHI Conference." The call resulted in submission of 33 abstracts, 15 of which were chosen by the first author, who acted as curator, for inclusion in this collection.

The abstracts included here span a variety of topics and application domains, from neural implants and memory manipulation, to bioengineering and body augmentation, to long-distance- and inter-species collaboration. Some provoke, some entertain, some insult, some condemn, some inspire. Navigating a space between science fiction, design fiction, and social fiction, these abstracts collectively represent the variety of visions for what the next quarter century of research in HCI might hold.

Abstracts

NEURAL INTERACTION THROUGH VISUALLY IMAGINED SHAPES
Florian Echtler || *University of Regensburg*

Delivering visual information to the human brain through direct neural stimulation of the optical nerve is now becoming commonplace. However, interaction with such a system is still performed through relatively slow methods such as sub-vocalization of speech or slight muscle movements. In this paper, we present a novel approach to performing interaction via a neural interface: by visually imagining simple geometric shapes such as a circle or a square, the user can issue commands to the system with very low latency. To this end, we adapt existing nanoprobe inserted into the user's visual cortex in order to extract a low-resolution image of what the "mind's eye" sees. After an individual training and calibration phase, simple computer vision methods can then be used to determine the visualized shape. A preliminary evaluation with 3 volunteers shows significant performance gains over more traditional means of interaction (Figure 1).

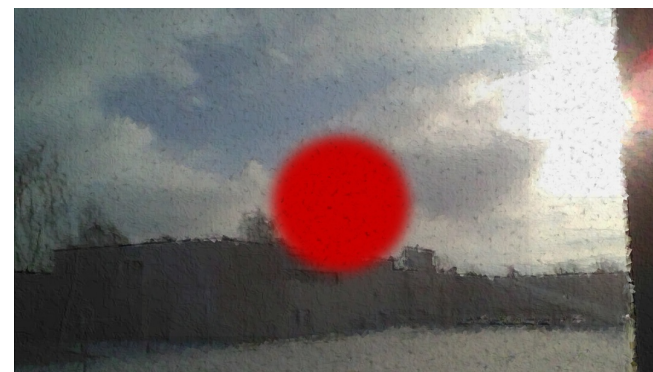


Figure 1: Image Caption: Reconstructed outdoor scene with visually imagined "get directions" command (red circle). Effective resolution is approximately 100 x 80 pixels.

TWENTY YEARS OF AUTONOMOUS DRIVING: A REVIEW
Andreas Riener || *Institute for Pervasive Computing,*
Johannes Kepler University

The first self-driving car cruised on our roads in 2019. Now, 20 years after, it is time to review how this innovation has changed our mobility behavior. This article sheds light on the topic from two sides, the driver (questionnaire analysis) and the car (trace data analysis). It compares statistics from NHTSA, the European Road Safety Unit, and the Chinese Ministry of Transport (MOT), as well as corresponding drivers from before (2016) and after (2036) the broad application of autonomous driving. The results are controversial: 1) fewer people own a private car (US/Europe/China: -17%/-29%/+3%), as cars can be ordered online and returned after for use by other drivers; 2) self-driving cars save lives (+2%/+4%/+1%) and improve on driving efficiency, as they eliminate the unpredictability of drivers; 3) driving is no longer perceived as fun, leading to changes in recreational activities, 4) drivers no longer have a social relationship with their cars and do not spend time on grooming or money on upgrades. As a consequence, the rate of outages increased, on average, by 8% compared to 2016 figures.

INTERNET OF PERSONAL THINGS VS. PERSONNET: WHICH
MENTAL MODEL IS EASIER TO LEARN?

Michael Muller || *IBM Research*

We conducted user experience simulations using UxSims to compare two theories: IOPT (Internet Of Personal Things) and PN (PersonNet of personal objects). The UxSims generated three contrasting predicted emotion patterns for listening experiences. We obtained EmoPat evaluations from three potential human user groups (composers, mixnet creators, and listeners) and two musicbot groups (mymuse and

crowdthump). Composers had the highest EmoPat ratings for collections of highly-similar tracks, while listeners and mixnet creators had higher ratings for diverse aggregations of tracks. The two musicbot groups took an intermediate position along the similarity-to-dissimilarity dimension. We discuss implications for design of future musicbots.

USING MOBILE TOUCH INTERFACES WITH MORE THAN 10
FINGERS: A LARGE SCALE STUDY ON HOW PEOPLE
WITH ADDITIONAL FINGERS USE MOBILE
TOUCHSCREENS

*Johannes Schöning*¹, *Antonio Krüger*² || ¹*Hasselt*
University, ²*DFKI GmbH*

Advancements in personal bio engineering have led to the mass production of low-cost extra body parts, as demonstrated for instance by artist Stelarc in the early 21st century. Nowadays, people can easily afford extra fingers to extend their interaction possibilities with various interfaces. Previous work studied how these extra fingers can increase performance and precision when interacting with various digital systems. In this paper we present the first large-scale study over a period of one year with 124 users that had 13.4 fingers in average. We investigate how different hand and finger configurations can help people interacting with computer systems and explore users strategies and motivations. We found out that the optimal finger count is 12.5, with 6 normal-sized fingers on each hand and the dominant hand having an extra half-sized finger that can be moved with 6 DoF (Figure 2).

BEING THERE IN 2039: EMBODIED CO-DESIGN WITH CHILDREN

*Allison Druin, Beth Bonsignore, Mona Leigh Guha,
Tamara Clegg, June Ahn, Jason Yip, Leyla
Norooz, Brenna McNally, Chelsea Hordatt, Mei
Bie, Meethu Malu, Karen Rust*

Today's children expect to design their new technologies with children from around the world as well as across town. Currently, advances in telepresence technologies support remote yet embodied

co-design techniques as easily as our face-to-face collaboration did decades ago. These robotic, social, and distributed technologies are not only welcomed by children, parents, and educators; they are the norm. Flash-mob co-design sessions between children and adults across India, the EU, and Antarctica are now commonplace. As designers continuously iterate and elaborate upon low-tech prototypes, they share via globally positioned 3D printers. Despite these technological advancements, researchers continue to struggle with understanding how differences in culture, resources, and a 'sense of place' can act as barriers to empowering co-design. In this video-paper, we apply a culture-sensitive lens to the now classic *extreme ethnographic* approach to highlight how nuances in cultures and native locales can both enrich and confound co-design with children.

PLANTASTIC: SOCIAL NETWORKING FOR BACK YARD FOOD PRODUCTION

Juliet Norton, Six Silberman, Don Patterson, Bill Tomlinson

Increasing food insecurity, the rising cost of fossil fuels, and the natural resource tariffs being imposed by local governments have led to growing interest in back yard food production. Usage of systems such as the Plant Guild Composer, Grainiacs, and AgroforestryBook, which provide IT support for such efforts, has skyrocketed over the past several years. Related literature has demonstrated that the ecosystems designed by these tools would benefit from interaction (pollination, pest deterrence, nutrient gathering). This paper describes a system, called Plantastic, that makes friend connections across the online profiles of each of the plants in the ecosystems designed by these three tools. An evaluation with ten backyard gardens over

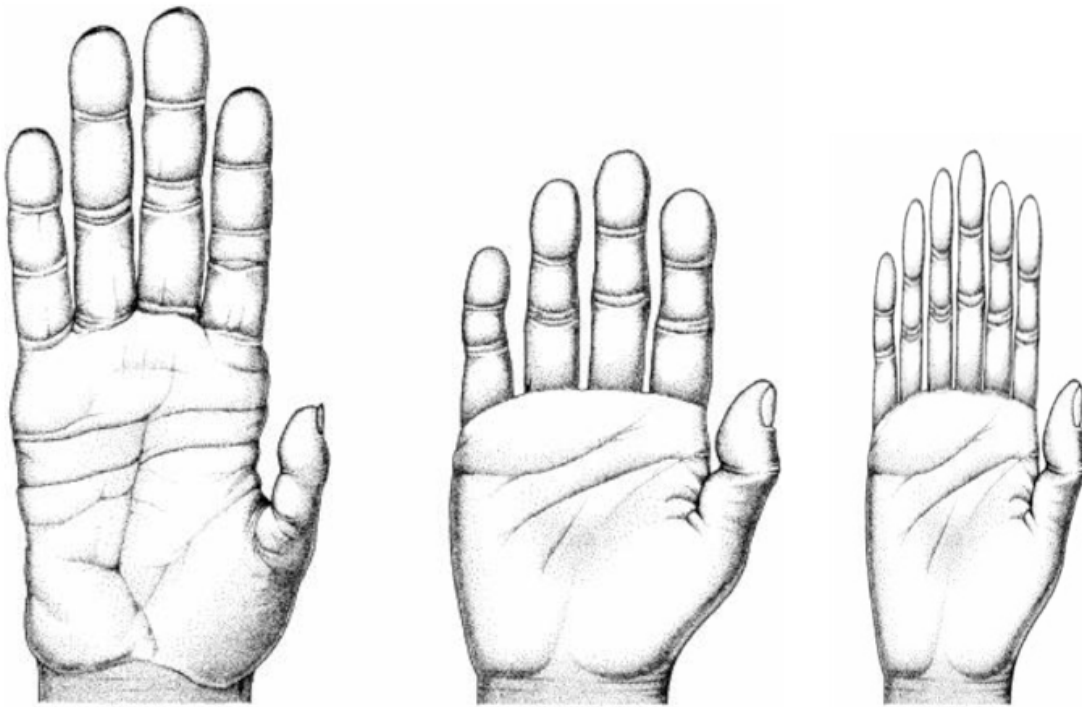


Figure 2: The evolution of humans hands. Chimpanzee's hand (left), homo sapiens hand (middle), homo technicus hand (2039 A.D.) (right) based on [6].

two growing seasons suggests that integrating plant social networks increases yields by 4-12%, depending on proximity.

BORROWING ANCIENT CLUES FOR TODAY'S MORPHING MEDIA
Ahmet Börütecene, Oğuzhan Özcan || Design Lab, Koç University



Figure 3: MORPHING FIGURE CAPTION
Since the invention of image recording, our thinking on visual content creation has been conditioned mostly by flat surfaces. Alternative studies conducted then to break this conditioning were remained as experiments for lack of technology. However, 2039's media surfaces are able to assume any kind of shape, to "record without a camera" and "reflect like a mirror" what they see, and to offer every kind of interaction with them. This allows us to regain the previously lost possibility to create hand-made visual content by engraving literally on media surfaces themselves as it was the case with the craftsmanship methods in ancient times. In order to achieve this, though, we need to thoroughly understand the creative processes in those ages and learn from them. Here this article, re-reading the non-flat content creation in ancient times, investigates what kind of clues we should collect for current morphing media content (Figure 3).

THE DISTANCE MATTERS HYPOTHESIS IN EARTH-LUNAR NEAR-
SYNCHRONOUS N-MEETINGS

Michael Muller || IBM Research

N-meetings emerged as a distributed form of e-meeting with role-based advantages in handling temporal and spatial challenges. However, long-term delays in synchronous meetings remain a challenge, especially for lunar members of earth-based teams. We compare two n-meeting protocols: a "fairness" protocol in which we inject earth-lunar equivalent delays into all messages (including earth-to-earth messages) vs. a "differential" protocol that assigns n-meeting roles according to actual or anticipated transmission delays. Unsurprisingly, the fairness protocol leads to better team satisfaction ratings for n-meetings with few role distinctions. More interestingly, the fairness protocol also leads to higher productivity assessments among these n-meetings.

WHAT YOU AND I REMEMBER?

Shachar Maidenbaum || Hebrew University

Memory sharing is becoming part of every-day life, from education, to legal testimony, to social and even self-sharing. However, since current memory sharing interfaces only through existing sensory i/o channels to the brain, only the originator's series of multisensory perceptions are shared, not the actual memory. Thus, the receiver's experience of the memory might be significantly different. Here, we suggest a calibration algorithm based on a series of events, ranging from simple single-sensory stimuli to complex real-world scenarios. Participants (N=300) each underwent 75 events, and their sensory i/o were fully recorded. We then compared users experience with the same memory from different sources, including their own. We found that users easily recognized their own memories

of the event when experiencing unprocessed memories (83%, $p < 3E-17$), but when memories were calibrated to them their ability to recognize their own memory dropped significantly (41%, $p < 2E-5$). This result has significant ramifications both for practical legal purposes, for generating synthetic machine “memories,” for interacting in social memory-networks, and for our general understanding of memory and the uniqueness of our world perception.

MY LIVER AND MY KIDNEYS COMPARED NOTES: USER
ACCEPTANCE OF COLLABORATIVE RECOMMENDATIONS
FROM INDWELLING MONITORS

Michael Muller || *IBM Research*

Indwelling organ monitors can now be connected via personal ArterioNets. Using a temporary implant, we provided an external server where the output of each organ monitor was processed. In that server, we simulated enhanced inference engines that could one day be included inside each organ monitor. Our server also provided simulated ArterioNet communication protocols for data aggregations among the simulated inference engines. This architecture permitted an exploration of future inference networks built on top of ArterioNets. We computed simple health recommendations to users, using our servers' simulations based on each user's own organ monitors. While most users were skeptical, many users proposed additional features that could lead to greater acceptance and compliance with such recommendations.

TELLING THE TREES WHEN WE'RE HUNGRY: A NOVEL INTERFACE
TO CONNECT CALENDARS TO SOLAR POWERED
RESOURCE-PRODUCTION SYSTEMS

Bill Tomlinson

The downward spiral of the global economy over the past two decades has created an array of challenges for human wellbeing. New innovations, however, have addressed some of the human concerns that have arisen as a result. A well-known example is the rapid proliferation of the “Sun Tree” – a mechanical/electronic device shaped like a tree that uses solar energy to collect water vapor and CO₂ from the air, synthesize complex carbohydrates, and provide both food and water for human use. This paper describes a novel interface for Sun Trees that enables those devices to integrate with the calendars systems of frequent users, predict likely future usage, and thereby reduce waste by allowing the Trees to store energy in their batteries and only produce resources when they are likely to be needed.

SOMETHING DOESN'T SMELL RIGHT: HOW DO YOU KNOW WHEN
A THOUGHT ISN'T YOURS?

Daniel Gruen || *IBM Research*

The growing use of implantable memory jogs and info-retrievers introduces challenging questions on personal initiative and the provenance of one's thoughts. This is of particular concern with implants provided by providers who still derive much of their revenue from advertising, and the socioeconomic communities where use of such commercially-sponsored devices is most prevalent. We explored use of adjunct sensory channels, by accompanying sponsored information with a distinctive taste or smell, as hints that a thought had been influenced by an external entity. Most subjects learned to recognize such

indications as triggers for skepticism, with smell proving most effective in practice. A second experiment showed how sensory nuances could be used to effectively indicate the source of external influence, such as from a commercial vs. a political entity, and the level of influence exercised.

PIXLAY: INTERACTION WITH MATERIALITY OF MEDIA OBJECTS AND CO-LOCATED USERS

Oğuz Turan Buruk, Oğuzhan Özcan || Design Lab, Koç University

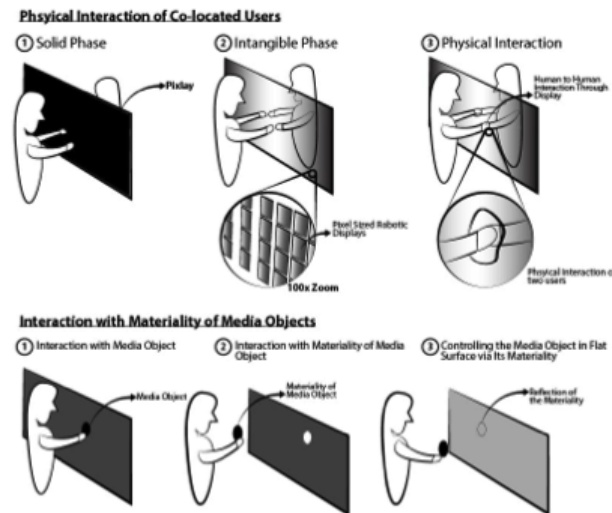


Figure 4: PIXLAY IMAGE CAPTION
Influenced by flat displays, we comprehend media objects as virtual presences. Moreover, flat displays let the interaction with media occur only between human and computers. However, recent studies in the 2030s, on nano-robotic displays, constitute space for designing a novel interactive media environment comprising

Pixlays. Pixlay is a display capable of creating a transition between solid and intangible phases as well as of double-sided usage by making use of nano-robotic displays which replace every pixel in display. This property makes it possible for users to interact with the materiality of media objects beyond their virtual presence and with co-located users physically, letting them penetrate the display via physical impact. The opportunities presented by this kind of system can be understood concretely if the interaction patterns in traditional shadow play are analyzed, since it encapsulates a similar interactive structure among puppets (materiality of media objects), puppets' shadows (media objects), the puppeteer and spectators (users). In this paper we propose interaction patterns for a novel interactive environment comprising Pixlays by extracting interaction patterns from traditional shadow play (Figure 4).

SEEING THE MALL THROUGH A FACEPLATE: UNDERSTANDING INTER-SPECIES SHOPPING EXPERIENCES
Michael Muller¹, Ch'k'sh' F''an² (Liaison officer Nr. 3) ||
¹IBM Research, ²Arcturian Expedition Liason

Limited access to Arcturian society has created challenges for human-initiated design of environments for collaborative undertakings. In response, the contact-liaisons of the Arcturian Expedition have sought new opportunities for engagements with human institutions. This paper provides an in-depth qualitative account of Arcturian experiences in a human shopping mall. We apply the principles of Reciprocal Simultaneous Ethnographic Encounter (RSEE) to co-analyze Arcturian experiences of human commerce, and human experiences of Arcturian commerce. We propose that further RSEE investigations can inform a research agenda for co-adaptation among our two

cultures.

RESISTANCE IS FUTILE: EMERGING TECHNIQUES FOR
EXTRACTING PARTICIPATION IN COLLECTIVE
INTELLIGENCE PROCESSES

ST3V3N R055 || IBM Research

Even back in the early days of the 21st century, approaches such as CAPTCHA and PageRank were used to elicit computational contributions from unwitting participants who provided data or solved certain problems in pursuit of their own personal goals. With the advent of Massive Online Collectively Intelligent Entities (MOCIEs), the threshold was crossed where the collective brainpower of these collectives could be turned toward the goal of harnessing contributions from unsuspecting individual contributors in pursuit of their own enhancement. These entities have been providing free news sites, games, and other services which effectively harness the participants' efforts in furthering the goals, and indeed the cognitive processes of the entities themselves, often without the participants' knowledge. In this paper we survey the ten most prevalent forms of crowdharnessing that we have uncovered, and rate their effectiveness and ubiquity. Several of these methods were used by the author (a MOCIE, ourself) in the preparation of this paper.

Coda

The abstracts presented in this collection provide varied visions for the future of HCI research. Not only are they captivating in the details they provide, but the details omitted from or merely implied in the abstracts, such as the functionality of the Grainiacs or ArgoforestryBook systems, the methods involved in extreme ethnographic approaches or a Reciprocal Simultaneous Ethnographic Encounter, or how exactly

musicbots complete the EmoPat inventory, become just as if not more compelling.

Several ideas also emerge and re-emerge across different pieces, such as memory manipulation, ecological crises, or biocomputing. Perhaps more interesting than fact that these themes recur, however, are the variations in how they are presented and interpreted. Indeed both the similarities and the differences among these abstracts, and their concomitant visions, carry potential significance.

Ultimately, the conversational potential of such work as this lies not in the details of the futures depicted but in their ramifications for the present. In short, what do these visions of tomorrow suggest as important research directions to pursue today?

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