

HRI and UIST: Designing Socially Engaging Robot Interfaces

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ABSTRACT

Human-Robot Interaction (HRI) is a field of study that focuses on the understanding, design, and evaluation of interactions between humans and robots. This workshop aims to bring together researchers interested in exploring the intersection of UIST and HRI. Our goal is to provide attendees with a deeper understanding of the synergies between the two research communities and to inspire better alignment between technical advancements in UIST and their application to social HRI contexts. The workshop will feature interactive demos, prototyping sessions, and discussions to explore key HRI concepts and considerations for designing robot interfaces that facilitate social interactions with humans.

CCS CONCEPTS

• **Computer systems organization** → **Robotics**; • **Human-centered computing** → **Interaction paradigms**; **Interaction techniques**.

KEYWORDS

human-robot interaction, embodied agent, socially interactive robot, social robot

ACM Reference Format:

Pragathi Praveena, Arissa J. Sato, Amy Koike, Ran Zhou, Nathan White, and Ken Nakagaki. 2024. HRI and UIST: Designing Socially Engaging Robot Interfaces. In *The 37th Annual ACM Symposium on User Interface Software and Technology (UIST Adjunct '24)*, October 13–16, 2024, Pittsburgh, PA, USA. ACM, New York, NY, USA, 3 pages. <https://doi.org/10.1145/3672539.3686705>

1 INTRODUCTION

Human-Robot Interaction (HRI) is an interdisciplinary field of study that focuses on the understanding, design, and evaluation of interactions between humans and robots [15]. HRI extends HCI by addressing the unique challenges and opportunities presented by robots. Robots have a *physical presence* [16] and can interact with

the world around them. They can use modalities such as *proxemics*¹ and *social touch*² to create a social presence. The physical form and appearance of a robot can affect human perceptions, such as expectations and trust [10]. People may attribute *agency* to a robot if they perceive its behaviors as intentional and goal-directed, which can shape their social interactions with the robot [26].

Many technical innovations within UIST have shown connections with social HRI. For example, recent work from UIST [14] and HRI [3] explore care-based interactions and their impact on the user’s relationship with the device. Additionally, research on soft materials within the UIST community [6, 19, 21, 27] has potential implications for HRI, as soft materials incorporated into social robot design can evoke warmth [5] as well as foster attachment and provide affective touch experiences [24, 28]. Despite some conceptual and technological overlaps between the UIST and HRI communities, there exists a significant opportunity for greater cross-pollination of intellectual development between these two communities. Our proposed workshop aims to introduce interested researchers and practitioners within the UIST community to relevant HRI considerations and applications when designing future novel interfaces and encourage participants to think about the broader social impacts of their work. Participants in our workshop will engage in *collaborative, rapid prototyping activities to explore key HRI concepts and considerations for designing robot interfaces that facilitate social interactions with humans*. Our goal is to provide attendees with a deeper understanding of the synergies between the two research communities and to inspire better alignment between technical advancements in UIST and their application to social HRI contexts.

2 SCOPE

This workshop aims to bring together researchers interested in exploring the intersection of UIST and HRI. Toward this goal, the workshop will feature: (1) **Interactive Demos** that showcase concepts and considerations for designing social interactions with robots, (2) **Prototyping Sessions** with a robot to explore and experience social engagement, and (3) **Discussion Sessions** where participants brainstorm how the above concepts and experiences are relevant to or inspire their ongoing research. Our intended audience includes researchers and designers interested in exploring robotic interfaces, physically embodied interfaces, social

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UIST Adjunct '24, October 13–16, 2024, Pittsburgh, PA, USA

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ACM ISBN 979-8-4007-0718-6/24/10

<https://doi.org/10.1145/3672539.3686705>

¹ perception and use of physical space, including distance from others [25]

² physical contact that can be used to gain attention, communicate needs, and build empathy and attachment [2]

engagement, and the agency of devices. During the workshop, we aim to explore the following questions:

- (1) What fundamental concepts and key findings are shaping recent HRI research in social settings?
- (2) What social affordances are provided by the physical embodiment of robots?
- (3) What is the experience of interacting with a socially engaging robot?
- (4) How do we envision novel technologies developed by the UIST community enhancing social engagement between robots and humans?

3 WORKSHOP PLANS

Our full-day, in-person workshop will engage 20–25 participants³, organized into small groups, in a series of interactive activities. We are coordinating efforts to borrow robots from the CMU AI Makerspace⁴ in Pittsburgh. In addition, we will invite experienced researchers from the HRI and UIST communities to serve as mentors and provide diverse perspectives during brainstorming, prototyping, and discussions. We anticipate attendance of about 35 individuals, including participants, mentors, and organizers.

3.1 Preparatory Activities

As part of the application process for participation, we will invite potential attendees to briefly share their research interests and their motivation for joining the workshop. We plan to set up an online forum (on Slack or Discord) for attendees to interact with each other and the organizers before the workshop. We will use the forum to tailor our activities to the needs and interests of the attendees.

3.2 Workshop Activities

Introduction and Icebreakers: (30 min) The organizers will commence the workshop by motivating the importance and impact of designing socially engaging robots. The participants will then engage in icebreaking activities in small groups (3–5 people).

Interactive Exploration of HRI Concepts: (90 min) In two 45-minute sessions, the organizers will introduce fundamental concepts and key findings that shape recent HRI research in social settings. Example topics include agency [9], embodiment [4], trust and acceptance [20], attachment [12], and social norms [22]. In small groups, participants will engage with demonstrations created by the organizers that showcase the introduced concepts and applications of social HRI.

Brainstorming Interaction Design: (45 min) Participants will design social interactions with robots, combining concepts from social HRI and their own areas of interest (e.g., multisensory interfaces, shape-changing actuators, e-textiles, physical telepresence, and human-agent collaboration). All participants will be encouraged to bring prototypes or ideas from their ongoing work to contextualize the designs developed during the workshop. The organizers will provide prompts based on scenarios, challenges,

themes, and constraints to facilitate the design process. Materials for paper sketching and tangible design [7] will be provided.

Rapid Prototyping: (75 min) Each group will have access to a social robot for prototyping the designs developed in the previous session. We plan to use the Misty social robot⁵ with a custom visual programming interface. We will help participants integrate or Wizard-of-Oz [1] aspects of their own research work into the interactions prototyped during the workshop. The preparatory activities will support this effort.

Discussion and Speculation: (60 mins) During this session, we will facilitate discussions around the questions outlined in Section 2, with an emphasis on questions 3 and 4. Questions 1 and 2 will primarily be covered in our HRI curriculum. Drawing on their experiences in designing and interacting with social robots from previous sessions, participants will be encouraged to envision how technical innovations from the UIST community can be integrated into social HRI applications.

Final Presentation and Closing: (30 min) We will conclude with a presentation session, where groups will demo their prototypes and provide feedback and suggestions to other participants. This will be followed by a closing statement from the organizers.

3.3 Post-workshop Plans

Following the workshop, all attendees will have ongoing access to the workshop community via the online forum to continue discussions, benefit from shared expertise, and establish collaborations. We hope that the workshop will inspire attendees from the UIST community to consider relevant HRI concepts and applications when designing future novel interfaces, and attendees from the HRI community to explore and incorporate the technical innovations emerging from the UIST community.

4 ORGANIZING COMMITTEE

Our organizing committee consists of a diverse group from the HRI and UIST communities, with extensive research experience in creating novel experiences with robots and actuated tangible UIs, as well as expertise in leading relevant hands-on workshops. Amy Koike and Pragathi Praveena have been recognized with best paper/honorable mention awards at the HRI conference⁶ for their contributions [8, 23]. Arissa Sato and Nathan White contributed to the Social Robotics Major for Grandparents University 2024⁷ at UW–Madison, where children and their grandparents learn about and program social robots. Ran Zhou focuses on developing haptic design tools [29] and co-organized a UIST 2023 workshop on electro-actuated materials for future haptic interfaces [13]. Ken Nakagaki has contributed novel actuated interfaces [17, 18] to the UIST community and co-organized a TEI 2024 workshop on designing expressive movement in robots and actuated tangible UIs [11]. We will leverage our collective expertise to explore the intersection of UIST and HRI through this workshop, which we hope will inspire new research directions and collaborations.

³ We are limiting the number of participants due to the hands-on nature of the activities involving robots and our goal for each group to have access to their own robot.

⁴ <https://www.cs.cmu.edu/initiatives/ai-maker-space/>

⁵ <https://www.mistyrobotics.com/>

⁶ <https://dl.acm.org/conference/hri>

⁷ <https://uwalumni.com/grandparents-university/>

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