User Experience and Social Interaction with Robots

Jonna Häkkilä
University of Lapland
Finland
jonna.hakkila@ulapland.fi

Kaisa Väänänen
Tampere University
Finland
kaisa.vaananen@tuni.fi

Markus Löchtefeld
Aalborg University
Denmark
mloc@create.aau.dk

Aino Ahtinen
Tampere University
Finland
aino.ahtinen@tuni.fi

Kirsikka Kaipainen
Tampere University
Finland
kirsikka.kaipainen@tuni.fi

Matthias Rehm
Aalborg University
Denmark
matthias@create.aau.dk

Siiri Paananen
University of Lapland
Finland
siiri.paananen@ulapland.fi

Petri Hannula
Lapland University of Applied Sciences
Finland
petri.hannula@lapinamk.fi

Ashley Colley
University of Lapland
Finland
ashley.colley@ulapland.fi

ABSTRACT

Robots are an emerging area in human-computer interaction. Although different types of robots have been around for automation and maintenance tasks, they are now emerging more and more towards use cases with social interaction, bringing new opportunities and challenges for the designers. Robots are being integrated into different work and service domains, including office work, healthcare and education. When designing interactive technologies, we need to take into account different user groups, use contexts, and even cultural sensitivities to achieve good user experiences. With robots, also tangible interaction, the form factor, and physical appearance are part of the interactive system design. This workshop addresses interaction with robots, focusing especially on the user experience and social interaction side of it. The workshop invites researchers and practitioners to present their work, or position papers, on the topic and to discuss about related case studies, applications, research methods, and experiences.

KEYWORDS

social robots, human-robot interaction, user experience

1 INTRODUCTION

Robots are familiar already from the early days of automation industry, and interacting with humanoid robots is a concept introduced in science fiction books and movies long before technologies for such products existed. The role and the functionalities of robots have evolved during the years as they have taken up more versatile tasks and been adopted into different contexts of use in our everyday surroundings. For instance, domestic robots can today be found in houses helping in vacuuming or lawn-mowing [4], and robots are central tools in exploration and rescue missions, where autonomous vehicles and drones are used [14]. Robots that interact with people in social situation have also been subject to extensive research, and features such as gaze, head movements and nodding [11], and body orientation [18] are investigated to make robot behaviour more natural. Still, social robots' appearance is not yet common in everyday encounters. Introducing robots to different services and giving them a function in social interaction is however in rise, and due technology development, they can perform increasingly complex tasks and mimic human behaviour.

The technology acceptance and adoptation is a sum of different factors. The adoptation of robots does not depend only on their technical capabilities, but also design, contextual requirements, and social factors play a role. How we interact with robots is not only the question of using them for some utilitarian use case, but the situation compiles to a whole holistic user experience. It is important to investigate the different aspects that can affect to human-robot interaction, and consider the new emerging use cases both from technology and design viewpoint.

In this workshop, we address the user experience and social interaction with robots. We are especially interested in social robots, which are defined as autonomous or semi-autonomous robots that communicate and interact with human beings, and aim at obeying the behavioral norms set by human beings [3]. User experience includes both utilitarian and hedonic aspects, and goes beyond the traditional thinking of system usability [8], and provides a wide framework to approach interaction design with social robots. The workshop aims to engage researchers and practitioners with interest to social robotics, and facilitate holistic discussions related to the topic.

2 INTERACTING WITH ROBOTS

Human interaction with robots can be direct, or happen through indirect encounters. In the scope of this workshop, we are especially

Veröffentlicht durch die Gesellschaft für Informatik e.V.
in K. Marky, U. Grünefeld & T. Kosch (Hrsg.):
Mensch und Computer 2022 – Workshopband, 04.-07. September 2022, Darmstadt

https://doi.org/10.18420/muc2022-mci-ws13-122

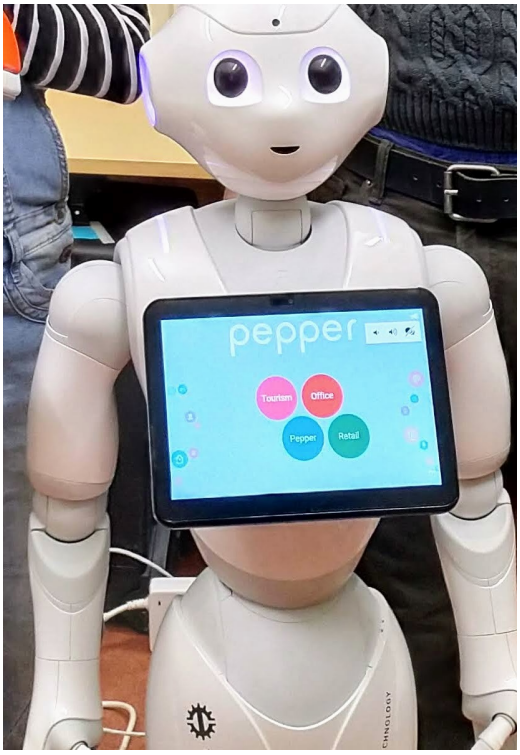

Figure 1: Pepper robot has a humanoid appearance.

interested in interaction with social robots, or when robots are taking public roles e.g. in public places or as service robots.

2.1 Interacting with Social Robots

Social robots provide an interesting viewpoint to the future, where we (expectantly) interact with increasingly complex technology, and where technology is even deeper entwined into our everyday life. Social robots present one possibility to ease the user experience of interaction with complex technology, and a wide set of potential research directions are possible.

Social robots are robots that are able to communicate and interact with people according to the social and cultural structures associated with the role they are given by designers [3]. Social robots can proactively engage with humans to accomplish specific tasks, utilizing natural human-like communication mechanisms such as speech, gestures and eye gaze [5]. Whereas robots can appear in many shapes for different human-robot interaction tasks, humanoid robots are generally preferred for social use cases. For instance, the Pepper robot, which today is popular in different research experiments, is designed to resemble humans in its shape and outlook, Figure 1. Approaches leveraging anthropomorphism have been identified as a fruitful direction to improve human acceptance of robots [21].

Likeness to humans however goes beyond facial and bodily features. As robots are not merely digital representations but have a dynamic physical shape, their behaviour has very tangible aspects, including postures and gestures that are interpreted by the

Figure 2: Interacting with a robot in a museum.

surrounding humans. Including emotional expressions in robots is another challenge for social robotics. For instance, research on robots for civic engagement emphasizes that the robot should express its purpose clearly, and showing emotions can be a supportive element [10]. The emotional expression can be communicated by facial expressions [9], but also by the robot's movement, such as the flying patterns of a drone [6].

2.2 Robots in Public Roles

In addition to interaction with robots in controlled and confined environments, such as in industrial settings, robots are now being deployed to many public spaces such as streets, shopping malls [12], or museums (Figure 2). Robots can also be part of a larger service design solution. For instance, a rescue robot can function as an element within a larger emergency services concept, Figure 3. In these kind of examples, robots can be seen to be taking public roles, where they inevitably interact with people. With the increase in deployment of robots in to these types of scenarios [20], it can be expected that this will form the context for a large proportion of future human-robot interactions.

In a study where robots on the street asked for help from passersby, Weiss et al. found people were willing to provide guidance to the robot, indicative of a high level of social acceptance [19]. Salvini et al. [17], highlight the numerous factors that may affect human acceptance of robots in public roles, calling for a viewpoint that is wider than user centered. With a focus on autonomous delivery robots, Abrams et al. developed a theoretical model for social acceptance [1], and introduced the concept of 'Existence Acceptance' for autonomous systems.

When robots in public roles become more common, it can be expected that new etiquette and social practices are formed with interacting with robots, as tends to happen with emerging technology use in general [15]. Appropriate and context sensitive behaviour codes are an important part of human interaction, and correspondingly, a robot using correct etiquette is more comfortable to interact with. For instance, in the context of a museum guide robot, it has been reported that people preferred a robot which performed an appropriate greeting to one which did not [7].

Figure 3: Arkbot [2] design concept for interacting with a rescue robot.

Cultural factors, such as manners and etiquette, are also factors which influence people's perceptions of robots. Moreover, as with graphical user interface design [13], robot interaction design needs to consider if the possible alternative cultural interpretations of the robot's behaviour. Inconsiderate designs may give grounds to misunderstandings and awkwardness in the human-robot interaction.

3 THE WORKSHOP AREAS OF INTEREST

The examples provided in the prior section illustrate how research on robots is emerging from many directions, and seeks to enhance our interactions with robots, making it more fluent and natural. The research on user experience and social interaction with robots is however only at the beginning.

The aim of the workshop is to gather together researchers, designers and practitioners that are working with human-robot interaction, and are particularly interested in aspects related to user experience and social robots. The workshop aims to be a forum to present existing cases, new possibilities, early research, challenges and lessons learned, and offer a stage where these questions can be discussed with peers and new colleagues with similar interests. We encourage multi-disciplinary participation, and wish to provide an opportunity to network with new peers.

The workshop invites researchers and practitioners with background in, but not limited to, HCI, computer science, design, psychology, and social science related to the technology use. The workshop invites submissions of case studies, applications, methodological notes, as well as position papers, related to topics such as

- interaction with social robots
- use of robots in a societal interactions
- social robots as mediators of human interactions
- service concepts integrating robots as part of the service experience
- user experience with automation robots
- emotions and affect with robots
- user experience with robots in healtcare, education, rescue or other professional contexts
- telepresence or robots as avatars
- interaction with robots in cross-cultural contexts
- ethics in human-robot interaction

4 ORGANIZATION OF THE WORKSHOP

4.1 The Workshop

The workshop consists of thematic session, where the accepted workshop papers are presented. In addition, the workshop will includes a demo session and two interactive sessions. The first interactive session addresses social robots through scenarios presented with visual stimuli. The second session consists of working on a a social robot use case in groups, using low-fi prototyping materials. The essential information about the workshop is shared on the workshop web page [16], and the workshop papers are available, upon agreement, through the GI Digital Library.

4.2 Organizers

Jonna Häkkilä is professor at University of Lapland, Finland, Faculty of Art and Design. She conducts research at the cross section of design and technology, and is interested in the user experience design of futuristic topics in human-computer interaction. She leads Lapland User Experience Design research group (LUX), and is U. Lapland PI for Lapland Robotics project.

Kaisa Väänänen is a full professor of Human-Technology Interaction in Tampere University, Finland. She leads the research group of Human-Centered Technology (IHTE) in the unit of Computing Sciences. She is currently focusing on Human-Centered AI and sustainable development supported by technology, including social robots. She is the general co-chair of CHI 2023 conference.

Markus Löchtefeld is an associate professor for wearable- and tangible computing at Aalborg University. His research is situated at the intersection of HCI and UbiComp particularly focusing on wearable computing as well as novel prototyping and fabrication techniques.

Aino Ahtinen, Dr., is a university lecturer on human-technology interaction at Tampere University, unit of Computing Sciences. She teaches and supervises social robotics topics. Her personal research interest focus on robot-assisted learning and collaborative learning around social robotics.

Kirsikka Kaipainen, Dr., is a postdoctoral researcher at the Unit of Computing Sciences, Tampere University. Her research interests encompass technologies to promote sustainability and wellbeing. She is currently working in the RoboCivics research project, investigating the potential of social robots in youth's civic participation.

Siiri Paananen is a PhD student at University of Lapland, User Experience Design group. Her research focuses on augmenting the museum user experiences with interactive technologies.

Matthias Rehm is a professor at Aalborg University leading the Human Machine Interaction group and coordinating the HRI lab. His research focuses on the fundamental question of how our socio-cultural practices become manifest in interactions with technology.

Petri Hannula is game technology expert and lecturer at Lapland University of Applied Science. His interests include robots for Arctic context.

Ashley Colley is assistant professor at Faculty of Art and Design, University of Lapland. He conducts interaction design research with emerging technologies.

ACKNOWLEDGMENTS

This work has received support from RoboCivics project, funded by Academy of Finland, and Lapland Robotics project, funded by European Regional Development Fund.

REFERENCES

[1] Anna MH Abrams, Pia SC Dautzenberg, Carla Jakobowsky, Stefan Ladwig, and Astrid M Rosenthal-von der Pütten. 2021. A theoretical and empirical reflection on technology acceptance models for autonomous delivery robots. In *Proceedings of the 2021 ACM/IEEE International Conference on Human-Robot Interaction*. 272–280.

[2] ArkBot. 2021. ArkBot Use Scenario. https://www.youtube.com/watch?v=MBwbdE8GgRU. Last accessed 30 June 2022.

[3] Christoph Bartneck and Jodi Forlizzi. 2004. A design-centred framework for social human-robot interaction. In *RO-MAN 2004. 13th IEEE international workshop on robot and human interactive communication (IEEE Catalog No. 04TH8759)*. IEEE, 591–594.

[4] Robert Bogue. 2017. Domestic robots: Has their time finally come? *Industrial Robot: An International Journal* (2017).

[5] Cynthia Breazeal. 2003. Toward sociable robots. *Robotics and autonomous systems* 42, 3-4 (2003), 167–175.

[6] Jessica R Cauchard, Kevin Y Zhai, Marco Spadafora, and James A Landay. 2016. Emotion encoding in human-drone interaction. In *2016 11th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE, 263–270.

[7] Laura-Dora Daczo, Lucie Kalova, Kresta Louise F Bonita, Marc Domenech Lopez, and Matthias Rehm. 2021. Interaction Initiation with a Museum Guide Robot—From the Lab into the Field. In *IFIP Conference on Human-Computer Interaction*. Springer, 438–447.

[8] Marc Hassenzahl and Noam Tractinsky. 2006. User experience-a research agenda. *Behaviour & information technology* 25, 2 (2006), 91–97.

[9] Viviane Herdel, Anastasia Kuzminykh, Andrea Hildebrandt, and Jessica R Cauchard. 2021. Drone in love: Emotional perception of facial expressions on flying robots. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. 1–20.

[10] Kirsikka Kaipainen, Salla Jarske, Jari Varsaluoma, and Kaisa Väänänen. 2020. Persuading youth in civic participation with social robots: What is appropriate? In *Culturally Sustainable Social Robotics*. IOS Press, 183–193.

[11] Chaoran Liu, Carlos T Ishi, Hiroshi Ishiguro, and Norihiro Hagita. 2012. Generation of nodding, head tilting and eye gazing for human-robot dialogue interaction. In *2012 7th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE, 285–292.

[12] Seng W Loke and Andry Rakotonirainy. 2021. Automated Vehicles, Urban Robots and Drones: Three Elements of the Automated City. In *The Automated City*. Springer, 69–108.

[13] Aaron Marcus and Emilie W Gould. 2000. Cultural dimensions and global web user-interface design: What? So what? Now what. In *Proceedings of the 6th Conference on Human Factors and the Web*, Vol. 19.

[14] Robin R Murphy. 2012. A decade of rescue robots. In *2012 IEEE/RSJ International Conference on Intelligent Robots and Systems*. IEEE, 5448–5449.

[15] Pramod K Nayar. 2010. *An introduction to new media and cybercultures*. John Wiley & Sons.

[16] RoboX'22. 2022. RoboX'22 workshop. https://laplandrobotics.com/muc_workshop. Last accessed 26 July 2022.

[17] Pericle Salvini, Cecilia Laschi, and Paolo Dario. 2010. Design for acceptability: improving robots' coexistence in human society. *International journal of social robotics* 2, 4 (2010), 451–460.

[18] Marynel Vázquez, Elizabeth J Carter, Braden McDorman, Jodi Forlizzi, Aaron Steinfeld, and Scott E Hudson. 2017. Towards robot autonomy in group conversations: Understanding the effects of body orientation and gaze. In *2017 12th ACM/IEEE International Conference on Human-Robot Interaction (HRI*. IEEE, 42–52.

[19] Astrid Weiss, Judith Igelsböck, Manfred Tscheligi, Andrea Bauer, Kolja Kühnlenz, Dirk Wollherr, and Martin Buss. 2010. Robots asking for directions—The willingness of passers-by to support robots. In *2010 5th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE, 23–30.

[20] World robotics. 2019. Executive summary world robotics 2019 service robots. https://ifr.org/downloads/press2018/Executive_Summary_WR_Service_Robots_2019.pdf. Last accessed 30 June 2022.

[21] Jakub Złotowski, Diane Proudfoot, Kumar Yogeeswaran, and Christoph Bartneck. 2015. Anthropomorphism: opportunities and challenges in human–robot interaction. *International journal of social robotics* 7, 3 (2015), 347–360.