Closeness with Robots as Social Partners

Jamy Li
Human-Media Interaction
University of Twente
Enschede, The Netherlands
j.j.li@utwente.nl

David Sirkin
Center for Design Research
Stanford University
Stanford, USA
sirkin@stanford.edu

Jan van Erp
Human-Media Interaction
University of Twente
Enschede, The Netherlands
jan.vanerp@utwente.nl

Birna van Riemsdijk
Interactive Intelligence Lab
Delft University of Technology
Delft, The Netherlands
m.b.vanriemsdijk@tudelft.nl

***Abstract*—HRI researchers have explored how people behave toward technology agents, advancing the concept that people can attain "closeness" with technology itself in addition to a living social partner. Yet the topic of closeness with robots has not been fully explored or organized into a discrete area of study. This seems particularly important to the design of robots that are expressive, to the implementation of technologies that use new social signal processing or reciprocal social touch, and to the study of how people respond to robots. This half-day workshop is a forum to discuss the future of "closeness" with robots, conversational agents, autonomous vehicles, Internet of Things devices and other technologies that act as social partners—designs, applications, responses and societal concerns.**

Keywords—Robots; Internet of Things; human-robot interaction; interpersonal closeness; robot design; performing arts

I. INTRODUCTION

This workshop explores the effects and design of robots that people feel close to, extending our prior workshop on the expressive design of robots [1].

A. Responses to robots and agents

How will the nature of our interactions with technology change as new media such as robots and conversational assistants are introduced? How can people develop social affect and closeness with the technology itself? In past work, Eyssel et al. [2] found that people feel closer to robots with the same gender as them. Cramer et al. [3] found people with negative attitudes towards robots perceived a robot as less close than those with positive attitudes. Kramer et al. [4] found that people who have a high need to belong felt less desire to connect with other people after conversing with a virtual agent that used social signals (e.g., head nods), but not when the agent lacked social signals. A chess-playing agent that acted in an empathic manner was rated as higher in potential for long-term companionship than one that lacked empathic actions [5]. Social touch with robots can also generate affective [6] and physiological responses [7] in users. Understanding how advances in speech, expressive movement, touch and social signal processing techniques may affect people's social responses to robots is important to understand their potential social consequences—both positive and negative.

B. Design of expressive robots

A large body of research explores how robot behavior—both motion and sound—can be designed to be expressive. For example, emotion-conveying robot motion has been designed using aesthetics [8] and Laban theatre techniques [9]. Multimodal behaviors including emotion-conveying sounds have also been designed and validated for robots [10]. Various techniques from design research and theatre can be productively applied to robotics prototyping [11]. The exploration of additional variables and methods of designing expressive (and perhaps perceptive) robots can expand the space of what interactions are possible with robots.

II. WORKSHOP GOAL

This workshop brings together participants from diverse fields interested in the concept of "closeness" with technology agents as social partners. We propose a workshop to share each other's works and developing thoughts on the area and an interactive discussion session to discuss the future of closeness with robots, on topics such as the social effects, behavior design and applications of closeness with robots.

III. WORKSHOP ACTIVITIES

This half-day workshop's format consists of keynote speakers, an interactive session to discuss the future of the field and spotlight talks of the accepted authors' works. Participants are invited to share their work in 7-minute presentations of a paper/video/audio clip or enactments such as improvisational demonstration of an interaction idea, and then receive feedback and questions by attendees. *Dr. Heather Knight* (Assistant Professor of Computer

Science at Oregon State University) will give a talk entitled "Literal and Expressive Closeness." *Dr. Vanessa Evers* (Professor of Human-Media Interaction at University of Twente) will give a talk about human interaction with autonomous agents that have social intelligence.

Prospective participants are asked to prepare an extended abstract of 2 to 4 pages. Videos or audio clips of up to 3 minutes are encouraged as group discussion pieces and can be submitted as supplements to an extended abstract or as submissions by themselves. Descriptions of enactments are also welcome as submissions. We welcome contributions from all disciplines. Topics can include: psychological closeness with robots; physical closeness and touch; emotional closeness; design of socially-expressive robots; design of robots using theater or performing arts methods; long-term interaction; anthropomorphism; human vulnerabilities in relation to robots as social partners; case studies of useful applications of closeness; special populations' closeness with technology; social acceptability of closeness; as well as others.

IV. Organizers

Jamy Li is an Assistant Professor at the University of Twente in the Netherlands, where he teaches human-computer interaction and research methods for human-robot interaction. His research interests are in human-robot interaction and closeness with technology. He studied human-robot interaction design at the Center for Design Research at Stanford, communication research in the Department of Communication at Stanford, and engineering at the University of Toronto.

David Sirkin is Executive Director at Stanford University's Center for Design Research, where he focuses on design methodology, as well as the design of physical interactions between humans and robots, and autonomous vehicles and their interfaces. He is also a Lecturer in Electrical Engineering, where he teaches interactive device design. David frequently collaborates with, and consults for, local Silicon Valley and global technology companies including Siemens, SAP and Microsoft Research.

Jan van Erp is Professor of Tangible User Interaction at the University of Twente in the Netherlands with a special interest in using discriminative touch in haptic and tactile displays and social touch in mediated communication and interaction with virtual agents and robots. Jan is also with The Netherlands Organization for Applied Scientific Research TNO as principal scientist.

Birna van Riemsdijk is Associate Professor of Intimate Computing at Delft University of Technology and guest researcher at University of Twente in The Netherlands. She develops modelling and reasoning techniques for software that can take into account human vulnerabilities, in particular, norms and values of people. She is recipient of the Dutch Prize for Research in ICT 2014 and was elected member of the board of the International Foundation of Autonomous Agents and Multiagent Systems (IFAAMAS) from 2012-2018.

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