Symbiotic Society with Avatars (SSA)

Toward Empowering Social Interactions Beyond Space and Time

Stela H. Seo
Kyoto University, Japan
stela.seo@i.kyoto-u.ac.jp

Daniel J. Rea
University of New Brunswick, Canada
daniel.rea@unb.ca

Kanae Kochigami
Kyoto University, Japan
kochigami@i.kyoto-u.ac.jp

Takayuki Kanda
Kyoto University, Japan
kanda@i.kyoto-u.ac.jp

James E. Young
University of Manitoba, Canada
young@cs.umanitoba.ca

Yukiko Nakano
Seikei University, Japan
y.nakano@st.seikei.ac.jp

Alberto Sanfeliu
Universitat Politècnica de Catalunya, Spain
sanfeliu@iri.upc.edu

Hiroshi Ishiguro
Osaka University, Japan
ishiguro@irl.sys.es.osaka-u.ac.jp

Figure 1. Avatar robots can have different embodiments, functionalities, representations, and social interactions, for example, a virtual agent (left-most picture) interacting with people, a humanoid avatar robot (left-mid) having daily conversations, a computer-generated anime-style avatar (right-mid) replacing information booths, and a mobile humanoid robot (right-most) working as a tour guide.

ABSTRACT

Avatar robots, representations of remote people, help them extend their physical, cognitive, and perceptual capabilities. These avatars can be a range of embodiments from virtual agents to physical robots. With avatar robots, a person (operator) can coexist in multiple locations (beyond space) by controlling multiple avatars simultaneously and move from one place to another without delays (beyond time) by connecting to another avatar in a different location. In the near future, avatar technology would change people's lives dramatically. However, we face various challenges to reach this future, including uncharted knowledge of social interactions between people and avatar robots, missing standardization on developing robots (robot specs and controls), the lack of related laws and ethical rules, and technical difficulties. With this developing area of human-robot interaction, new key challenges and problems, approaches, and data are rapidly emerging. This workshop would act as a key meeting point to focus this effort and discuss avatar robots and related research and form new collaborations to forge ahead toward symbiotic society with avatars.

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CCS CONCEPTS

• **Human-centered computing** → Human computer interaction (HCI) → HCI design and evaluation methods

KEYWORDS

Avatar Robots, Avatar Communication, Social Teleoperation, Facial Expression, Body Language

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1. WORKSHOP OVERVIEW

In this 3rd International Workshop of Symbiotic Society with Avatars (SSA), we hold a half-day workshop to provide a short but productive time to discuss avatar-related topics and future society with avatar robots. This is to continue the successful

conversations from the prior two years of the international workshops held at RO-MAN 2022 and HRI 2023.

Avatars can have different embodiments from virtual agents to physical robots (Figure 1). Many traditional avatars emerge as on-screen agents or as teleoperation robots [1, 5]. However, modern novel avatars emerged using new display technologies [8, 10]. Moreover, more sophisticated and capable humanoid avatars appeared and kept improving. Using avatar robots, an operator can go different places quickly and exist in multiple places while socially interacting with remote people.

There are many avatar robot applications empowering users to achieve goals such as remotely interacting with people (e.g., telepresence [9]), expanding their reach (e.g., space exploration [6], narrow pipes [2], or hazardous places such as nuclear reactor [3]), and performing actions (e.g., remote surgery [4], search and rescue [7], or remote employment [1]). However, avatar research is still developing and has many key challenges and problems. This workshop is to act as a meeting for human-robot interaction, robotics, psychology, and sociology researchers together with industry people to discuss avatar robots and related research and form new collaborations.

This workshop is to bring together human-robot interaction researchers who are actively working in the areas of telepresence, teleoperation, social teleoperation, social robotics, virtual agents, and more. Our goal is to build a community to share their challenges, and advances in the field of avatar robots. The schedule is shown in Table 1.

2. KEYNOTE SPEAKERS

Both of our keynote speakers have agreed to give a presentation.

Daniel J. Szafir is an assistant professor of Computer Science at the University of North Carolina at Chapel Hill. He is the director of the Interactive Robotics and Novel Technologies Laboratory (IRON Lab) and leads an interdisciplinary group of researchers working at the intersection of robotics and human-computer interaction to investigate how novel technologies can mediate interactions between people and autonomous systems.

Dylan F. Glas is a senior applied scientist in the HRI Science team at Amazon Lab126, USA developing intelligent social navigation and other features for the Astro robot. In his academic work, he was a senior researcher in social robotics at Hiroshi Ishiguro Lab at ATR and a guest associate professor at the Intelligent Robotics Laboratory at Osaka University. He was the software architect for the ERICA android in the ERATO Ishiguro Symbiotic Human-Robot Interaction Project.

Table 1. The schedule with total cumulative duration.

	Duration	Cumulative
Introduction	5m	5m
Keynote speaker 1: Daniel J. Szafir	30m	35m
Keynote speaker 2: Dylan F. Glas	30m	65m
Organizer's talks	60m	125m
Community contributions (short presentation of submissions)	60m	185m
General discussion	50m	235m
Closing	5m	240m

3. ORGANIZING TEAM

The organizing team consists of d iverse r esearchers w ho a re working on the topic related to this workshop.

Stela H. Seo is an assistant professor in Informatics at Kyoto University, Japan. He received his PhD in Human-Robot Interaction from the University of Manitoba in 2021, following his MSc in 2015 and his BCSc Hons in 2012. He started his career as an assistant professor at Kyoto University in 2021. He is interested in researching social teleoperation, teleoperation interface designs, multi-robot operations, social human-robot interaction, and interactive content designs. He is serving as Steering Committee Managing Director for the ACM/IEEE Human-Robot Interaction conference.

Daniel J. Rea is an assistant professor at the University of New Brunswick and a frequent visitor at Kyoto University with Dr. Takayuki Kanda, and earned his M.Sc. and Ph.D. at the University of Manitoba in 2015 and 2020. His focus is on user-centered design to improve the performance and experience of people remotely controlling robots. Side research interests include game design and applying game design to robotics and other fields, and social human-robot interaction, interaction design, and virtual reality.

Kanae Kochigami is a program-specific assistant professor in Informatics at Kyoto University, Japan. She received her B. Eng, Master of Arts and Sciences in the field of Information Studies, and Ph. D. in the field of Information Studies from the University of Tokyo in 2015, 2017, and 2022, respectively. Her research focuses on the creation of human-human interaction around a robot, in other words, fostering social capital using a robot.

Takayuki Kanda is a professor in Informatics at Kyoto University, Japan. He is also a Visiting Group Leader at ATR Intelligent Robotics and Communication Laboratories, Kyoto, Japan. He received his B. Eng, M. Eng, and Ph. D. degrees in computer science from Kyoto University, Kyoto, Japan, in 1998, 2000, and 2003, respectively. He is one of ATR's starting members of the Communication Robots project. He has developed a communication robot, Robovie, and applied it in daily situations, such as peer-tutor at elementary school and as a museum exhibit guide. His research interests include human-robot interaction, interactive humanoid robots, and field trials.

James E. Young is a professor in the Department of Computer Science, University of Manitoba, where he directs the Human-Robot Interaction group and co-direct the Human-Computer Interaction lab. His research focuses on understanding human experiences with robots, and learning

how to effectively design and develop robots to shape those experiences. He received his BSc from Vancouver Island University in (Computer Science, 2005) and PhD (Computer Science, University of Calgary) in 2010. He is currently serving as Steering Committee Co-Chair for the ACM/IEEE Human-Robot Interaction conference, Managing Editor of the ACM Transactions on Human Robot Interaction Journal, and an Associate Editor for the Frontiers In Robotics and AI (Human-Robot Interaction) journal. He served as Program co-chair for the ACM/IEEE International Conference on Human-Robot Interaction (2017) and General co-chair for ACM/IEEE HRI (2020).

Yukiko Nakano is a professor in the Department of Computer and Information Science at Seikei University, Japan, and leading the Intelligent User Interface Laboratory (IUI lab). She received her M.S. in Media Arts and Sciences from the Massachusetts Institute of Technology, the USA, and a Ph.D. in Information Science and Technology from the University of Tokyo, Japan. With the goal of allowing more natural human-computer interaction, she has addressed issues on modeling conversations by analyzing human verbal and nonverbal communicative behaviors. Based on the empirical models, she has developed Multimodal Conversational Interfaces. She has served as a program committee member for over 30 major international conferences and as a co-chair and a senior program committee member for major international conferences targeting interaction and intelligent agents including IUI, ICMI, AAMAS, and IVA.

Alberto Sanfeliu is full professor of Computational Sciences and Artificial Intelligence on UPC. He was the Scientific Director of the "Unity of Excellence Maria Maeztu" of IRI, Instituto de Robotica i Informatica Industrial - IRI (UPC-CSIC). He is the head of the research line Mobile Robotics of IRI. He is former director of IRI, former director of the UPC's Automatic Control Department, and past president of AERFAI, (Spanish Association for Pattern Recognition). His research interests include Intelligent Robotics, HRI, Computer Vision and Pattern Recognition.

Hiroshi Ishiguro received a Ph. D. in systems engineering from the Osaka University, Japan in 1991. He is currently a Professor in the Department of Systems Innovation in the Graduate School of Engineering Science at Osaka University (2009-) and Visiting Director (2011-) of Hiroshi Ishiguro Laboratories at the Advanced Telecommunications Research Institute (ATR). He is also a Distinguished Professor at Osaka University and an ATR fellow (one of six fellows). His research interests are interactive robotics, avatar technology, and android science. He has developed many interactive humanoids and androids, called Robovie, Repliee, Geminoid, Telenoid, Elfoid, CommU, ERICA, and Ibuki. These robots have been reported by media such as Discovery Channel, NHK, and BBC. In 2011, he won the Osaka Cultural Award. In 2015, he received the Prize for Science and Technology from the Minister of Education, Culture, Sports, Science, and Technology (MEXT). He was also awarded the Sheikh Mohammed Bin Rashid Al Maktoum Knowledge Award in Dubai in 2015. Tateisi Award in 2020, and an honorary doctorate from Aarhus university in 2021.

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