This body doesn't represent me: Exploring telepresence robots and self-presentation

Andy Elliot Ricci
Department of Computer Science,
Cornell University
Ithaca, NY, USA
ear295@cornell.edu

ABSTRACT

Telepresence robots have the potential to revolutionize remote interactions, but they can also misrepresent users. This paper draws on existing theory and empirical evidence to explore how self-presentation is performed through and distorted by telepresence robots. This work focuses on the relationship between the user's physical body and their robot embodiment and provides directions for future work.

ACM Reference Format:
Andy Elliot Ricci. 2023. This body doesn't represent me: Exploring telepresence robots and self-presentation. In *Proceedings of ACM Conference (Conference'17).* ACM, New York, NY, USA, 4 pages. https://doi.org/10.1145/nnnnnnn.nnnnnnn

1 INTRODUCTION

Telepresence systems are designed to improve virtual interactions and collaborations by making users feel physically and socially present in remote environments. A majority of telepresence research focuses on systems in the 'iPad-on-a-stick' paradigm and evaluate success in terms of feelings of presence and task performance through controlled lab studies [11, 15, 17, 18]. Deployment-style studies in offices [11, 19], schools [4, 14, 16], conferences [13], and homes[2, 5, 22] have studied interactions with real users and highlighted key problem areas. Overall, there is a strong foundation of telepresence research with evaluation methods that center on feelings of presence and task performance, but as Boudouraki et al. [1] asserts, there is more to interaction than feeling present.

Telepresence robots allow users to physically take up space in remote environments, giving them a physical presence, but what are the implications of interacting through a robot body? To answer this we first consider the role of our bodies in face-to-face interactions. The physical body plays an important role in social interactions, including embodied cognition, proxemics, and backchanneling gestures, and remote interactions are limited by the lack of physicality. We express ourselves to others through the appearance and actions of our bodies; this process is called self-presentation or impression management and is a key element of human interaction. The impact of computer-mediated communication on self-presentation strategies is well studied [8, 20], but this has not been explicitly studied for robot-mediated communication. Since our physical bodies are at the core of self-presentation, when we communicate through a telepresence robot, we must perform our presentation through the robot. Therefore it is important to understand how a user's self-presentation is expressed through and possibly distorted by telepresence robots. This matters because there is evidence of people feeling less comfortable in social situations when using the telepresence robot and of people feeling like the telepresence robot didn't represent them or let them be seen as they would like to be seen.

In this paper, I draw from impression management theory and empirical evidence from telepresence studies to show how telepresence impacts how others perceive us, why this matters, and what we can do about it. I argue that telepresence systems have the potential to make people feel less connected and harm remote interactions instead of strengthening them. I consider how this is context-dependent and is potentially more harmful to users with less power or resources. I introduce ways of thinking about how likely this is to occur based on robot design. Finally, I propose recommendations and areas for future work.

2 SELF-PRESENTATION & TELEPRESENCE

Self-presentation, or impression management, is the process of controlling our appearance and behaviors to influence how others perceive us and is a critical element of social interactions. We monitor how others perceive us and adjust our presentation to help align other's perceptions with our sense of self and goals. It is important to consider how telepresence robots impact self-presentation because this process is linked to our self-esteem, identity development, social acceptance, and material rewards [10].

The theory of self-presentation was introduced by sociologist Erving Goffman through a theater metaphor [7]. In this model, social interactions are considered plays in which we perform some role. As *actors* in the play, we perform on a *stage* wearing *costumes* and following *scripts* in order to convince the *audience* that we are a certain *character*. In the real world, the stage is the context in which the interaction takes place, and the audience is composed of the people we are interacting with. Costumes are elements a person can use to modify their appearance, or that otherwise contribute to their physical appearance. This includes relatively static physical attributes like height, facial features, and easily modified accessories like clothing and makeup. Scripts are verbal and non-verbal actions and behaviors; the scripts a person can perform depend on their physical and mental abilities. A person's presentation, or role

Conference'17, July 2017, Washington, DC, USA

ACM ISBN 978-x-xxxx-xxxx-x/YY/MM…$15.00
https://doi.org/10.1145/nnnnnnn.nnnnnnn

performance, is limited by the costumes and scripts they access and their physical body.

The physical body is a central component of self-presentation, so what happens when people communicate through a robot body? We explore this through the costume and script elements from Goffman's theater metaphor. I focus on three questions:

(1) Does the robot have access to the same costumes and scripts as the user?
(2) How do we translate the user's costumes and scripts onto the robot?
(3) How does the robot's physical body impact how the costumes, scripts, and user are perceived?

2.1 Costumes and Scripts

People use costumes and scripts to control their presentation. Everyone has access to different costumes and scripts, and the costumes and scripts available are constantly changing. Ideally, telepresence robots can represent users and preserve their presentation by copying their costumes and scripts. Therefore, we start by exploring what costumes and scripts a robot has access to and how this relates to a user's costumes and scripts.

A robot's software and hardware determine what costumes and scripts they have access to. Just as a user's costumes are ways of modifying their physical appearance, a robot's costumes are all the physical appearances it can have and this is determined by hardware (and sometimes software). In many cases, the robot's base costume is the standard appearance of its body which can be customized with accessories and video. A robot's available scripts are the possible behaviors it can perform, including physical movements, playing audio, and displaying video. These are a product of the robot's hardware and software.

Since robots cannot perfectly replicate people it isn't possible for them to have all the costume and script elements, but some are more important than others. We consider two examples where a user's presentation and overall user experience were negatively impacted because the robot was missing a costume or script element.

For example, the stuffed bear telepresence robot used in [9] does not have access to any costumes that are aligned with an average user's clothing and physical appearance. Kuwamura et al. [9] found that users' presentations were distorted and their personalities were perceived differently when communicating through a stuffed bear robot [9]. This change in how the user is perceived can negatively impact users, especially when interacting with strangers or trying to make a good impression.

Most telepresence robots do not have arms and cannot open doors. This is a script limitation, as most users could open doors and perform tasks with their arms if they were physically present. Telepresence users commonly mention this limitation, and while people get around this problem by asking for help, some users mention feeling embarrassed and missing their independence [1, 11]. For example, a user recalled a time when they could not quietly leave a meeting because they couldn't open the door: "...the room just erupted in giant laughter, so it was kinda comical, but for me it was kind of really challenging because there was no way for me to gracefully leave that room." Interveiw 1 from [1]. This type of encounter illustrates a change in how the user is perceived and how this can impact social dynamics and the user's sense of self and self-esteem.

A user's self-presentation is limited by their costume and script sets and a telepresence robot's ability to accurately represent the remote user's presentation is limited by the robot's available costumes and scripts. Thinking about telepresence systems in terms of the available costumes and scripts allows us to consider whether the robot has options for the expected and most relevant scripts and costumes for a given context. This also brings up questions about determining if costumes and scripts are equivalent, and what costumes and scripts are most important for a given user and context. This brings us to how the user's presentation, costumes, and scripts are mapped onto the robot's presentation, costume, and scripts.

2.2 Mapping from Users to Robots

Current systems use a range of approaches to map a user's physical appearance and actions onto a telepresence robot including robot personalization [6], video displays, and robot control interfaces. Depending on the robot's design and control mechanisms the user has a varying level of control over the robot's costumes and scripts. The standard 'iPad-on-a-stick' telepresence robots give user's control over the audio and video performed on the robot and prior work has explored how the costumes of these standard robots can be expanded by allowing users to personalize their robot with physical clothing items and accessories [6, 13]. It is important to note that the goal is not to choose the best costumes and scripts for a user, but instead, we want to preserve the user's choices and give them agency over their presentation. Ideally, telepresence robots will accurately convey the user's costumes and scripts to allow them to be perceived as they would be if they were physically present.

We can model the mapping process as two functions, one from the user's costumes to the robot's costumes and the other from the user's scripts to the robot's scripts. In order for the robot to preserve the user's presentation the functions should map the user's script and costume choices onto equivalent scripts and costumes available to the robot. If we could perfectly and directly map all the user's costumes and scripts onto the robot, the robot would perfectly replicate the human user. This is not technologically feasible, and considering the uncanny valley effect [12] this is not something that could also impact the user's presentation. This being said some costumes and scripts are more important to the user's overall presentation than others. This abstraction allows us to think about what it means for scripts and costumes to be equivalent, what costumes and scripts are most important to preserve, and how to evaluate a mapping.

A common example of a mapping gone wrong is when the robot's volume makes it seem like the user is speaking much louder than they actually are. Users have reported that this makes it seem like the remote user is shouting which can cause others to perceive them rude and disruptive [11, 13]. On a similar note, difficulties with navigation are well documented. In this case, the robot has the ability to move through the space as the user would, but the control interface limits the actual movement. Users report feeling uncomfortable, embarrassed, and attracting unwanted attention when their robot body does not move as they would [1, 11, 13].

2.3 Context Matters

It's not enough to directly map scripts and costumes onto robot one by one, as they are interpreted in context and holistically. Furthermore given that telepresence robots cannot perfectly replicate humans, the robot will always have costume elements, most notably the robot's visible hardware, that are not representative of the remote user's costume and outside of the user's control. As a result, even when we can map a script or costume element to a nearly identical version in the robot's set it may be interpreted differently when presented by the robot. For example, telepresence robots wearing wigs were perceived as unpleasant [6], and user's personalities were distorted when interacting through a Nao robot that copied their physical movements [3]. More generally, the robomorphism effect, the attribution of robot-like qualities onto a user, suggests that user's presentations may always be affected by telepresence robots [18]. These changes can be attributed to the fact that presentations are performed through the interplay of costume and script items and that both the performance and the audience's perceptions of it are complex and context-dependent.

Overall, there are many ways to map a user's costumes and scripts to the robot and there is no perfect or one-size-fits-all solution. We need to consider factors such as the interaction context, computational feasibility, and user preferences during the design process. In addition, we should think about how we can give the remote user insight into and control over the mapping process so that they can self-monitor and have some agency over their augmented self-presentation. This abstraction highlights some key open questions, including what it means for scripts and costumes to be equivalent, what scripts and costumes are most important to preserve, and how each script and costume impacts the impression as a whole.

3 IMPLICATIONS & DIRECTIONS FOR FUTURE WORK

The primary goals of telepresence systems are to improve remote interactions and make people feel more present, but there is evidence that telepresence robots alter how users present themselves and how others perceive them. This is contrary to the purpose of telepresence since self-presentation is linked to social and material rewards, self-concept, and self-esteem, and any disruption to or augmentation of presentation has the potential to cause harm. While research is needed to fully understand when, how, and to what extent telepresence robots impact self-presentation, we can use this preliminary exploration to inform how to design and evaluate telepresence systems.

When designing systems, consider what types of costumes and scripts are missing from the robot and compare them to what costumes, scripts, and impressions are expected for a given context. For example, a telepresence robot used in homes may have different needs than one used in an office setting. We should think about how to design control algorithms and interfaces to give users control and the ability to self-monitor while not causing cognitive overload.

In terms of evaluation, we need to rethink what successful telepresence systems look like and how we can define and measure success. Much of this work was motivated by findings from deployment studies and interviews with real users. This highlights the importance of studying telepresence in context and centering real users and interactions. It is important to note the lack of diversity in the participants included in these studies and HRI studies more broadly [21]. This is particularly relevant because, following impression motivation theory, users who have less relative power or are otherwise outsiders in an interaction are more likely to want to control their presentation. As a result, these users may be more negatively affected than others if a telepresence robot distorts their self-presentation. Therefore it is important to evaluate telepresence systems with a diverse population of users to ensure that we are not only observing interactions between more privileged users who are less likely to be impacted by a distorted presentation.

This paper introduces a way to think about how self-presentation is impacted robot-mediated communication and illustrates that this is a complex process that is highly context-dependent. Future work is needed to formalize this model and answer open questions about designing and evaluating telepresence systems with self-presentation in mind.

ACKNOWLEDGMENTS

I would like to thank Malte Jung and the National Science Foundation (Grant 1925100) for supporting this research.

REFERENCES

[1] Andriana Boudouraki, Joel E Fischer, Stuart Reeves, and Sean Rintel. 2023. " Being in on the Action" in Mobile Robotic Telepresence: Rethinking Presence in Hybrid Participation. In *Proceedings of the 2023 ACM/IEEE International Conference on Human-Robot Interaction*. 63–71.

[2] Andriana Boudouraki, Stuart Reeves, Joel E Fischer, and Sean Rintel. 2022. Mediated Visits: Longitudinal Domestic Dwelling with Mobile Robotic Telepresence. In *CHI Conference on Human Factors in Computing Systems*. 1–16.

[3] Paul Adam Bremner, Oya Celiktutan, and Hatice Gunes. 2017. Personality Perception of robot avatar Teleoperators in solo and Dyadic Tasks. *Frontiers in Robotics and AI* 4 (2017), 16.

[4] Houda Elmimouni, Amy Kinney, Elizabeth C Brooks, Hannah Li, and Selma Sabanovic. 2023. " Who's that?" Identity Self-Perception and Projection in the Use of Telepresence Robots in Hybrid Classrooms. In *Companion of the 2023 ACM/IEEE International Conference on Human-Robot Interaction*. 287–291.

[5] Laura Fiorini, Alessandra Sorrentino, Mattia Pistolesi, Claudia Becchimanzi, Francesca Tosi, and Filippo Cavallo. 2022. Living with a telepresence robot: results from a field-trial. *IEEE Robotics and Automation Letters* 7, 2 (2022), 5405–5412.

[6] Naomi T Fitter, Megan Strait, Eloise Bisbee, Maja J Mataric, and Leila Takayama. 2021. You're Wigging Me Out! Is Personalization of Telepresence Robots Strictly Positive?. In *Proceedings of the 2021 ACM/IEEE International Conference on Human-Robot Interaction*. 168–176.

[7] Erving Goffman. 1959. The presentation of self in everyday life.

[8] Erin E Hollenbaugh. 2021. Self-presentation in social media: Review and research opportunities. *Review of communication research* 9 (2021), 80–98.

[9] Kaiko Kuwamura, Takashi Minato, Shuichi Nishio, and Hiroshi Ishiguro. 2012. Personality distortion in communication through teleoperated robots. In *2012 IEEE RO-MAN: The 21st IEEE International Symposium on Robot and Human Interactive Communication*. IEEE, 49–54.

[10] Mark R Leary and Robin M Kowalski. 1990. Impression management: A literature review and two-component model. *Psychological bulletin* 107, 1 (1990), 34.

[11] Min Kyung Lee and Leila Takayama. 2011. "Now, I have a body" uses and social norms for mobile remote presence in the workplace. In *Proceedings of the SIGCHI conference on human factors in computing systems*. 33–42.

[12] Masahiro Mori. 1970. The uncanny valley: the original essay by Masahiro Mori. *IEEE Spectrum* (1970).

[13] Carman Neustaedter, Gina Venolia, Jason Procyk, and Daniel Hawkins. 2016. To Beam or not to Beam: A study of remote telepresence attendance at an academic conference. In *Proceedings of the 19th acm conference on computer-supported cooperative work & social computing*. 418–431.

[14] Veronica Ahumada Newhart, Mark Warschauer, and Leonard Sender. 2016. Virtual inclusion via telepresence robots in the classroom: An exploratory case study. *The International Journal of Technologies in Learning* 23, 4 (2016), 9–25.

[15] Irene Rae, Bilge Mutlu, and Leila Takayama. 2014. Bodies in motion: mobility, presence, and task awareness in telepresence. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. 2153–2162.

[16] Matthew Rueben, Mohammad Syed, Emily London, Mark Camarena, Eunsook Shin, Yulun Zhang, Timothy S Wang, Thomas R Groechel, Rhianna Lee, and Maja J Matarić. 2021. Long-term, in-the-wild study of feedback about speech intelligibility for k-12 students attending class via a telepresence robot. In *Proceedings of the 2021 International Conference on Multimodal Interaction*. 567–576.

[17] Daisuke Sakamoto, Takayuki Kanda, Tetsuo Ono, Hiroshi Ishiguro, and Norihiro Hagita. 2007. Android as a telecommunication medium with a human-like presence. In *2007 2nd ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE, 193–200.

[18] Alexander P Schouten, Tijs C Portegies, Iris Withuis, Lotte M Willemsen, and Komala Mazerant-Dubois. 2022. Robomorphism: Examining the effects of telepresence robots on between-student cooperation. *Computers in Human Behavior* 126 (2022), 106980.

[19] Leila Takayama. 2015. Telepresence and apparent agency in human–robot interaction. *The handbook of the psychology of communication technology* (2015), 160–175.

[20] Joseph B Walther. 2007. Selective self-presentation in computer-mediated communication: Hyperpersonal dimensions of technology, language, and cognition. *Computers in Human Behavior* 23, 5 (2007), 2538–2557.

[21] Katie Winkle, Donald McMillan, Maria Arnelid, Katherine Harrison, Madeline Balaam, Ericka Johnson, and Iolanda Leite. 2023. Feminist human-robot interaction: Disentangling power, principles and practice for better, more ethical HRI. In *Proceedings of the 2023 ACM/IEEE International Conference on Human-Robot Interaction*. 72–82.

[22] Lillian Yang and Carman Neustaedter. 2020. An autobiographical design study of a long distance relationship: When telepresence robots meet smart home tools. In *Proceedings of the 2020 ACM Designing Interactive Systems Conference*. 129–140.