Intergroup contact via Telepresence Robots

Aalto University Doctoral Program | Research Plan

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10/2020

Contents

1 Introduction

The proposed research investigates how robots could facilitate contact between groups in conflict. It uses a multidisciplinary approach, combining communication and media studies, social psychology, art, design, and robot engineering with one principal objective: reducing prejudice between the groups. Telepresence robots (robots that are remotely operated by humans) are increasingly used in social situations where face-to-face meetings are difficult to organize. Robots are being used in public services such as health care and education, as well as private-sector working places and residential homes. New demands for robotic avatars also surfaced in light of the COVID-19 pandemic, where physical distancing is imposed on society. Telepresence robots have not been used, so far, for intergroup contact.

The theoretical foundation for the research stems from the principles of intergroup contact outlined by Gordon Allport in the 1954 seminal work *The Nature of Prejudice* (1954). The premise of Allport's theory is that the first step toward reducing prejudice between groups is to enable *contact* between them. The social motivation for the research is the dire need for practical, innovative solutions to the violent, long-term conflict in my home country, Israel, with its Palestinian neighbors. The prolonged state of alienation and lack of communication between the two sides, fixated by a 708-kilometer separation barrier, became a breeding ground for prejudiced opinions and an intensifying cycle of hate. I believe that from this extreme use-case of robots for the sake of intergroup conflict resolution, wider-scale lessons regarding social robot design, physical interaction, and mediated communication can be acquired and applied in other contexts of Human-Robot Interaction.

This research will contribute to the academic community in four publications over four years, detailed in this plan:

1) The robot contact hypothesis: In a conceptual article, we will lay the foundation for future implementations of telepresence robots designed for intergroup conflict resolution.

2) Avatar-making workshop: We will produce a novel design for a robot avatar-making toolkit that lets inexperienced users fabricate their robotic avatars and use them to occupy remote locations.

3) A field test for telepresence robot contact in the context of the Israeli-Palestinian conflict

4) Dissertation: A final dissertation that aggregates, concludes, and reflects on the entire process.

2 Conceptual framework

2.1 Intergroup contact hypothesis

The contact hypothesis, as formulated by Gordon Allport, (1954), specifies four conditions to be fulfilled during positive intergroup contact: equal status, having common goals, active cooperation, and institutional support. Fifty years later, a meta-analysis across more than 500 studies in a variety of intergroup contexts (Pettigrew and Tropp, 2006) has revealed that contact is indeed an effective means to reduce prejudice. However, the meta-analysis also showed that the conditions are not strictly essential for a positive outcome, yet they are factors among others that facilitate it. Later research focused on expanding the theory to include more conditions such as forming cross-group friendships (Cook, 1962) and identifying affective drivers, such as empathy and (reduced) anxiety, that play a mediating role in contact interventions (Pettigrew et al., 2011; Brown and Hewstone, 2005). An additional factor that moderates the outcome of contact is *group salience*, the degree to which the group identity of the participants is evident. A high level of group salience facilitates the generalization of attitudes from the interpersonal level to the group level (Voci and Hewstone, 2003).

Previous intergroup contact studies were mainly conducted in face-to-face (FtF) settings. However, face-to-face contact can be challenging to implement, particularly in areas of violent conflict (Hasler and Amichai-Hamburger, 2013). Organizers commonly face practical issues such as gathering diverse groups, finding a neutral, accessible location, and compensating participants for travel expenses. Therefore, recent projects have used technology (especially online communication) to facilitate intergroup encounters.

2.2 Online contact

Communication technologies expand the models of contact and add new modalities of interaction while compromising on the benefits of traditional FtF encounters. Research on online intergroup contact has shown its potential to reduce prejudice and aid in conflict resolution (Amichai-Hamburger et al., 2015; Hasler and Amichai-Hamburger, 2013; Walther et al., 2015). However, online contact is not always constructive, and may result in a negative outcome and increased prejudice. The remote and abstract nature of the medium makes participants less accountable for their actions and less engaged in the conversation (White et al., 2015; Schumann et al., 2017). The lack of nonverbal cues (Burgoon and Hoobler, 1994) obstructs the path to a mutual understanding and impairs the turn-taking process, which may evoke negative feelings between the group members, such as anger and frustration (Johnson et al., 2009).

Prejudice can be seen as an abstraction of the human body (Ahmed, 2000); yet despite the inherent abstraction in virtual mediums and the widely recognized role of the body in forming social cognition (Dewey, 1986; Merleau-Ponty, 2013; Gallagher, 2006; Malafouris, 2013), little attention has been given to robots as a tool for intergroup contact. Remote-controlled robots (telerobots) have a lot in

common with online mediums and may carry similar risks when used for contact. Nevertheless, telerobots have a physical presence; we use our bodies to interact with robots just as we would with a living being. They provide corporeal depth to mediated contact, situating a midpoint between online communication and an FtF meeting.

2.3 Telepresence and telerobots

Originally, the term *telepresence* was used by Marvin Minsky and Patrick Gunkel to describe a vision of a futuristic economy in which people perform manual, physical labor from remote locations (Minsky, 1980). Although the term is nowadays used to describe a human's presence in a virtual environment (Steuer, 1992), telepresence originally refers to the experience of being in a remote environment that is *real* and mediated by a physical sensing agent, that is, a *telerobot*. (Campanella, 2000). When a telerobot serves as a remote representation of a human operator, it is referred to as its *avatar*. In phenomenological terms, the experience of operating a telerobot is named *re-embodiment* (Dolezal, 2009). Today telerobots go beyond industrial use and are deployed in social care (Michaud et al., 2007), education (Tanaka et al., 2014), and interpersonal communication (Ogawa et al., 2011), utilizing the internet as the medium for tele-operation.

Research in Human-Robot-Interaction (HRI) over the past two decades offers insight on a wide range of possibilities for designing social robots (robots that conduct social interaction with humans). Key factors that influence the attitude toward the robot include the level of anthropomorphism of the robot's appearance (Hancock et al., 2011; Fink, 2012), the use of an external display on the body of the robot (Thrun, 2004; Choi and Kwak, 2016), the use of affective touch and soft materials (Kerruish, 2017; Stiehl et al., 2005; Bao et al., 2018), and the use of nonverbal cues (Hirano et al., 2016; Lala et al., 2019). In telepresence, research focused on factors affecting the sense of presence and self-extension from operators toward their robotic avatars. Key elements include the responsiveness and feedback level of the control interface (Cole et al., 2000; Dolezal, 2009) and the appearance of the robotic avatar (Lee et al., 2015; Groom et al., 2009). Telerobot designs vary from the commonly used video conferencing tablet on wheels to full-body anthropomorphic, zoomorphic, and caricature appearances.

The above factors are all relevant for establishing trust and positive relations between interlocutors and robotic avatars. In this research, however, we focus on the design and architectural elements that may be of particular importance to intergroup contact and conflict resolution. By juxtaposing theories of HRI, Computer-Mediated Communication (CMC), intergroup contact, and conflict resolution, we can explore the use of telepresence robots as a means to reduce prejudice between groups.

3 Milestones

As a prelude to this research, a position paper titled "The Potential of Telepresence Robots for Intergroup Contact" was submitted and accepted to the CHIRA 2020 conference on Computer-Human Interaction. The paper lists potential pitfalls and opportunities toward the first implementation of telepresence-based intergroup contact. Subsequently, we will conduct a four-year study and produce four publications, divided into the following milestones:

3.1 The robot contact hypothesis

In a conceptual article, we will lay the foundation for future implementations of telepresence robots designed for intergroup conflict resolution. Following a comprehensive literature review in HRI and intergroup contact theory, and induction of design principles, we will conduct a user-survey in Israel and Palestine regarding user preferences and willingness for intergroup robot-mediated encounters.

The survey would include a representative demographic sample with diverse political ideologies, estimating the potential for robot-mediated contact to reach those who carry a negative and prejudice opinion toward the outgroup. The survey would also serve us as a means to construct a user-base for the practical implementation detailed in the next milestone.

3.2 Avatar-making workshop

We will produce a novel design for a robot avatar-making toolkit that allows inexperienced users to fabricate their robotic avatars, design their appearances and movements, and use them to occupy remote locations. The toolkit will include lessons learned in my Master's thesis soft-robotic implementation (Peled, 2019), and move toward a new approach for textile-based, pneumatic-driven robots that are modular, easily customizable, and exhibit flexible motion.

Textile-based soft robots are an emerging field that utilizes commercially-available fabrics for creating flexible robotic actuators (Pyka et al., 2020). Textile actuators are safer for the human body, exhibit a wide range of organic movements, and can be produced using readily-available equipment such as a sewing machine and an impulse sealer (Cappello et al., 2018). Textile actuators have been used primarily for medical purposes, such as wearable assistive gloves (Ge et al., 2020), but their properties make them ideal for creating customized robotic avatars in a workshop setting.

The practice of *Co-Design* in mediated intergroup contact can increase the involvement of minority groups in the process, disseminate technological knowledge, and reduce the notion of a higher power from above coming to restore peace without perceiving the situation and its nuances. Moreover, Groom et al. showed that operators had a greater sense of self-extension to a robot that was assembled by them, rather than another (Groom et al., 2009). Robots were also successfully co-designed with children as the target users (Alves-Oliveira et al.,

2017; Henkemans et al., 2016), and co-design methods improved the general attitude of students toward robots in educational settings (Reich-Stiebert et al., 2019).

In the workshop, we will provide participants with a ready-made communication controller and central pneumatic system, providing built-in conversation and actuation capabilities, including language translation and remote control via the mobile web. Participants will use the provided fabrics and elastic materials to design and create their robotic avatar (see fig. 1). Tutoring will draw inspiration from expressive art therapy (Muri, 2007; Sholt and Gavron, 2006), encouraging participants to express themselves and their group identity through the avatar. They will design their expressions into the robot, whether it is an offensive hand gesture or an offer for peace.

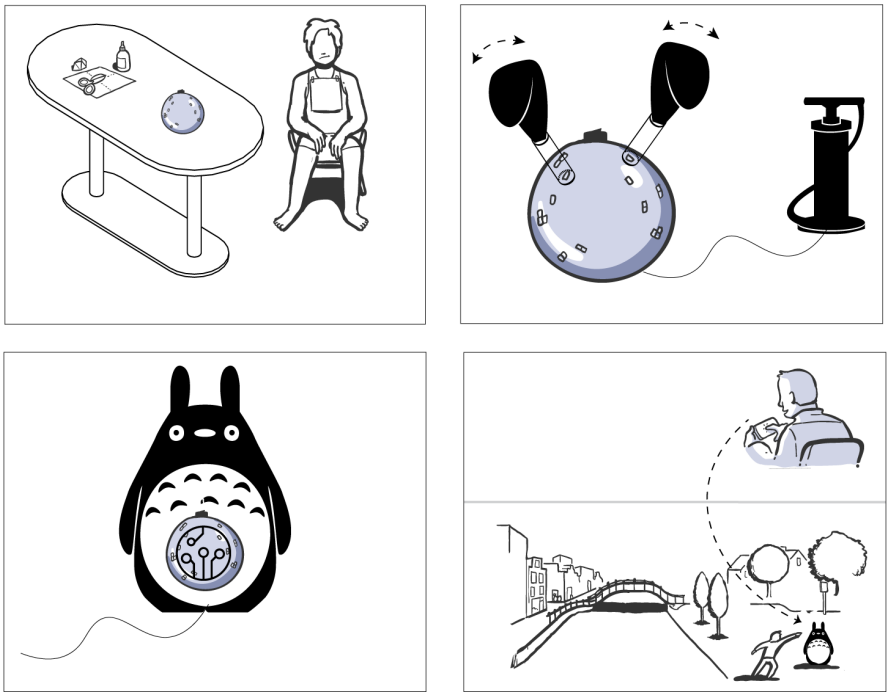

Figure 1: Workshop storyboard: 1) Make robotic body parts from textile and elastic balloons. 2) Connect parts to the pre-built controller and test actuation upon inflation. 3) Design robot over the core controller. 4) Operate robot remotely

As a first stage, workshops would be conducted in Finland, Israel, and Palestine, and qualitatively analyzed through pre/post-session interviews and observations made in the field. The approach of *Constructive Design Research* (Koskinen, 2011) combines lab-work with participatory practices and ethnographic fieldwork, aiming to improve the design and tailor it to situated scenarios. The feedback

from the participants and the resulting robot designs would prepare us for the final milestone of conducting the workshops in Israel and Palestine and deploying the robots in the field of conflict.

3.3 Telepresence robot contact in Israel-Palestine

A field test for telepresence robot contact in the context of the Israeli-Palestinian conflict: Based on the developed toolkit, we will conduct workshops in Israel and Palestine and organize robot-mediated encounters and public-space appearances of robots from across the separation barrier. Results from the events would be documented and analyzed using qualitative analysis of pre and post-session interviews, field notes, and coded memos, as well as quantitative analysis of data automatically gathered by the robots.

3.4 Dissertation

The final dissertation would aggregate the previous articles and conclude them with a monograph that reflects on the creative process and organizes the findings for further development.

Appendix A: Timeline graph

The milestones are arranged on the following graph. In addition to publications, I will take 60 ECTS of courses.

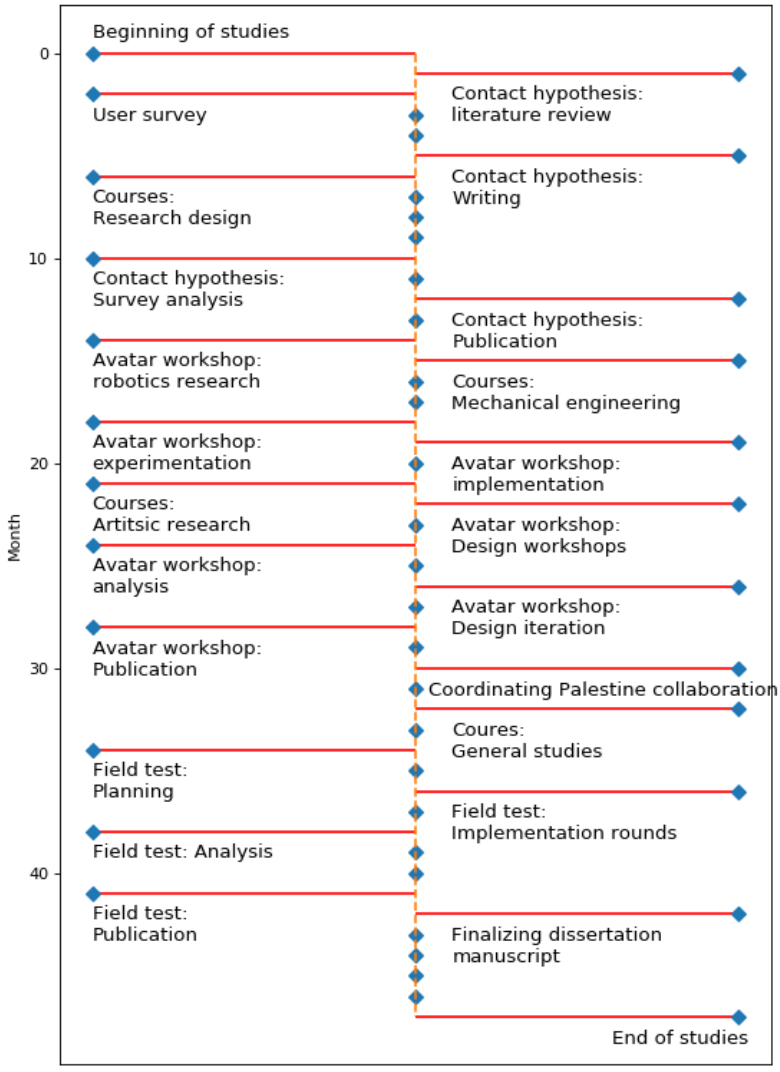

Figure 2: Research timeline draft

Appendix B: Advisors

I have confirmed the availability of three advisors for my studies:

1. **Prof. Teemu Leinonen:** Head of the Learning Environments research group and supervisor of my doctoral studies.
2. **Dr. Béatrice Hasler:** Founder of VR-CORE: Virtual Reality Lab for Conflict Research in IDC Herzliya research school in Israel. Béatrice has years of experience researching virtual intergroup contact in the Israeli-Palestinian conflict and has studied online collaboration. Beatrice graciously offered to advise and participate in this research and has introduced me to missing links in social psychology that are essential for this dissertation.
3. **Dr. Mia Muurimäki:** A former Aalto Media Lab faculty and now a service designer team leader in Futurice. Mia has helped me during my Master's thesis in a multitude of ways. She directed me to relevant literature, suggested design changes, and advised me on project management and schedules. Mia has been conducting participatory and co-design workshops in Futurice, and I am sure she will also be able to advise on the design process.

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