When Robots Interact with Groups, Where Does the Trust Reside?

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Abstract—As robots are introduced to more and more complex scenarios, the issues of trust become more complex as various groups, peoples, and entities begin to interact with a deployed robot. This short paper explores a few scenarios in which the trust of the robot may come into conflict between one (or more) entities or groups that the robot is required to deal with. We also present a scenario concerning the idea of repairing trust through a possible apology.

I. INTRODUCTION & MOTIVATION

A longstanding and multifaceted core-challenge within the development of social robotics and their use in social settings relates to the robots’ trustworthiness [1]. While there is a burgeoning literature covering many diverse aspects of trust within HRI, such as robots gaining trust [2], losing and restoring of trust [3], [4], addressing users’ over-trusting a robot [5], much of the attention in research examines trust in terms of simple dyadic interaction [6].

Even within a ‘simple’ dyadic scenario, variations in social contexts may influence people’s trust towards a robot and determine what constitutes trustworthy behaviour [7]. The social context may further derive from people’s understanding of who ‘owns responsibility’ for the robot and their motivations, thereby bringing additional agents into potentially any current social HRI scenario [8]. Moreover, emerging work exploring trust in contexts of larger social groups shines a light on these additional social complexities for a robot to navigate; for example, recent empirical research indicates that trust within a group can be shaped via a robot mediating human-human interactions [9] or making its own social disclosures [10].

For a robot to determine trust from a group, a simple summation of the respective trust of each individual within the group might not be appropriate; where multiple (potentially concurrent) users are interacting with a system, there may be many approaches to determining trust holistically, let alone optimising for this [11]. Similarly, building trust with one group could potentially diminish trust with another. Given this, ought a robot to simply maximise overall trust, or are there alternatives to take and if so, how may a robot determine this calculus? Research considering how a robot could, or should, potentially navigate dynamic, social, group interaction contexts, can illuminate HRI issues which will arise in real-world contexts, where robots have been deployed alongside humans engaging in their daily life, providing future HRI research directions. In this paper, we present three scenarios in which a hypothetical social robot must address issues relating to trust across multiple agents and identify appropriate actions across competing demands for trust.

II. SCENARIOS

For the sake of simplicity, we keep the same premise across the scenarios of a hypothetical barista robot, (well beyond state-of-the-art, e.g., [12]). This type of service-oriented social robot is envisioned to be able to

i interact with customers
ii interact with co-workers
iii have the capabilities of functioning as a barista.

The setting for the scenarios is chosen as a familiar illustration of co-existing and competing interests within the service industry, an area identified as high interest in enrollment of social robotics [13]. Recent research highlights the dynamic social environment and careful navigation through social interactions that may be expected of barista robots in HRI scenarios with multiple people [14]. As identified in their work, social violations such as breaching privacy, can have meaningful impact on how people view the robot and could potentially affect human-human interaction.

While such challenges may also be ones that people face in everyday human-human interaction, we consider the specific requirements necessary for a robot to appropriately navigate these, as both meaningful steps in developing models for trust in robotics, and as illustrative of the complex (often unstated) decisions humans make in such circumstances. Challenges particular to a robot may include its inability to make decisions in real time, using the same level, and complexity, of a priori information accessible to humans making equivalent decisions.

Our setting presents the barista robot as being a member of one group (the service staff) in relation to two other groups (customers and managers). Specifically, the scenarios serve to highlight potential issues for a robot in navigating working with service staff for a manager towards customers. The overarching question is not one of how can the robot build trust, but with whom should the robot seek to build trust.

A. Overheard Gossip

This first scenario discusses the conflict in trust between teammates and the company/owner that deployed the robot.

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[Scenario 1] The robot, working on its tasks, overhears co-workers discussing an upcoming opportunity to unionise their workforce.

There are a few potential actions the robot could take upon hearing these conversations. It could tell the boss/owner about the conversations happening. It could also inform its teammates that it will tell the owner. It could do nothing, reporting to neither group. A number of these actions revolve around the issue of deciding where privacy and first-order trust reside for the robot. Is the robot an extension of company policy verbatim or is the robot’s adaptability to increase its own particular team’s efficiency the higher priority?

B. An Accident and A Mea Culpa

This second scenario discusses how trust management and repair might work between teammates and customers.

[Scenario 2] After spilling a cup of coffee on a customer, the robot apologises to the customer but is still yelled at for incompetence within earshot of co-workers.

This scenario focuses less on the next action of the robot, but more on the question of changes in trust from this event. How does this impact the human teammates attitudes towards the robot? Would this engender sympathy from them? Would this make them think the robot is incompetent and a nuisance to their team? While trying to repair trust from a mistake with a customer, does the apology build trust with other customers who overhear it?

C. An (Intentionally) Mislabeled Order

This third scenario discusses the conflict in trust between teammates, customers, and social norms.

[Scenario 3] The robot is handed a completed order to deliver/announce to the customer base, however the robot notes that the written name on the order can be interpreted as offensive to the customer and is not the name the customer gave when ordering.

In this last scenario, the robot once again has a few possible actions it can take. The straightforward thing might be to say the problematic name that its teammate wrote down. Alternatively, another option might be to call out what the order was, instead of the name, reducing the risk of a possible conflict. This all depends on the types of social norms that the robot executes (and its expected to execute). Should the robot help its teammates perform mild forms of protest? Or should the robot’s first-order trust reside with the customer’s comfort and satisfaction?

III. DISCUSSION

These simple scenarios provide some context for the complexities involved in trust management that various deployed robotic systems will encounter. If robots are to become truly interactive in non-trivial environments, then managing various levels of trust will be inevitable.

Non-dyadic trust, or group trust, may become especially important to navigate. These scenarios ask a number of questions around privacy sharing, group trust building, and issues surrounding group-alignment. Finding situations in which a robot will have to choose one group over another - and how that could affect the underlying trust of the excluded group - is not far fetched. As they are group level decisions, it is also integral to begin looking at trust properties of groups over merely collections of individuals.

These thought experiments are intended to highlight issues with social robots that will be able to make decisions in real-world scenarios. It is not a case of, should a robot make decisions, but rather, an acknowledgement of the need to address what needs to be in place when robots do make decisions in the real-world. What social and legal infrastructure needs to be in place to ensure everyone in these situations is clear on who is responsible for the actions and outcomes of the advanced technology in the work-place? Considering who trusts whom in these human-robot-manager situations is one practical starting point to answering such a question.

REFERENCES

[1] S. Naneva, M. Sarda Gou, T. L. Webb, and T. J. Prescott, “A systematic review of attitudes, anxiety, acceptance, and trust towards social robots,” International Journal of Social Robotics, vol. 12, no. 6, pp. 1179–1201, 2020.
[2] P. Robinette, A. R. Wagner, and A. M. Howard, “Building and maintaining trust between humans and guidance robots in an emergency,” in 2013 AAAI Spring Symposium Series, 2013.
[3] M. Salem, G. Lakatos, F. Amirabdollahian, and K. Dautenhahn, “Would you trust a (faulty) robot? effects of error, task type and personality on human-robot cooperation and trust,” in 2015 10th ACM/IEEE International Conference on Human-Robot Interaction (HRI). IEEE, 2015, pp. 1–8.
[4] D. Cameron, S. de Saille, E. C. Collins, J. M. Aitken, H. Cheung, A. Chua, E. J. Loh, and J. Law, “The effect of social-cognitive recovery strategies on likability, capability and trust in social robots,” Computers in human behavior, vol. 114, p. 106561, 2021.
[5] D. Ullrich, A. Butz, and S. Diefenbach, “The development of overtrust: An empirical simulation and psychological analysis in the context of human–robot interaction,” Frontiers in Robotics and AI, vol. 8, p. 554578, 2021.
[6] C. S. Nam and J. B. Lyons, Eds., Trust in Human-Robot Interaction. San Diego, CA: Academic Press, Nov. 2020.
[7] P. Holthaus, “How does a robot’s social credibility relate to its perceived trustworthiness?” arXiv preprint arXiv:2107.08805, 2021.
[8] D. Cameron and E. C. Collins, “User, robot, deployer: A new model for measuring trust in hri,” arXiv preprint arXiv:2109.00861, 2021.
[9] C. Birmingham, Z. Hu, K. Mahajan, E. Reber, and M. J. Matarić, “Can i trust you? a user study of robot mediation of a support group,” in 2020 IEEE International Conference on Robotics and Automation (ICRA). IEEE, 2020, pp. 8019–8026.
[10] S. Strohkorb Sebo, M. Traeger, M. Jung, and B. Scassellati, “The ripple effects of vulnerability: The effects of a robot’s vulnerable behavior on trust in human-robot teams,” in Proceedings of the 2018 ACM/IEEE International Conference on Human-Robot Interaction, 2018, pp. 178–186.
[11] W. Leister and T. Schulz, “Ideas for a trust indicator in the internet of things,” in The First International Conference on Smart Systems, Devices and Technologies. SMART Press Oslo, 2012.
[12] H. J. Sung and H. M. Jeon, “Untact: Customer’s acceptance intention toward robot barista in coffee shop,” Sustainability, vol. 12, no. 20, p. 8598, 2020.
[13] K. Blöcher and R. Alt, “Ai and robotics in the european restaurant sector: Assessing potentials for process innovation in a high-contact service industry,” Electronic Markets, vol. 31, no. 3, pp. 529–551, 2021.
[14] S. Hedao, A. Williams, C. Wadguonkar, and H. Knight, “A robot barista comments on its clients: Social attitudes toward robot data use,” in 2019 14th ACM/IEEE International Conference on Human-Robot Interaction (HRI). IEEE, 2019, pp. 66–74.