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Community Embedded Robots: Non-Robot Pre-Deployment Interview Study

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Introduction

Perceptions of incidental human-robot encounters in public settings are of increasing interest to social scientists and roboticists alike (Eguchi & Okada, 2017; Moesgaard et al., 2022). One benefit of this research is the level of context-specific information that can be implemented into design (de Graaf & Allouch, 2013).

Research Goal

The goals of this project are to better understand the real-world consequences and social dynamics of incidental community-based encounters with autonomous mobile robots.

Methods

Phase I: Research question: *How do people feel about incidental encounters with autonomous robots in public settings?* In total, 41 research participants were interviewed for 10-15 minutes located near a main road on campus. After informed consent, interviews were recorded. Transcripts for each interview were anonymized and analyzed by two primary coders. Constructivist grounded theory (Charmaz, 2006) was the analytical method used, with the goal of generating new relevant theoretical insights.

Phase II: Research question: *How might organizing constitute a robot design process which involves communities, individuals, and organizations?* All 25 interviews were recorded, and transcripts have been collected and securely stored. The analytic technique for phase 2 is Braun & Clarke's (2012) thematic analysis. Adaptive structuration theory (DeSanctis & Poole, 1994) will be used during data analysis.

Project Overview

	Agential Synergistic Agency	Agential Zero-sum Agency	Agential Runaway Agency
Opportunities	Increased robotic autonomy increases human agency	Robot agency is contained, preserving human agency	Align growth of robot and human agency
Risks	Bias in robotic benefit to humans	Robotic autonomy replaces human agency	Robotic autonomy will outpace human agency
Imperative	Ensure equitable distribution of robot benefits	Limit what robots are allowed to do	Limit robot capabilities relative to humans
	Agentive Synergistic Agency	**Agentive Zero-Sum Agency**	**Agentive Runaway Agency**
Opportunities	Increased robotic usability increases human agency	Use of robots is controlled, preserving human agency	Ensure human agency increases evenly
Risks	Concentration of robotic control among few humans	Robots enable humans to reduce others' agency	Robotic utility will allow outsized human agency
Imperative	Ensure equitable access to use robots	Limit what robots are allowed to be used for	Limit disparities in robot utility among humans

- Participants described imagined encounters with robots using a narrative structure.
- They often described themselves or others as collaborators, observers, or even antagonists to robots.
- Agency emerged as important.
- The table presents the dynamics through which participants' narratives about human-robot agency emerged from the data.

Direction of agency (**agential** vs **agentive**) & a summative description of the combined actors' (human and robot) agencies.
Agential: Robots capacity to autonomously act. **Agentive:** How a robot contributes to human capability.

Effects of robots' agency within the imagined scenarios fall within a gradient of potential outcomes. These outcomes are:
- ***Synergistic*** agency involves the collaboration of human and robot action, which participants' often found exciting or indictive of a utopian like society.
- ***Runaway*** agency was perceived as much more negative, whereas many participants felt robots may usurp human capability entirely, or become harmful to those around it – both human and machine.
- ***Zero-sum*** agency is perhaps the least indicative of human or robot domination, where robot action has little to no effect on people, places, or things around it. In this sense, everything evens out.

Within each category also includes the opportunities, risks, and imperatives related to the potential outcomes of human-robot life described by participants.

- Findings suggest there can be both imagined benefits and perceived detriments.
- The imperatives serve to illustrate the beginnings of ethical considerations involved in the imagined robot scenarios.
- Designers should construct testing scenarios for potential users or community members encountering robots.

Phase 2:
1) Uses Adaptive Structuration Theory (AST) to understand both the material and social consequences of community robot encounters.
2) Considers the structural and organizational impact community robots both create and constrain.
3) AST's focus on outcomes also benefits design decisions
4) Using thematic analysis, each interview will be open coded
5) Codes will be sorted into categories
6) Categories will be paired with matching quotes
7) Themes will characterize the data as a whole

Interview team members

Expected Outputs

Research and theory generated from this study contributes to a variety of fields, including robotics, information studies, organizational studies, and communication. The contributions are expected as such:

- Generating theory related to robot agency
- Gaining further understanding about robots in community settings
- Enhancing legacy theories such as AST in the direction of emerging technologies
- Illustrating the benefits of interdisciplinary collaboration
- Contributing to the field of social robotics

Examining the demographic data for Phase II, this research highlights various parts of the community. For instance, although 72% of participants were current or former students on campus, 28% had other affiliations such as staff members or professors. In terms of gender, 57% of participants identified as female, 30% as male, and 16% as non-binary/transgender or other. Of the sample, 31% of participants identified as Hispanic, 35% as Asian, 15% as white, and 20% as Black, American Indian, or Pacific Islander.

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References

Braun, V., & Clarke, V. (2012). *Thematic analysis*. American Psychological Association.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. sage.

De Graaf, M. M., & Allouch, S. B. (2013). Exploring influencing variables for the acceptance of social robots. *Robotics and autonomous systems*, *61*(12), 1476-1486. https://doi-org.ezproxy.lib.utexas.edu/10.1016/j.robot.2013.07.007

DeSanctis, G., & Poole, M. S. (1994). Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization science*, *5*(2), 121-147.

Eguchi, A., & Okada, H. (2017, March). Social Robots: How Becoming an Active User Impacts Students' Perceptions. In *Proceedings of the Companion of the 2017 ACM/IEEE International Conference on Human-Robot Interaction* (pp. 111-112). https://doi-org.ezproxy.lib.utexas.edu/10.1145/3029798.3038424

Moesgaard, F., Hulgaard, L., & Bødker, M. (2022, August). Incidental Encounters with Robots. In *2022 31st IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)* (pp. 377-384). IEEE. https://doi-org.ezproxy.lib.utexas.edu/10.1109/RO-MAN53752.2022.9900591