

Proposing a Field Manual for Field Observation Studies of Public Human-Robot Interaction

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ABSTRACT

The increasing presence of robots in public spaces provides an opportunity to study real-world human-robot interactions through naturalistic field observations. However, there are currently limited resources for learning the skills of the trade and many aspects of observation strategies may go undocumented in academic papers. In this work, we shared some of the deeper details of observation planning, data collection, issue management, and reflecting on data as an example of the rich considerations that go into a field observation study. We then propose to create a collectively edited field manual for teaching field observation methods specific to public robot deployments. Overall, we aim to create a resource and a community of practice that champions field observation methods and helps teach more researchers how to conduct successful field observation studies.

CCS CONCEPTS

- Human-centered computing → Field studies.

KEYWORDS

field observations, field manual, public robots, ethnographic methods

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1 INTRODUCTION

Robots are increasingly entering public spaces, with use cases ranging from goods delivery [1] to public safety [5]. Due to the increased presence of robots in public, researchers can now observe real-world interactions between the public and robots [1, 2, 4, 6–8]. This presents a new opportunity for HRI researchers who often rely on lab-based studies to understand human-robot interaction or conduct field experiments with robots under their control. Observing public interactions between people and robots requires using ethnographic and anthropological observational skills and methods.

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However, such skills in field observations and ethnographic methodologies have so far had limited use in HRI studies¹ are often not taught among HRI classes. Thus, while HRI researchers from many disciplinary backgrounds may be interested in conducting field observations, we argue that there is a need to grow a community of practice around field observations.

Often, the procedure of a paper can describe observational methods, however, there can be details left out that speak to the nuances of conducting fieldwork. Much of these skills are often taught or learned by doing, however, through sharing more detailed descriptions of procedures and stories around observations, our community could grow resources for teaching field observation methods to more researchers. In this paper, we describe some of the behind-the-scenes methods considerations from a recent field study that we conducted, including information on planning, managing challenges and issues, and reflecting on observations to give an example of the kind of details we believe can be useful for teaching field observation strategies. We conclude the paper with a proposal to call upon the community to collect more detailed field observation accounts and create a collaboratively edited field manual for public observations of robots to help build an easy-to-use resource for teaching public robot field observation methods and to build a community of practice.

2 FIELD OBSERVATIONS OF DELIVERY ROBOTS IN PITTSBURGH

Our team conducted field observations and intercept interviews of a public delivery robot pilot in Pittsburgh, PA between July–December 2021. The pilot allowed robots operated by Kiwibot to make deliveries in the Garfield and Lawrenceville neighborhoods of Pittsburgh. The City of Pittsburgh's Department of Mobility and Infrastructure (DOMI) sponsored the pilot with support from the Knight Foundation [3]. Our team was invited to conduct field observations during daytime hours throughout the pilot. We did not have any control over the robots. Details of the full study and our results can be found in [8]. Here, we document some of the detailed planning and considerations that we believe are useful for others looking to conduct similar kinds of field observations or robots in public.

2.1 Locating Observation Points

To prepare our observation team, we first mapped out the area and potential routes of the delivery robots. We then went to the neighborhood and walked major and minor streets to identify locations to observe the robots from afar and while stationary and when in

¹understandably because there have not been many robot deployments around to study, especially in public

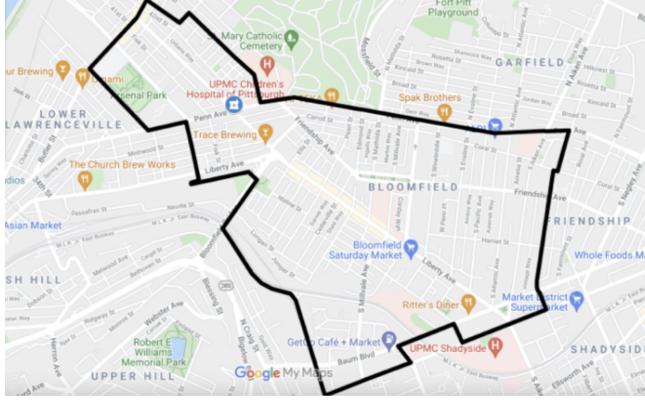


Figure 1: Locations where our robot observations took place.

motion. In general, we looked for places where we could blend in and be unnoticed near locations where people and robots would likely interact.

2.1.1 Stationary Observation Points. To observe from afar and for extended periods of time, we identified locations where we could sit without needing to leave, such as cafés or restaurants with outdoor seating², bus stops, or park benches. At these locations, we documented the field of view, potential obstacles that could impede our view, and possible areas within the field of view where human-robot interaction could likely be challenging, such as places where the sidewalk narrows, in front of popular shops, or areas with many kinds of pedestrians.

2.1.2 Dynamic Observations. We conducted dynamic observations while walking near the robot. This allowed our team to observe more interactions over time and in different areas of a neighborhood. To choose good locations for these dynamic observations we considered areas where we could walk across the street from the robot while still having a good view of the robot, areas with wide sidewalks so that we could avoid interactions with others when the robot interaction occurred, and areas where interactions could be potentially challenging, especially areas where the robot might have issues navigating the sidewalk, road features, or potential obstacles.

2.2 Capturing Observational Notes

To ease note-taking, we prepared an observational checklist that would allow us to quickly note down characteristics of the interaction. This included items such as:

- Interaction dynamics of the robots as they navigate and as they interact with people.
- Movement attributes such as speed, direction, location on sidewalk, stops and starts, and obstacles encountered
- If a staff member comes up to help and check the robot
- How pedestrians interact with the robot
- How people approach and move around the robot
- Basic, inferred information about the people interacting with the robot (age, appearance, use of assistive devices)

²we recommend patronizing these businesses :)

- and interaction with bystanders not in the direct path of the robot

(See Appendix A of [8] for the full checklist).

In addition to these visual observations, our team also listened for any conversations that people might have with each other about the robot. We documented the conversations in notes. Finally, we would encourage our note takers to sketch interactions quickly noting where a robot and pedestrian moved on a sidewalk.

Practically, our team used mobile phones to capture notes. This was done, because people don't really notice the team members notetaking since they cannot see the device and it is common for people to be on their phones in public. Our team members did not use their personal phones, but phones designated for the study to avoid saving images or video with potentially identifiable information on their own devices.

2.3 Capturing photos and video

As stated above, using phones can make it easy to blend in and allow the team to take picture or video without drawing attention to themselves. Our team captured photos of more static situations such as a robot getting stuck or people interacting but without much movement. We captured video during longer sequences or where more movement occurred. The decision to capture photos or videos was left to the observer and their moment assessment of a situation. On a practical note, photos are generally fast and draw less attention than videos. After collecting the data, we blurred faces in photos and videos to protect people's privacy. Photos and videos were used during analysis alongside observation notes and analytic memos.

2.4 Interacting with the public

Sometimes, members of the public would begin to have a conversation with an observer about the robot. This often would amount to small talk about the robot, questions about the purpose and function, and inquiring about opinions. During such situations and if the person has not asked if the researcher is related to the robot, we instructed observers to try and say as little as possible, allowing the other people to speak more. In general, we would try not to reveal thoughts or opinions about the robot. Maintaining a low-profile during the conversation helps to keep people's conversation and their subsequent interactions as natural as possible.

2.5 Issues in the Field

2.5.1 Being identified as a researcher. While conducting observations, members of the public may recognize you and approach you about what you are doing. In our study, this was more likely to occur when following the robot, with people questioning if a member of our team was part of the company deploying the robot. When this occurred, we would be honest with the person and let them know that we were not from the company but from the local university and were part of a research team conducting observations of the robot. We would explain the purpose of our research and provide contact information so they could reach out with any further questions about the study. Depending on the situation, we may also take the opportunity to engage with the person and ask them questions about their observations and perspectives on the robot. Using the

opportunity to interview the person is most informative if they have interacted with the robot recently; however, getting opinions from the public can be worthwhile.

2.5.2 Encountering hostility from the public. While many interactions with the public were generally pleasant, we were open to the potential that people could become irritated around the robot or with our research team. We noted to our research team that they should remove themselves from a situation should it feel unsafe. During our observations, there was only one incident that occurred where a male team member was approached by someone and asked why they kept walking by a school. Upon realizing the potential issues, our researcher de-escalated the situation by explaining that they were from the local university working on a project to observe the robot. After this incident, the team reconsidered how often we went past the school so as not to draw attention.

2.6 Reflecting on Observations

After completing the observations, our team chose to write analytic memos. These analytic memos aim to capture the researcher's recollection of an event and their interpretation of the interactions between people and the robot. The memos are written in a narrative style, aiming to convey events that occurred and the surrounding context. One aims to have the reader of the memo recreate the situation in their mind so that they can consider the events as if they have observed them and reason critically about the researcher's interpretation. An example memo from our study describes a situation where a robot is impeded by a vacuum tube lying across the sidewalk and where another pedestrian speaks to the researcher.

A vacuum tube was set up from a retail store to a company van, spanning the width of the sidewalk. When the robot was 1 foot away from the tube, it stopped, paused for a moment, turned around, and rolled in the opposite direction. It repeated this sequence, unable to move past the tube. I stood on the street corner, facing away from the device. A woman stood next to me, waiting for the light to change. Her head is turned, facing the device. She looked toward the direction the device had come from and nodded her head to the vacuum tube and said "I think it's stuck. I was shopping there, and I kept seeing it from the window. I don't think it can get through." She looked at me and laughed, and then said, "I bet someone is missing their delivery." (Observation, 5 November 2021).

Such narrative reflections, especially when paired with photos or video, can aid the large team in discussing different events. Furthermore, these observational notes can serve as rich pieces of evidence to include in written work on the observations.

3 PROPOSAL: COLLECTIVELY CREATING A FIELD MANUAL FOR OBSERVING ROBOTS IN PUBLIC

While there are studies that provide methods sections on field observations of robots and an increasing number of observational studies of robots in public [8], extracting the know-how about how to conduct such studies can be challenging. Furthermore, there are



Figure 2: A man helps a robot after realizing it is impeded by a vacuum tube lying across the sidewalk.

often considerations, techniques, and management strategies that researchers may employ but do not document in their academic papers. A field manual describing methods and strategies for field observations along with operating principles could be helpful for teaching HRI researchers how to conduct field observations. Such a manual could share tips and strategies for planning observational studies, managing issues in the field, and analyzing field observation data. While some of the considerations and operational procedures that we have described in this paper can serve as a useful starting point, we aim to engage others in the community to share their techniques, perspectives, and learned know-how so that we can create a community of practice around field observations and help accelerate the growth of high-quality studies. Such a field manual could be developed as a collaborative, open-source document where researchers describe their methods. The members of this workshop could develop an initial draft, and volunteers from this group could serve as editors managing collective contributions to the document. Finally, the document can serve as a space to capture field reports that showcase specific situations that can provide learning value, such as how to observe in unique locations, how to manage constraints, and how to manage issues.

4 CONCLUSION

As robots become more apart of everyday public life, there is an opportunity to study real-world human-robot interactions through naturalistic field observations. To do so requires HRI researchers to learn how to conduct such field observations. However, there are currently limited resources for learning the skills of the trade and many aspects of observation strategies may go undocumented in academic papers. In this work, we shared some of the deeper details of observation planning, data collection, issue management, and reflecting on data as an example of the rich considerations that go into a field observation study. We then propose to create a collectively edited field manual for teaching field observation methods specific to public robot deployments. Overall, we aim to create a resource an a community of practice that champions field observation methods and helps teach more researchers how to conduct successful field observation studies.

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