

Towards Community-Robot Interactions

Swapna Joshi
Indiana University Bloomington
swapna@iu.edu

Abstract. Technical advances in multi-user robotics are supporting their increased real-world robot deployments in community and organizational settings. However, interactions with robots in these settings are viewed mostly as an aggregate of individual interactions with robots, separate from their social context. Through my Ph.D. research, I raise awareness about the need for a community perspective to Human-Robot Interactions (HRI) and use real-world studies to demonstrate the conceptual and methodological relevance of community-centric approaches to robot use. The goal of my research is to provide a value framework of 'Community-Robot Interactions' for systematic study of the use and development of robots for communities and probe the role of the robots as a community resource having theoretical and design implications for HRI.

Overview of Research

Life around social robots is envisioned in a variety of social contexts such as community organizations and institutions. In line with these applications, robots are being developed to collaborate with humans on complex tasks and to interact socially in open-ended environments. Despite such technical advancements and broadening of the use contexts, most research in HRI is limited to enabling robot's interactions with individuals and more recently, with small group and teams. HRI interactions beyond the individual and small groups are presented as equivalent to an aggregate of individual interactions, in shared settings. This approach has been useful to support technical advancement of robotics but has proved to be less productive for understanding the potential benefits of robots for collective purposes, the broader consequences of using robots in society, and the issues around deployment in communities where social dynamics are at play.

Critical perspectives on the use and development of technology for communities have been extensively researched in CI, CSCW, and HCI. HRI, however, is yet to produce systematic and critical investigations of the potential use of robots to serve communities. Most research in HRI is oriented to understanding individual interactions with and perceptions of robots for a specific task or behavior, to aid technical advancement in robotics. This also reflects in the discussion of HRI metrics and taxonomies, such as by Steinfeld et al. (2006); Yanco and Drury (2004) that show a focus on technical factors, with less attention to contextual aspects of social settings. Previous literature by Šabanović (2010) has called for research to move away from a focus on acceptability and adaptation towards an emphasis on social and cultural factors in use, design, and evaluation. Although a holistic consideration of the community context is missing in most HRI literature, studies indicate the potential for usefully integrating different aspects of community. For example, previous studies have deployed robots in organizational and community settings to encourage social interactions found that shared robots provided communal experiences: Kidd et al. (2006). Recent work, also showed how robot use could enable community empowerment and foster knowledge and culture by catalyzing new opportunities for community interaction: Nourbakhsh et al. (2010). It is time for research to provide ways for systematic design and evaluation of robots for communities, and support their collective values and goals.

Through my Ph.D. research, I show how community is currently an invisible and unrecognized actor in HRI studies and indicate the need for and potential benefits of employing a community perspective to the design and study of HRI. I draw upon scholarship on community and technology from inter-disciplinary literature and point to its relevance for the study and design of HRI. Finally, using real-world studies, I outline an initial framework for Community-Robot Interactions to guide systematic research and design of HRI for communities and highlight the interplay of robots and social-organizational aspects of communities. I describe four such studies below.

Research and Findings to Date, and Next Steps

Study 1 - Robots and The Community Perspective

The goal of this study by Joshi and Šabanović (2017) was to demonstrate how roles and purposes of robots for community contexts would vary from those discussed in previous studies of individual interactions with robots. I conducted interviews of members of a retirement community to understand shared robot uses and roles they would desire for their community. My approach of discussing their community goals, initiatives and their vision for robot roles to support the community provided an understanding of how their sense of community-guided their desire for robot use to strengthen social interactions and increase community participation. I showed how their imagined roles for robots, were communal in nature, such as ‘community organizer’, ‘social enabler’ and ‘resourceful facilitator’.

Study 2 -Community-centered Use and Deployment of Robots

Through this study by Joshi and Šabanović (2019), I intended to show how a community-centric approach, supporting community-oriented goals and using community member's insights in research, design, and evaluation is crucial to successful use of robots in the real world. The complex social settings of this community organization- a 'co-located inter-generational facility', posed various challenges such as from the varying needs of its different actors - frail elders with dementia, preschool children and staff/teachers. Using a community-centric approach allowed to identify specific community goals and guided robot use, such as to reduce social isolation for elders and teach patience and tolerance to children. Evaluation of HRI, in this otherwise complex social context, became straightforward from knowing how community members valued and desired peer and inter-generational interactions and desired increased involvement in social activities. Working closely with this community revealed how the social and organizational factors supported the use of robots in this setting.

Study 3 -The Community-Robot Interaction Framework

To derive an initial framework for Community-Robot Interactions, I used findings and experiences from Study 1 and Study 2 as case studies, along with relevant literature on community and technology from Sociology, CSCW, HCI, and CI. Based on the work so far, I conceptualize that 'Community-Robot Interaction' moves away the focus of HRI from the individual to the community, its goals, and values. Robots in this context, integrate into the community, to catalyze its interactions and support its initiatives.

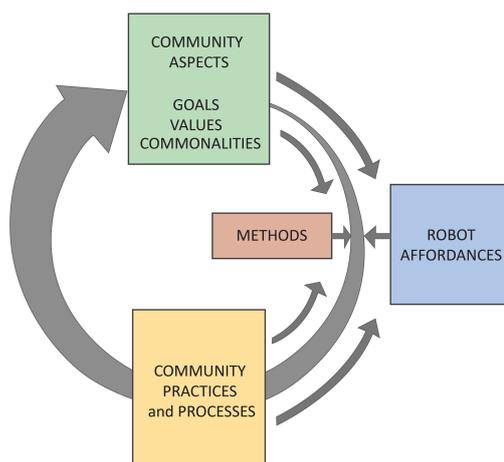


Figure 1. An Initial Framework of Community-Robot Interaction.

The initial framework (Figure 1) shows different aspects of the community, its practices and processes, and their relation to research methods and robot use. It shows community, as the social unit, the key element of study, and the desired outcome for HRI. It requires design and research methods to be informed by the goals, values, and practices of a community. It suggests research and design to be shaped by leveraging skills, expertise and resources from the community and its members. It aims for HRI to empower and to be enabled by the community practices and social processes.

Study 4 -Configurations of the Robot and the Community

Next steps involve a close examination of the interplay of community life, social and community processes, and organizational practices around the use of and interactions with robots, to refine the initial Community-Robot interaction framework. To do so, using observations and interviews, I plan to study how the use and adoption of robots by a community shapes their everyday interactions and practices.

Expected contributions

My research aims to motivate HRI scholars to consider a community perspective as integral to their research, and to the design and deployment of robots for real-world uses. By outlining a framework for Community-Robot Interactions, I intend to provide grounds for debate and discussion on community-centric possibilities and approaches for HRI and encourage context-specific improvements to the framework.

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