
Social and Psychological Reactions to Receiving Help from a Robot

Cristen Torrey

Human Computer Interaction Institute
Carnegie Mellon University
5000 Forbes Ave.
Pittsburgh, PA 15213 USA
ctorrey@cs.cmu.edu

Abstract

Computer systems, including humanoid robots, are becoming capable of recognizing human activity and, in the future, may offer unsolicited help in a variety of contexts. This helpfulness may improve people's performance on certain tasks, but there could be negative social and psychological consequences. Help recipients may feel vulnerable—that their self-esteem and their control over the task have been threatened. To better understand the social psychological impact of receiving help from a robot, this thesis explores strategies used in human-human conversation to deliver unsolicited help and observes participants' reactions to these strategies in human-robot dialogue.

Keywords

human-robot dialogue, advice giving, help seeking, adaptive interfaces

ACM Classification Keywords

H.5.2 [Information Interfaces and Presentation]: User Interfaces – *Evaluation/methodology, Natural language, Theory and methods.*

Introduction

One Saturday afternoon, Margaret decides to make a new pie recipe for a friend's birthday. While rolling out the crust, she is interrupted by a computer system—

either a disembodied voice, an agent on a monitor, or a humanoid robot. The system reminds her that for best results she should let the dough chill in the refrigerator before rolling it out. If the advice were coming from another person, Margaret could be grateful or insulted, depending on her expertise and her relationship with the help giver. But how would Margaret react to receiving such advice from a computer?

Today, computer systems that offer help with daily activities in the home are not widely available, but activity recognition research is being pursued for a variety of smart home and health applications (e.g. [6][8]). This thesis explores how such systems, aware of an individual's activities, should offer help. It seems likely there are situations where offering help will improve performance and protect individuals from serious errors, but performance is not the only outcome worth considering. Does receiving help from a robot carry the social costs associated with receiving help from another person? If a robot's help is demeaning, do people really care what a robot thinks of them? Is it necessary (and possible) for robots to mitigate their help-giving behavior much as people do?

Unsolicited Help from Humans

Previous studies of human communication describe several costs associated with receiving help. Help recipients may be concerned they will lose credit for a successful outcome, which is particularly damaging if they are highly invested in the task [2]. Help recipients also may fear other's perceptions that they are incompetent and dependent on others [5]. Becoming indebted to a help giver can also be a source of vulnerability for a help recipient, especially when reciprocity is not possible [3].

According to politeness theory, receiving help is a face-threatening action; it potentially threatens an individual's autonomy and self-esteem [1]. Politeness theory suggests that people use indirect language when making requests in order to mitigate some of these threats. For example, an indirect request might begin with a phrase like "I was wondering if you would consider" before stating the request.

Laboratory studies by Nadler and colleagues conceptualize reactions to help with a "threat to self-esteem model" [7]. According to this model, "self-supporting" language can positively influence a help recipient's reaction. For example, a help giver might support self-esteem by reminding the help recipient that a lot of people have similar difficulties. This strategy is common in tutorial contexts, where tutors point out where everyone struggles the first time.

Prior work highlights the importance of language choices when giving help. Generally, how help is worded can effect how help is received. The first stage of this research seeks to detail the specific communication features that contribute to both positive and negative helping interactions. In order to learn more about the language people use when they offer help, I gathered conversational data in a college dormitory and in the laboratory.

Pilot Data Collection

I first collected observational data in a college dormitory by organizing a "cupcake night" in the dormitory kitchen. I brought baking supplies, tools, and recipes to the kitchen where participants could bake cupcakes at their own pace. To increase the number of helping interactions, I invited a baking expert to

facilitate the event. The baking expert was instructed to answer questions and help as necessary. I ran two sessions with different experts and one session without an expert. I analyzed the transcribed conversations with particular attention to unsolicited help giving.

The conversational data provided evidence of both successful and unsuccessful help-giving episodes. People are not always effective help givers. In the dormitory kitchen, help givers' advice was rarely rejected outright, but there were situations in which the help recipients appeared uncomfortable with the interaction. In the dormitory kitchen, help recipients seemed to be offended by help givers who were directive. Help givers who gave more open-ended advice appeared to be more successful; their language left the final decision up to the help recipient. I also noticed variation in these interactions as a function of age differences between the help giver and the help recipient.

Laboratory Data Collection

To measure help recipients' reactions to specific conversational features more precisely, I observed participants in a laboratory kitchen. A baking expert monitored each laboratory session while two participants selected a recipe and prepared cupcakes together. Some baking experts were undergraduates helping their peers. Other baking experts were graduate students or university staff and were helping those of lower status. In studies of communication, age is an indicator of power and status and greatly effects communication dynamics [4]. Help recipients in this study responded to the help they received and the help giver by completing a questionnaire when their cupcakes were finished. These data are currently being

analyzed to investigate possible correlations between specific conversational features and the social psychological questionnaire measures.

Upon completion, the laboratory study will describe specific conversational phenomena associated with more successful and less successful forms of help giving. In addition, this phase of the research offers richly detailed examples from which to generate a robotic helper's dialogue. In the next stage of the thesis, these observations will be tested in a human-robot context.

Unsolicited Help from Robots

The proposed experimental stage of this thesis investigates the application of human help-giving strategies to human-robot dialogue. The experiments explore whether receiving help from a robot is similar to receiving help from a human. First, are the same negative reactions to human helpers observed in reactions to robotic helpers? And second, can robotic helpers adopt successful human help-giving strategies to mitigate these negative reactions to help?

Proposed Experimental Manipulation

The experimental set-up will use the kitchen laboratory in a protocol similar to the previous study. A robotic helper that uses successful human help-giving strategies will be compared to a robotic helper that uses unsuccessful human help-giving strategies. The robotic helper conditions will be compared to a confederate human helper condition. This experiment will be a 2 x 2 (human/robot x successful/unsuccessful help-giving language) between-subjects design.

Further proposed experiments will investigate another variable of interest, the robot's status. A robot can offer help as an authority, as a subordinate, or as a peer; each of these roles necessitates a different manner of speaking. Certain roles may be more appropriate or more effective for robotic helpers. Using conversational data from successful human helpers to create the robot's dialogue, this experiment will compare a robotic authority, a robotic subordinate, and a robotic peer in a between-subjects design.

Proposed Experimental Measures

Data will be collected with both behavioral and interview measures. Behavioral measures include time on task, number of questions asked, and whether participants followed the help giver's advice. A post-experiment structured interview will ascertain the participants' attitudes with Likert-scale questions. The audiotaped interview format allows the experimenter to collect participants' immediate reactions to the questions in addition to a discrete value suitable for statistical analysis. The interview will focus on participants' impression of themselves, the task, and their help giver.

Contributions

This work will describe human help-giving behavior and the ways help givers use verbal strategies to soften the negative social repercussions of unsolicited help. These insights will be tested in the domain of human-robot interaction. Continued research will explore whether these findings hold in traditional HCI applications such as desktop interfaces and conversational agents.

Acknowledgements

This research is funded by National Science Foundation grants IIS-0121426 and IIS-0624275. I would like to thank Susan Fussell and Sara Kiesler for their guidance and insight as this research has developed.

References

- [1] Brown, P. and Levinson, S. *Politeness: Some universals in language usage*. Cambridge University Press, Cambridge, UK, 1987.
- [2] DePaulo, B. and Fisher, J. The Costs of Asking for Help. *Basic and Applied Social Psychology*. Vol. 1, No. 1, 1980.
- [3] Greenberg, M. and Westcott, D. Indebtedness as a Mediator of Reactions to Aid. In *New Directions in Helping: Recipient Reactions to Aid*. Academic Press, New York, 1983.
- [4] Holtgraves, T. *Language as a Social Action: Social Psychology and Language Use*. Lawrence Erlbaum, Hillsdale, NJ, 2002.
- [5] Lee, F. The Social Costs of Seeking Help. *The Journal of Applied Behavioral Science*. Vol. 38, No. 1, 2002.
- [6] Maurer, U., Rower, A., Smailagic, A. and Siewiorek, D. Location and Activity Recognition Using eWatch: A Wearable Sensor Platform. In *Ambient Intelligence in Everyday Life*, Springer Press, 2006.
- [7] Nadler, A. and Fisher, J.D. The role of threat to self-esteem and perceived control in recipient reactions to help: Theory development and empirical validation. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology*, Vol. 19, 1986.
- [8] Patterson, D.J., Liao, L., Fox, D., and Kautz, H. Inferring High-Level Behavior from Low-Level Sensors. In *Proc. UBIComp 2003*, Springer-Verlag, 2003