

What do Users Seek in a Smart Home Robot?

An Interview-Based Exploration

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Abstract

In this paper we describe an interview-based exploration into people's expectations of a smart home management system, as part of our design of a new robot serving as an embodied interface to monitor and control smart home devices. We describe qualitative insights gleaned from interviewing potential users of the system, identifying concerns, desires, and frustrations they have, and user characteristics. We present initial design guidelines which will be used in the robot design process.

1 Introduction

Devices with new sensing and monitoring capabilities are entering the home, often collectively called "Smart Home" or "Internet of Things" (IoT) devices [1].

At the same time, affordable home robots are emerging in industry, including interactive speaker and voice interfaces (Amazon Echo), expressive social robots (Jibo), mobile projector robots (Keecker), family companion robots (Buddy), emotional humanoid robots (Softbank Pepper), and more.

Social robots could therefore provide a new model for the "smart home" user experience. We are currently conducting a collaborative design process for the development of a new social robot prototype aimed for smart home interaction.

In an iterative user-centered design process, potential users can guide design decisions at a very early stage. In this paper we describe one study we conducted as an early-stage qualitative inquiry into people's expectations of smart home technology.

2 Study

We conducted interviews with potential users to identify key usage points in smart home management, and to un-

derstand the frustrations and desires of the target users, who were defined by the industry team. The findings would then form the design guidelines for the prototype development.

2.1 Participants

The interviews included six students at a university in Israel (4 female, 2 male), aged 25-30. To examine a variety of cultural backgrounds, participants were chosen from four different countries: USA, Canada, Israel and Peru.

2.2 Procedure

The method chosen for the study was that of semi-structured interviews [3]. The interviews were carried out according to a set of open ended questions, written in advance. This method enabled a consistent interview structure on the one hand, but on the other hand allowed flexibility for the interviewer to further ask about a specific topic or ask additional questions based on the flow of conversation. The questions were on the topics of electrical appliance usage, behaviors and habits in a home environment, smart home devices and other related topics. Each participant was interviewed for about one hour in a laboratory setting or at their home, according to their preference.

Interviews were audio recorded, transcribed and later qualitatively analyzed by the researchers.

2.3 Results

In our interviews we found themes and patterns in four different categories: Concerns, Desires, Frustrations and Characteristics.

2.3.1 Concerns

Participants shared several concerns regarding the usage of electronic devices. The most common one was leaving these appliances on, for both safety and efficiency reasons.

“When I leave the dishwasher and I go to work, I kind of have this irrational fear that when I come back the house will be burnt down”.

“It could be helpful to be more aware. For example - to not forget the lights. It’s such a waste of energy and money”.

Another common concern among the participants was security for their homes. While most of the interviewees didn’t have smart security systems, a few mentioned they would adopt a solution if it was proven to be both effective and affordable.

“If there was some kind of solution to monitor my house and notify me if there is anybody in the house, I would definitely buy one”.

The issue of forgetting things at home was also raised several times, especially items related to mobile devices, such as chargers for the mobile phone or laptop.

2.3.2 Desires

Participants discussed some of the features they would like for their home environment, which they felt have no easy and practical solution today. The most common desire was to have balanced temperature around the house, especially at times of extreme weather.

“There’s that thin line of balance [temperature], and it’s hard to find manually”

2.3.3 Frustrations

Participants expressed frustrating moments when using different home appliances. These moments had in common a discrepancy between expectations from the appliances and their performance.

“You’re supposed to give me coffee. This is your role, this is my role, I press the button and you give me coffee... I’m very impatient”

2.3.4 Characteristics

During the interviews we recognized the participants were characterized with a thrifty approach. They were aware, or tried to be aware of their electricity usage, striving to consume electricity only when necessary.

“In general I’m an economical person. I use only what I actually need”

3 Design Guidelines and Concepts

The pain points identified by the interviews revealed an overarching need defined as “an easy and unified interface that controls and monitors all connected devices”. We also noticed that users would like to delegate home management tasks to the system, assuming it is reliable. The robot should therefore provide reliable information and transparent feedback of home status, utilize social conventions when interacting with users, and provide intelligent services (e.g., automatic configuration of temperature) without constantly interrupting the users.

Hence, we defined our robot to be an empathic butler-like robot which is thorough in execution but subtle and social in user interaction. This interestingly reflects findings in [2]. Based on this, we also defined the target user experience. The butler robot should provide the followings:

- A sense of *security*—design for a reliable interface, keeping users informed and aware of the home status of their home.
- A sense of *control*—provide an easy interface and transparent feedback so users feel they are in control.
- A sense of *thrift*—suggest control of or automatically control the home environment to appropriate settings to conserve energy and save bills (e.g., lowering temperature).
- A sense of *unobtrusiveness*—allow users to enjoy their time at home (i.e., rest and spend time with family). The robot should not disturb everyday life, but should be available when needed and alert when something goes wrong.

4 Conclusion

In this paper we presented interviews as part of an initial design process of a butler-like robot for the smart home. From these interviews we identified the design goals of security, control, thrift, and unobtrusiveness. These will guide the next stages of the robot design.

References

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