

Please Tell Me About It: Self-Reflection Conversational Robots to Help with Loneliness

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ABSTRACT

We introduce a conversational social robot designed for long-term in-home use to help with loneliness. Our simple design leverages techniques from psychology to encourage self-reflection and promote wellness. To increase feasibility, we pay special attention to simple and robust robotic interaction, avoiding complex behaviors that may be prohibitively complex (i.e., possible in lab but not deployable) or unpredictable (e.g., generated speech saying something inappropriate). We present a novel robot behavior design to have simple self-reflection conversations with people to improve wellness, while still being feasible, deployable, and safe.

CCS CONCEPTS

Human-centered computing → Interactive systems and tools; User studies.

KEYWORDS

Domestic Robots; Emotional Support; Social Robots

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1 Introduction

Loneliness, a self-perceived lack of social connection, is a growing problem that correlates with health complications and increased mortality [6, 8]. Many people find it challenging to connect with others, a problem exacerbated by the current global pandemic. Technological solutions show promise for helping mitigate loneliness, for example, providing digital social networks [5] or online automated “chatbots” [3] that can be beneficial. Another technological tool is social robots, those designed to interact with people as a kind of social entity [4]; social robots can positively impact a person’s feelings, can work as emotional support and can provide companionship [1, 11]. Based on these positive benefits, social robots show promise for helping with loneliness.

A common approach to companion robots is to create animal-like designs, such as the seal robot Paro [15, 16] or Sony’s AIBO dog robot [2], to leverage people’s familiarity with real animals and



Figure 1: Conversational robot serving as a companion and talking to a person to mitigate feelings of loneliness.

encourage similar interactions. Animal-like robots further have simpler interactions (and thus may be more feasible to create) than humanoids, as they do not typically aim to support conversation, human-like expression or other human-like complex interactions [12]. Humanoids, on the other hand, have increased interaction capabilities and potential for more human-like companionship, if we can overcome the technical challenges. In this paper, we present such an interaction design: a simple, feasible humanoid robot prototype designed to be a conversational companion.

Our approach to building a conversational robot draws from therapy, specifically work demonstrating that reflecting on one’s feelings and experiences can help one feel better. Simple things like keeping a diary [10] or just talking about one’s feelings with someone can boost one’s mood [7, 14]. If a robot can facilitate such reflection through simple conversation, perhaps it can support wellness. As such, we designed a conversational robot behavior to get people to speak about their feelings and experiences. Our prototype does not rely on the robot interpreting or understanding what the person is saying, increasing the behavior’s feasibility.

In this paper, we present a novel prototype design for a conversational, domestic humanoid robot for people living alone. Our design balances simplicity, to make a feasible, deployable robot, with potential for supporting people living with loneliness, by leveraging simple behaviors from client-centered therapy.

2 Prototype Design Goals

Our primary goal is to design a robot that can help people alleviate feelings of loneliness. To achieve this, we employ reflective

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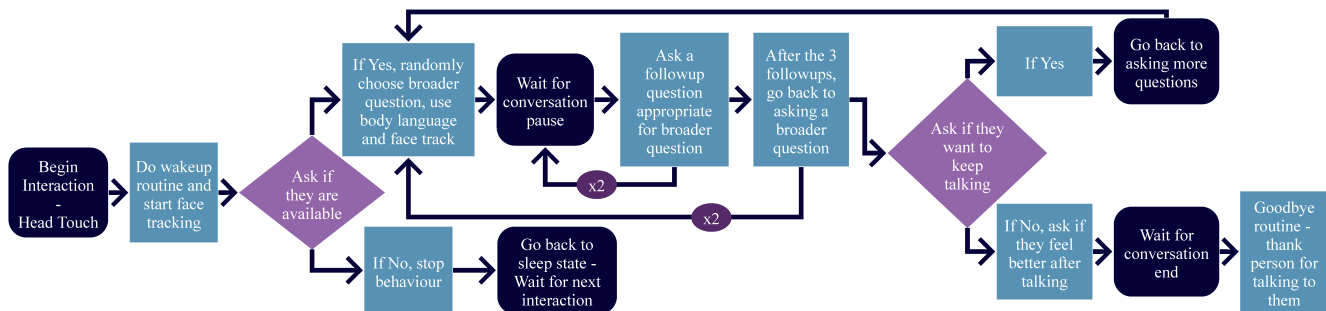


Figure 2: Prototype Interaction Flow. The robot asks a series of broad questions and follow-ups to serve as a listening partner, maintain user engagement, and promote self-reflection.

listening techniques where the robot’s only role is to listen and ask appropriate (if general) questions and use prods to encourage the person to talk more about their experiences or feelings; as such, we for a humanoid design that would be natural to converse with. Further, we emphasize key elements of the client-centered therapy approach including acceptance and being non-judgmental [9, 13]. We anticipate people may talk freely and introspect, therefore improving mood and reducing loneliness.

Our secondary design goal is ensuring safety and privacy while using the robot. As such, our robot and behavior design needs to ensure people that they are not being monitored or recorded. Another safety issue is the robot potentially saying inappropriate or harmful things given the complex social context; to avoid this we rely on safe and simple, pre-programmed utterances.

Our third goal is feasibility for long-term deployment in homes. We achieve this (Figure 2) by having the robot simply ask general questions, listen, and respond with reasonably generic follow-up prods. The result is that we only require the robot to understand what the person is saying during interaction branches (e.g., to finish interaction), and not the content of the person’s discussion.

3 Initial Prototype

We implemented our prototype on a Softbank NAO V6 humanoid robot (25 degrees of freedom, 58cm tall). To support privacy and safety our prototype does not connect to any network.

The robot starts in a sleeping state. To begin interaction the person touches the robot’s head; this simplifies interaction by reducing the need for the robot to detect complex engagement patterns. To build engagement the robot does a wake-up routine (stretches, looks around) and looks at the person (using built-in face tracking). The robot starts by asking if the person has time to talk, serving as a confirmation in case it was started by accident.

Afterwards, the robot engages in a structured conversation where it asks the person questions about their life, and responds with generic follow-up questions and prods. We crafted our questions to encourage thinking and reflecting on the one’s feelings, experiences, family, and friends. This further aims to prolong the conversation, and thus, create more opportunity to reflect. The robot moves its head and arms in a natural fashion, similar to a person listening, to indicate understanding and support engagement. NAO detects when the person stops talking and asks follow-ups questions as outlined in Figure 2.

After three cycles of the robot asking a broad question, with three follow-up prods per question, the robot then asks if the person wants to keep talking. If they indicate they are done, the robot enquires about the person’s feeling about the interaction, to encourage reflection. The robot says a goodbye phrase and goes back to a sleeping state. Figure 2 shows the entire interaction flow.

Since the interaction does not rely on the robot interpreting what the person is saying during conversation (only during rough branches) the resulting behavior is very technically simple.

Here we include a sample script from an interaction session with a person. Our actual implementation currently includes twenty broad questions and thirty follow-up prods, randomly chosen during interaction.

```

<person touches robot’s head>
Robot: *wakes up* Hi, are you available to talk?
Person: Yes
R: Has anything good or bad happened lately?
P: Yes, I got told my trip to Bahamas is still happening in 2021.
R: What do you think about that?
P: It’s great, I’ll finally have time to see Lucy.
R: Okay, tell me more.
P: Since quarantine started...
R: Is there something you would want to change in your life?
P: I guess I would have liked to cherish certain moments more...
R: Do you often feel this way?
<conversation continues, another main question & follow-ups>
R: Do you want to talk more?
P: No, thanks.
R: Okay, was talking to me helpful?
P: Yes, I think talking has helped me because...
R: I’m glad you talked to me, let’s talk soon, goodbye for now.
<robot goes back to sleeping state and position>

```

4 Conclusion

In this paper we present a simple, feasible, and potentially beneficial domestic conversational behavior for a humanoid robot. This behavior leverages simple conversational techniques from psychology to encourage self-reflection and help people with general wellness. Once the standalone robot is fully tested and programmed with these behaviors, it will be deployed for several weeks in real homes to study acceptance and impact on wellness. We expect that some will adopt the robot into their daily routines, and for those, the interactions will lead to reduced loneliness. We envision this work will open doors for future work into simple deployable social robots in homes.

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