A Social Companion and Conversation Partner for Elderly

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Abstract In this work, we present the development and evaluation of a social companion and conversation partner for the special user group of elderly. With the aim of designing a user-adaptive system, we responded to the desires of the elderly which have been identified during various interviews and created a companion which talks and listens to the elderly users. Moreover, we conducted a user study with a small group of retired seniors living at home or in a nursing home. The results show that our companion and its dialogue were perceived very positively and that a social companion and conversation partner is indeed in demand by lonely seniors.

1 Introduction

For humans, speech is the most important and most natural way to communicate. Therefore, scientists and engineers aim to realise methods and systems that enable not only interpersonal communication but also interaction with machines through natural spoken language. Today, we are able to communicate with various computer applications via speech. However, most of the currently used Spoken Dialogue Systems feel unnatural to humans, users are unsatisfied and dialogues are unsuccessful [6]. Therefore, current research focuses on user-adaptive Spoken Dialogue Systems (e.g. [7, 8]). In this work, we address the special user group of elderly.

In recent years, assistive technologies in the area of elderly care have been a rapidly increasing field of research and development and various socially assistive companions for elderly have been presented. The spectrum of functionalities and

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services reaches from intelligent reminding [5, 9], information provision and help in carrying out everyday tasks [10], via exercise advice [2] and guidance through the environments of the elderly [9], up to cognitive stimulation, mobile video-telephony with relatives or caregivers and the autonomous detection of dangerous situations like falls and their evaluation via mobile telepresence [5]. The effects and the effectiveness of socially assistive robots in elderly care have been reviewed, showing that there is a potential for the use of robot systems in elderly care [1]. Moreover, the acceptance of healthcare robots for elderly is investigated in [3].

All of these findings show that there is potential for an embodied social companion for elderly. Furthermore, the importance of considering the perspectives from a range of stakeholders, such as the older person, their family and medical staff, and carefully assessing their expectations and needs has been shown [3]. Therefore, the aim of our work is to develop a social companion and conversation partner for elderly based both on the desires and wishes of seniors affected by problems of loneliness and the need for care and on the assessments by their caregivers.

Looking into this from a different angle, Walters et al. [11] previously conducted a theatre-based human-robot interaction study. Elderly residents and caregivers thereby watched a theatre production of a play illustrating the functionality as well as social and ethical issues of robots helping with aspects of elderly care. Interviews about their views indicate that both caregivers and residents were generally positive towards the idea of using robots to help with care. Furthermore, the desire for care robots to also provide social interaction and entertainment was stressed by the residents. However, the trial participants have only been interviewed after the theatre about the robot's functionalities has been produced. In contrast, our goal is involve the elderly and their caregivers from the very start of the development of our social companion and conversation partner.

The study which has been presented in [4] explored people's perceptions and attitudes towards future robot companions for the home. The results show that a large proportion of participants were in favour of a robot companion as being an assistant, machine or servant. Only few wanted a robot companion to be a friend. However, most of the participants were students or academic staff aged between 26 and 45 who talked about their future, trying to put themselves in the shoes of elderly, which of course differs from the situation of asking elderly persons. In contrast, the starting point of our work is to talk to seniors affected by problems of loneliness and the need for care as well as with their caregivers. We identify the desires of elderly during various interviews at a nursing home and design a prototype of a social companion for elderly in accordance with them. Afterwards, we conduct a user study with a small group of retired seniors living at home or in a nursing home.

The structure of the remaining paper is as follows: In Section 2, we introduce our special user group of elderly. Subsequently, the development of our social companion and the results of our study are presented in Section 3, before concluding in Section 4.

2 Requirement Analysis

With the intention of getting a first insight in the special needs and requests of ageing adults, we have carried out discussions with the residents of a nursing home in the south of Germany as well as with the social managers and care givers where we talked about the aims and needs of the elderly. The major topic among our interlocutors was the loneliness of the elderly living in the nursing home. The fact that those people feel lonely can thereby be easily explained. Nearly all of the nursing home residents are widowed and therefore do not have a partner any more. Moreover, their children reached adulthood. They have a job where they pursue a career, their friends, their hobbies and usually they have raised their own family. Even if they do not aim to leave their parents alone, they often do not have the time for many visits. Commonly, children come to visit their parents in the nursing home only on weekends. Friends of the nursing home residents are usually of the same age. Some of them have already died, others suffer from physical disabilities and therefore meetings with friends are also nearly impossible.

The feeling of loneliness often leads to a perception of neglect and most of the nursing home residents to whom we have talked therefore wish to have a contact person who talks to them, and even more importantly, who listens to them. Our interviews with the elderly revealed that the ideal companion would not talk about topics like the elderly's fear of isolation, psychological or physical complaints, diseases or experiences of loss. In contrast, the companion should talk about news and current topics while at the same time allow the elderly to tell about their past.

However, when designing a prototype of a social companion for elderly, we need to take into account not only the needs and wishes of our user group, but also special difficulties which might occur due to the elderly's physical and mental condition. Our interviews with the social managers and care givers in the nursing home indicated that dementia, Alzheimer's disease, depressions and apoplectic strokes lead to a reduction of the elderly's cognitive abilities to produce speech. Furthermore, senior adults may have difficulty in breathing due to various diseases which leads to pronunciation problems. On the other hand, elderly tend to be hard of hearing.

All in all, the companion should therefore talk to the elderly about news and current topics in appropriate volume and pace so that the elderly can easily listen to him and keep up with the conversation. Moreover, it should be a good listener allowing the elderly to tell about their past.

3 Concept and Evaluation

Based on the results and impressions which we obtained during our interviews at the nursing home and which have been presented in Section 2, we designed a prototype of a social companion for elderly and conducted a user study with a small group of retired seniors living at home or in a nursing home.

Development of a Dialogue for the NAO Robot Due to the fact that the elderly expressed the wish to have a companion which talks and listens to them, we set our priorities on the verbal interaction between the elderly and our social agent and decided to use the well-known NAO robot as off-the-shelf solution for our platform. During the design of the dialogue, we aimed to respond to the desires of the interviewed elderly. As, in general, elderly are not used to talk to any technical device and as all of the interviewed persons stated that they have never seen a robot before, the NAO robot started with singing a well-known German folk song to break the ice. While singing, the robot started to make eye contact and waved his hand. After greeting the user and asking for their well-being, the robot asked whether he should read out aloud some news. The user was able to chose between the fields of sport, politics and economy. After each newspaper article, the robot asked some personal questions where the user could tell about their past. The NAO robot thereby sat down and listened to the elderly as long as they were talking. As good listener, he just nodded from time to time and kept eye contact. In the end, the robot said goodbye and after some good wishes he ended by singing another part of the folk song. Due to the fact that elderly tend to be hard of hearing, the speaking rate was slowed down, the volume was increased and the utterances were repeated if needed.

The Survey After implementing the dialogue using the NAO Software *Choregraphe*, we conducted a user study with a small group of retired seniors living at home or in a nursing home. In total, 16 persons participated in the survey, 6 of them lived in a nursing home. The participants living at home together with their spouse were aged between 50 and 75 years, whereas the participants living in the nursing home were aged between 75 and 98 years and widowed. It has been really hard to find elderly persons who wanted to talk to a robot. Moreover, three participants terminated the study right after the beginning, one of them due to hearing problems, the other two changed their mind when they saw the robot and did not want to talk to him. The course of the survey was as follows: at first, the participants had a conversation with the NAO robot, afterwards, they filled in the questionnaire which contained statements which had to be rated on a five-point Likert scale (1 = fully agree, 5 = fully disagree) which can be seen in Figure 1 as well as open questions on what might be improved and which kind of robot the elderly would like to use.

Evaluation Results The evaluation results are depicted in Figure 1. Overall, the ratings show that the NAO robot and the dialogue were perceived very positively. The users stated that they liked the overall concept ($M = 1.38$) and that they find the NAO robot pleasant ($M = 1.31$). Especially the gestures, the eye contact and the broad knowledge of the robot were emphasised. Moreover, the elderly liked the dialogue ($M = 1.69$) and its topics ($M = 1.69$). The participants felt that the robot understood what they said ($M = 1.46$) and that they understood what the robot said ($M = 1.38$). Most of the elderly perceived the NAO robot as a pleasant dialogue partner ($M = 1.69$) and would like to talk to him again ($M = 1.38$). Furthermore, we could find a difference between the elderly living at home and those living in the nursing home: while all of the participants in the nursing home stated that they prefer a robot companion as a dialogue partner, all of the participants living at home

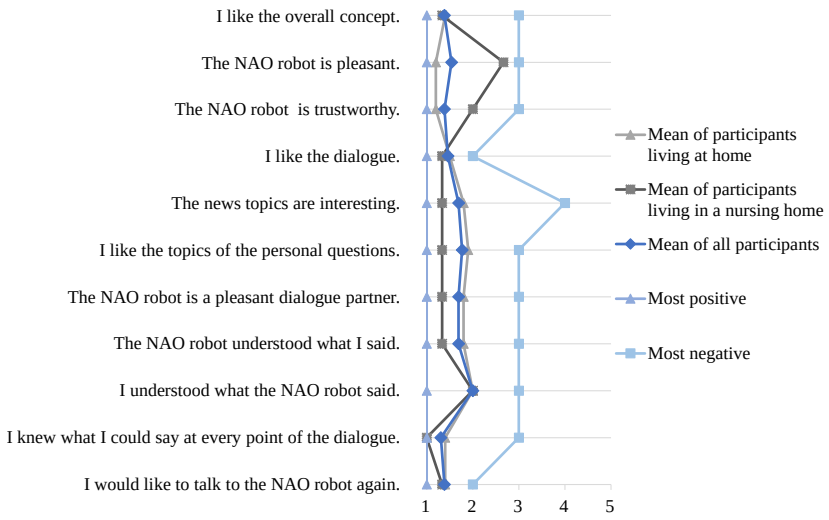

Fig. 1 The questionnaire contains 11 statements which had to be rated on a five-point Likert scale (1 = fully agree, 5 = fully disagree). Overall, the ratings of the 13 questionnaires show that the NAO robot and the dialogue were perceived very positively.

with their spouse favoured a robot which assumes the role of an assistant in everyday live which for example helps with household chores. This seems quite logical as the elderly living at home have a partner and therefore do not feel lonely whereas the residents of a nursing home do not need to keep house any more but feel lonely as they are widowed and therefore wish to have a contact person who talks to them, and even more importantly, who listens to them.

4 Conclusion and Future Directions

We presented the conception and the evaluation of a dialogue for a social companion for the special user group of elderly. Before the conception and implementation of our dialogue, we had conversations with the residents as well as with the social managers and care givers of a nursing home. When talking about the aims and needs of the elderly, we identified that the major topic was loneliness. Therefore, we created a companion which talks and listens to the elderly users and which responds to their desires. Afterwards, we conducted a user study with a small group of retired seniors living at home or in a nursing home. The results show that the NAO robot and the dialogue were perceived very positively. This leads us to the conclusion that a social companion as conversation partner and good listener for elderly is indeed in demand by lonely seniors of advanced age. However, potential participants declined to participate due to the fact that they did not want to interact with the robot. This shows that elderly are not used to talk to any technical device and therefore any device or robot needs to be introduced in a gentle and soft way. Moreover, a robot cannot

replace a human conversation partner. Elderly living together with their spouse do not feel the need or the desire to chat with a robot companion.

In this work, we conducted our user study with only a small group of elderly participants with the intention of getting a first insight in the special needs and requests of ageing adults. To get a more detailed view, in future work the comparison to contrastive control sets will be necessary. For instance, the difference between our special user group of elderly and users of all ages needs to be explored. In addition, the relationship between the system design and the user reaction is a question to be investigated. The results depicted in Figure 1 show that our concept suits the requirements of our user group. However, an extension of the dialogue towards individualisation would be expedient and desirable.

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