Patterns of Use: How Older Adults with Progressed Dementia Interact with a Robot

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ABSTRACT
Older adults represent a new group of potential robot users. Whilst studies focus on probable robot tasks [3, 4] or aspects of acceptance of older adults towards robotic devices [5, 6], rather few studies focus on tangible aspects of older adults’ interactions with robots (for example [7]), especially when they suffer from dementia. Therefore, we raise the question how older adults with progressed stages of dementia interact with an autonomous robot, providing interaction possibilities on its screen.

Keywords
Human-Robot Interaction; older adults, robot use; real-world trial

INTRODUCTION
Due to recent developments more robots are introduced to older adults in their private homes (e.g. HOBBIT [1]), or elder care facilities (e.g. ROREAS [2]). Therefore, older adults represent a new group of potential robot users. Whilst studies focus on probable robot tasks [3, 4] or aspects of acceptance of older adults towards robotic devices [5, 6], rather few studies focus on tangible aspects of older adults’ interactions with robots (for example [7]), especially when they suffer from dementia. Therefore, we raise the question how older adults with progressed stages of dementia interact with an autonomous robot, providing interaction possibilities on its screen.

1. ROBOT SYSTEM
The platform used is a SCITOS G5 non-holonomic mobile base, with an added HRI superstructure comprising a 15” touch screen on the robot’s back including stereo speakers and a pair of actuated eyes in an acrylic bowl resembling a head (Fig. 1). The screen can be adjusted to lower or higher viewing angles, serving standing or sitting interaction partners. Apart from odometry sensors, a SICK S300 laser scanner for navigation, and a Primense 3D camera for obstacle detection, the robot comprises an ASUS Xtion RGB-D camera on a pan-tilt unit mounted above the robot’s head with a pan and tilt radius of 360 and 90 degrees, respectively, to complete the sensory equipment.

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HR1 ’17 Companion, March 06-09, 2017, Vienna, Austria
ACM 978-1-4503-4885-0/17/03.
http://dx.doi.org/10.1145/3029798.3038388

2. MATERIALS AND METHODS
From April to June 2016 the described robot was deployed in a real-world long-term trial at a care facility for a third iteration (following deployments in 2014 and 2015). Among other tasks, it served as companion and source of entertainment and motivation in “Nordic Walking Groups” as part of physical therapy for older adults with progressed dementia. These groups were scheduled every Monday and Thursday afternoon and were led by two therapist teams, respectively, each team consisting of two therapists. In total, 12 older adults (9 women and 3 men) with progressed dementia participated, although some of them engaged only irregularly. The group gathered in front of the therapy room from where they started to walk a tour throughout the ground floor of the care facility. Between stretches of walking, the groups also rested on chairs which were aligned the sides of the corridors. Therapists supported participants when walking, talked to them or sang with them, to keep up their motivation.

During the robot trial, the robot accompanied the groups five times on Mondays and five times on Thursdays. Thereby, the robot met the group in front of the therapy room, where it positioned itself with its screen facing the chairs where people waited to start. Through the touchscreen interface, it offered to play music, view a picture gallery or a video (Fig. 2.b). The entertainment interface was carefully designed for the target group, e.g. using high contrast icons enabling the patients to operate the robot’s screen themselves (Fig. 2.a – 2.f). To decrease cognitive load, the number of buttons was kept at a minimum, e.g. the pictures would loop automatically and did not require to press a next button, and the interface had only two hierarchical levels.

When the whole group had gathered, therapist would send the robot ahead to follow a predefined route, leading the group. During walking bouts, it played hiking songs, which were chosen by therapists according to their usual therapy repertoire. On four predefined waypoints the robot stopped to wait for the group. Either participants or therapists then could press a button on the screen labeled “weiter” (continue) (Fig. 2.a) to send the robot off again. This presented an opportunity to facilitate the interaction of older adults with the robot and give them direct influence on the robot’s behavior. When approaching the resting points, participants could click on the screen if they would like to continue or to take a rest (Fig. 2.c). During rests participants set down on the chairs. Therapists could send the robot to single participants, with the robot stopping in front of a certain chair and turning around to present its screen. There participants could choose again from the entertainment options themselves (Fig. 2.b and 2.d – 2.f). This set up offered three different interaction-
possibilities for older adults with progressed dementia on the robot during these Walking Group sessions.

We found that in the majority of cases the therapists had to encourage participants to interact with the robot. Just two out of 12 participants showed self-facilitated clicks on the screen. One participant did not interact at all. In [7] it was shown that older adults with mild cognitive difficulties encountered problems when interacting with a robot. Our study points towards a similar direction, indicating that, despite designing a simple interface structure older adults with progressed dementia mostly require guidance by a therapist. In the presented setting, help or encouragement could easily be provided by the therapists. But when designing robots that should increase the users’ independence and, therefore, be used without the help of a therapist, more research is needed on specific user patterns and on what difficulties this user group faces when interacting with a robot. All in all, these results suggest, that human-robot interaction still faces limitations when it comes to user groups with progressed cognitive decline which has to be addressed in future research.

5. ACKNOWLEDGMENTS

The authors wish to thank the therapists and older adults for their participation and the STRANDS project partners for their contribution. The research leading to these results has received funding from the European Community's Seventh Framework Programme under grant agreement No. 600623, STRANDS. (http://strands.acin.tuwien.ac.at/).

6. REFERENCES


