Touch, and You Will Gaze: Elderly and Youngers' Use of Remote Controls in Interacting with a Healthcare Portal

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Abstract. This study extends previous research by exploring the quality of the interaction experienced by a group of elderly participants interacting with a healthcare portal when applying a touch screen remote control. This is compared to a standard remote control with physical buttons.

Keywords. Usability test, touch screen, remote control, elderly

Introduction

For the past decade we have seen developments of several home comfort technologies which aim to improve the wellness of elderly [1]. Such technologies include remote control of heating, air conditioning, ventilation, lighting, doors and windows in order to maintain accessibility [1]. Thus, in the future we will see a considerable increase in the amount of health related technologies within the homes of elderly, which also includes technologies relying on the usage of remote controls. In order to avoid a potential pile-up of several different remote controls within the homes of elderly and, in turn, to decrease elderly anxiety of technology, we believe there is a need for usability studies of remotes for controlling the various technologies. The above mentioned examples of technologies indicate that such remotes must support a high variety of devices and, hence, must be easily extendable with new buttons. For this reason a touch screen interface is a viable solution as button management is under software control. Previous studies on touch screen interfaces for elderly have focused on the usability of direct input interfaces, i.e. where there is no intermediary between the user and the device to be controlled [2]. One example is the study presented in [5], which investigates the feasibility of an on-screen keyboard on a touch screen (direct input) compared to a conventional keyboard (indirect input). However, there is a need for usability studies of touch screens applied as indirect input devices, which is relevant in the case of universal remote controls.

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1. Method

1.1. System & Setting

The SmartSenior healthcare portal offers various features such as communication with the hospital and other seniors, advice for healthy diets and room climate, measurements of vital parameters etc. The system is aimed for use by seniors in their homes and all user interaction is done through a web portal aimed for display on a TV using a remote control. External devices are required to conduct measurements of blood pressure, weight etc.

A usability evaluation was conducted in a room at the telemedicine center. In the test room participants were sitting in a chair operating the portal using two different remote controls; a remote control with physical buttons and a touch screen remote implemented on a smartphone. The smart phone was simulating haptic feedback through vibrations when buttons were pressed. A test monitor was sitting next to the participant and a data logger was standing in the test room behind the test participant and test monitor to observe all test sessions and to take notes.

1.2. Participants & Procedure

The system is primarily intended for use by elderly people and we selected 6 elderly test subjects (μ=67.2 years, SD=3.9) but also chose to include a control group of 6 younger users (μ=35.3 years, SD=5.6). All 12 participants were female. Although 6 participants in each group is relatively small number, it should be noted that formative usability evaluations in the domain of Human Computer Interaction are typically conducted using 5 test participants, which, from a cost/benefit point of view, is the most feasible [3]. None of the participants had previous experience with this or any similar portal system. Their experience in using electronic equipment in general varied. All participants owned a cell phone.

Six tasks were given to the participants one at a time and participants were asked to think aloud while solving these. Participants were using the standard remote control and the touch screen remote control in random order to solve the tasks.

All test sessions were recorded using screen capture software, a webcam and a microphone. We conducted a conventional video based analysis in accordance with [4] to identify the usability problems experienced by the test participants. Three evaluators analyzed the video data individually and made a list of identified usability problems. The severity of each problem was also categorized as either "critical", "serious" or "cosmetic". The three lists of usability problems were discussed by the three evaluators and then merged into one list of usability problems.

2. Results & Conclusion

2.1. Usability Problems

The qualitative analysis of the usability test data showed that the group of elderly participants experienced difficulties with the remote control sensitivity, which was the case for both the standard remote control as well as the touch screen remote. As an

example some of the elderly participants typed in double letters at the log in screen of the portal. Another problem related to the touch remote was that the elderly did not feel the vibration of the smart phone when activating a feature by touching the screen. This resulted in multiple presses on the same button.

2.2. Number of gazes

The fewer the times a user has to gaze at a remote control, the less time they have to spend on the interaction, which increases the quality of the interaction. For this reason we decided to count the number of times the participants had to gaze at the remote control while interacting with the healthcare portal.

Findings show that the group of elderly users on average gazed 102 times (SD=53) using the remote control with physical buttons and 139 times (SD=32) when applying the touch screen remote control. In case of the younger control group the average number of gazes on the standard remote was 22 (SD=13) and 70 (SD=26) in case of the touch screen. These findings indicate a downside to the touch screen remote, as both groups of participants spend mores gazes when applying the touch screen remote compared to the standard remote with physical buttons. A two sample T-test for unequal variances (Welch test) reveals significant differences in the number of gazes between the group of elderly and younger control group when applying the standard remote control ($t = 3.6$, $df = 5.75$, $p = 0.01$). In this case the elderly participants have to spend more gazes than the younger participants. This is also the case when considering the touch screen remote ($t = 3.9$, $df = 7.8$, $p < 0.01$).

The physicality of the standard remote control enables haptic feedback where users can feel the buttons, which ideally enables them to interact without having to look at the remote control. Currently, touch screen remotes do not provide such haptic feedback, which explains the above findings. This is also supported by our observations of the elderly not feeling the vibration of the touch remote, which simulated haptic feedback.

2.3. Conclusion

Multipurpose touch screen remote controls can reduce the potential pile-up of remote controls used for controlling various home comfort technologies. In this exploratory study, however, we found that such remote controls due to their missing haptic feedback pose usability problems for especially elderly users.

References

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