

Assisted Living Solutions for the Elderly through Interactive TV

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Abstract. In this paper we are presenting application called med-reminder which will extend the functionality of existing devices providing interactive TV and help to increase the quality of life for the elderly. Med-reminder application is used for reminding people to take their medicines correctly and on time or to call a relative or medical person in an emergency situation. Since the graphical user interface was adapted for the elderly, med-reminder is easy to use without previous training. For evaluating the graphical user interface, navigation and general usability of the application, and hence identification of key aspects that increases adoption rate of assisted living applications among the target population a methodology for usability evaluation study was designed and presented in the paper.

Keywords: Interactive TV, reminder, usability evaluation, elderly

1 Introduction

Increasing life expectancy and declining fertility are the main reasons for the population ageing in most regions of the world [1]. Demographic, structural, and social trends tend towards increasing number of elderly people and single households [2]. An increasing proportion in the older ages can dramatically affect society's political, economic and social structures. Significant changes are necessary in order to remain these structures effective [3].

The use of information and communication technologies (ICT) in assisted living solutions is implementing new methods of preventive care, diagnosis and treatment [4, 5]. Conducted studies show that elderly people spent great share of their waking time watching television (TV) [6]. This is an important opportunity for the assisted living solutions which are capable of adapting interactive TV systems to the needs of an ageing population while keeping them sustainable in societies with smaller workforce [7]. In our research we have analyzed various user studies [3] and suggested how to extend the functionality of existing devices providing interactive TV with interactive applications that will increase the quality of life for the elderly and people with special needs. Proposed solutions may provide assistance and prolong the autonomy of the elderly people while increasing the overall quality of life.

Existing commercially available products for monitoring elderly people, using interactive TV already employ a broad range of modern technology [8]. However, they are mostly closed, stand-alone systems with a limited ability to describe the actual situation. Moreover they are often just too difficult for the elderly people to operate with and useless in emergencies, which results in a low adoption rate of such products by target population.

Thereupon, in our research, a prototype for an application called med-reminder that could be used in an interactive TV system was designed. The application is intended for reminding people to take their medicines on time and in a correct way. Users, elder people, are also able to call medical personnel or a relative in case of emergency, simply by clicking on a key on the remote control. The main challenge during the research was the graphical user interface (GUI) design. We dedicated our work to create a GUI that will be intuitive and easy to use even for elderly people without previous training. In order to investigate how people are using med-reminder application in real situations, we have setup methodology for usability evaluation study, which should point out the key aspects that increases adoption rate of assisted living applications among the target population.

2 Med-reminder Application Description

Commercially available Net Top Box (NTB) devices are basically developed for providing interactive TV [9]. In our research we have integrated a module for information and communication technologies (ICT module) in the NTB device and so extended its basic functionalities. The med-reminder application exploits the ICT module capabilities thus providing users with some extra services such as presence monitoring, messaging, call control, media exchange, recommendations, etc. New features were used and med-reminder application was developed.

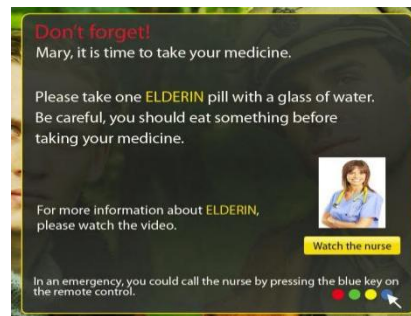


Fig. 1. Adding reminders for taking medicine **Fig. 2. Reminder for taking medicine**

Upon previous analysis of the conventional diseases characteristic for elder people, the usual medications with different doses and instructions for use for these diseases were then entered in the system [11]. Furthermore, short videos with information about each medicine were recorded and also added in the system.

Users, their relatives or somebody from the home care service is able to set a reminder on the GUI as shown in Fig. 1.

Each time a patient is supposed to take the prescribed medicine, a sound signal appears from the TV set. At the same time a new window with short and clear instructions for taking the medicine in the proper way becomes visible on the TV screen as shown in Fig. 2. By clicking the “Watch the nurse” button, user is also able to watch a short video, where a speaking “nurse” explains the written instructions and offers additional information about the medicine. As a supplementary feature, in emergency cases, elder people are enabled to make a video call to a relative or a medical person just by pressing a key on the remote control.

3 Methodology for User Evaluation Study

In order to evaluate the user interface, navigation and general usability of the interactive application, usability evaluation methodology was designed [10]. Several physicians, whose patients are mostly people older than 65 years, helped this research by recruiting participants for the evaluation study. Personal physicians briefly introduced their patients, with health condition appropriate for this research, about the study. Patients were then asked if they are willing to participate in the study. Twelve patients, six male and six female, confirmed the participation. Participant’s age range is between 65 and 85 years.

At the beginning, participants were asked several preliminary questions about their TV usage, general health condition and previous habits in taking medicine. The med-reminder application was then installed in the participants’ homes and it is now ready for usage and evaluation. Participants are expected to use med-reminder application for three weeks and carry out four different tasks (same tasks for all participants). In task 1, participants should set a reminder for taking a medicine, which they are using in their real life. Participants are supposed to take their medicine on time, while following the instructions on the screen in task 2. Task 3 includes watching a video for gaining information about their medicine. Making a video call with a relative or medical person is the main goal in Task 4. For each task, participants are asked to rate difficulty of task completion. After three weeks of med-reminder usage, participants are invited to fill out a standard usability questionnaire system usability scale (SUS). Finally, participants are asked about their general impressions of using the application and how the system should be improved to better fit their expectations. Moreover, the participants are also asked a set of questions that would indicate their subjective perception of the main benefit of the med-reminder application (e.g. functionality, usability, accessibility, reliability, amount of information presented ...). Participants are provided with a diary where they are expected to write their thoughts, emotions, possible difficulties etc, whenever they are using the med-reminder application.

The analysis of the results obtained from the usability evaluation study will determine to what extent med-reminder application assists elder people in their autonomy life and to what degree med-reminder application helps in increasing general quality of elder people lives. Possible difficulties with the med-reminder

application will be identified (for example: What happens if the TV is off or if elder person is not at home) and solutions will be suggested. We are interested in the scenarios and frequency of usage of the button for emergency call (would they in case of emergency actually use the interactive TV to make the call or would they prefer the usual telephone terminal) and the users' perception of the application benefits.

4 Conclusion

In the paper, we have presented the med-reminder application that could be used for improving the quality of elder people lives. The goal of the work was to design an application with the user interface that would overcome the usual drawbacks of applications for elderly that incorporate advanced technology achievements. Current experience shows that just applying advanced features into various solutions for elderly is far from being enough. Therefore too many advanced solutions are not being adopted by the users. The med-reminder graphical user interface was adapted specifically for the elderly, so that they would be able to use the application easily and without prior coaching and that the med-reminder application would actually become the first-choice for the elderly. First trials have shown that the med-reminder has a good potential to achieve its goal. However, thorough user testing according to the methodology for usability evaluation study defined in the paper will give the final answer.

The med-reminder application and its future extensions (reminders for visiting physician, pharmacy, season warnings and other notification of users) may have in future a significant impact on the lives of elderly. If adopted, they may contribute to preventive care improvement, diagnosis and treatment enhancements, which would consequently lead to reduced consumption of resources and materials that are part of the process of implementing health care.

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References

1. Gavrilov, L.A., Heuveline, P.: Ageing of Population. In: Demeny, G.P., McNicoll, G. (eds.) *The Encyclopedia of Population*, pp. 32-37. Macmillan Reference USA (2003)
2. Holzinger, A., Mukasa, S.K., Nischelwitz, K.A.: Introduction to the Special Thematic Session: Human-Computer Interaction and Usability Engineering for Elderly (HCI4AGING). In: Miesenberger, K., et al. (eds) *LNCS, Proc. ICCHP 2008*, vol. 5105, pp.18-21 (2008)
3. Christensen, K., Doblhammer, G., Rau, R., Vaupel, J. W.: Ageing populations: the challenges ahead. *Lancet* 374, 1196–1208 (2009)
4. Pogorelc, B., Gams, M.: Learning Abnormal Gait Patterns of Elderly from Motion Capture System. In: *Proc. UDMECAI2010*, pp. 57-61 (2010).