Illumination of Calendar Events in the Household of Older Persons

Wilko Heuten[1] and Susanne Boll[2]

[1] OFFIS - Institute for Information Technolgy,
Escherweg 2, 26121 Oldenburg, Germany
wilko.heuten@offis.de
http://www.offis.de/en
[2] University of Oldenburg, Media Informatics and Multimedia Systems
Escherweg 2, 26121 Oldenburg, Germany
susanne.boll@uni-oldenburg.de
http://medien.informatik.uni-oldenburg.de/

Abstract. Living a self-determined life at home is typically very important for older persons. For this the individual needs to still be able to follow the daily and weekly routines, maintain social contacts, and comply to certain treatment plans. As the mental skills are slightly decreasing over the years an intelligent reminder system might compensate for this. In our research, we are exploring ambient light as a modality to present calendar information to older persons in their household. This modality promises high acceptance, easy integration and unobtrusive presentation of the different relevant events for the person in the household. Our user studies show that under a careful design of the information presentation upcoming events can be indicated and are perceived by the person in the household – and in consequence support the individual's daily course.

Keywords: hci, light, reminder, older persons, household.

1 Introduction

Current assistance systems in the household of older persons use existing screens such as the TV or wearable devices such as wristbands to provide information, alarm signals and speech guidance. We can observe from studies of our projects with older persons that with respect to usability and acceptance users would either not use the system in their daily life, or they tend to miss the relevant information. Some reasons for these issues are that many assistance systems are too obtrusive, current tasks have to be interrupted or the presented personal information is undesirably made public to other residents or visitors. Other reasons are that the resident is currently not in front of the screen or the assistance device is not worn.

The residential homes offer a high potential for different interaction techniques, which can seamlessly integrated into the physical environment. In the

R. Wichert, K. Van Laerhoven, J. Gelissen (Eds.): AmI 2011 Workshops, CCIS 277, pp. 35–40, 2012.

Lower Saxony Research Network Design of Environments for Ageing (GAL)[1] we investigate the residential home as a design space for an interactive reminder system for older persons. We designed multimodal presentation techniques to provide emergent and pervasive interaction between system and human. Several prototypes were evaluated with end-users in labs and in an exemplary senior apartment. In this paper, we focus on light as one suggested mean to present calendar events in the household and discuss challenges and potentials of ambient light for this domain.

2 Illumination of Calendar Events

The specific design space in households differs from traditional stationary or mobile applications. Important factors for the design in households are: *privacy* – it may happen that visitors are present; the information to be presented might be private or public, *location of the resident* – the user is not always sitting in front of a device, but may walk between rooms, changing his perception focus to different elements in the household, and *obtrusiveness* – system integrated into the household are usually "always on" and should therefore present information with care in respect to the need of paying attention explicitly. Additionally, the requirements derived in our project GAL show that the information design is crucial not only with regard to the acceptance of the system. The system must avoid a complete takeover of the full responsibility of reminding to prevent a (further) degradation of the mental skills of the user.

2.1 Presentation Design for Reminders

We developed a two stage presentation design (see Figure 1) [2] for an illumination of calendar events. According to Shneiderman's *Visual Information Seeking Mantra* [4] the presentation is separated into an overview and a detailed view. The overview stage provides a continuous awareness about upcoming events and delivers abstract information about the reminder's content. That allows the elderly user to remember actively details before he or she requests them on demand based in the second stage. This presentation design enables the presentation of information in an unobtrusive way but offers also a detailed view of the concrete information. Both reminder stages employ different interaction modalities to deliver information to the user. The overview stage concentrates on unobtrusive presentation methods like non-speech sounds, ambient light or tactile feedback. To request details on demand, the user can also use different methods, such as traditional desktop based systems with mouse and keyboard or tablet PCs. We also developed speech dialogues for interacting with the system, such as adding new events, requesting more details or confirming events. In addition, requested details can be presented on the TV or digital picture frames.

[1] Lower Saxony Research Network Design of Environments for Ageing (GAL): `http://www.altersgerechte-lebenswelten.de/`

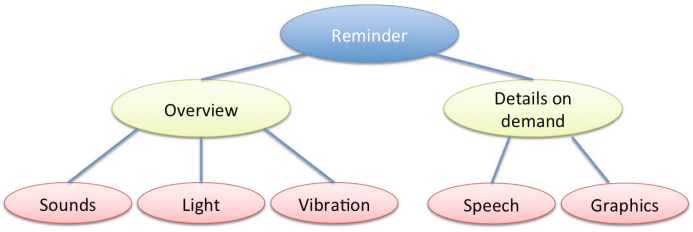

Fig. 1. Presentation concept for multimodal reminders

2.2 Lumicons for Presenting Calendar Events

We developed several low-fidelity and hi-fidelity prototypes [3] with the objective to design and test concrete solutions for the presentation of calendar events. We chose the modality of ambient light for information presentation in households, as it can address many of the requirements for the first stage in the reminding process: it is suitable in noisy environments, less obtrusive than auditory presentations, and offers the possibility for a continuous presentation. Ambient light can be perceived by the peripheral vision, i.e., the user needs not to switch the visual focus to the presentation, which would require the interruption of a current task. Modern home lighting devices are capable of being controlled in similar ways to event lighting systems. We can use different colors (color, saturation and intensity) or different rhythms for presenting information. Rhythmic presentation includes the use of specific color values but also multiple types of transitions between given values like cutting, fading or different kinds of pulsation. In that way, we form visual patterns, which we call *Lumicons* [1]. Beside presentations using single lighting devices also combinations of more lamps or similar lighting units are possible. Ambient light output may be perceived by other people, but the degree of privacy is high and most likely a lamp emitting colored light would be assumed to be just a part of the furniture. The light can be emitted in a direct way, e.g., using lamps or also in an indirect way by, e.g., illuminating walls or furniture.

The first low-fidelity prototype was developed using a projector emitting different colors projected through a translucent glass (see Figure 2). This prototype was created in order to find out how different colors can be matched with different types of calendar events, such as health related events (taking medicine, doing sports), leisure related events (appointments with friends) and tasks (e.g. housework, filling out tax return forms). In a second prototype, we used the Philips Living Colour[2], and its remote control in our showroom IDEAAL[3], in order to investigate the use of different saturation and intensity levels for

[2] Philips Living Colour: `http://www.philips.co.uk/c/choose-your-luminaire/livingcolors-frosted-white-6914387pu/prd/`, last accessed Oct, 11th 2011

[3] IDEAAL Apartment: `http://www.ideaal.de/`, German only.

indicating an upcoming event. We also wanted to find out, where the lamp should be placed in the apartment. Some potential locations are presented in Figure 2.

Fig. 2. (1) Low-fidelity prototype; (2+3) example locations for potential light presentations on the floor besides the sofa and on a board in the kitchen

Based on these first studies we conceptually designed Lumicons for calendar events. The presentation of an calendar event is divided into an *approach-phase* and an *overdue-phase* (see Figure 3). The approach-phase should prepare the resident for an upcoming event and provide a clue about what type of event is upcoming as well as when approximately the event will take place. The overdue-phase is designed as escalation, i.e. this phase should inform the resident that the event is already taking place.

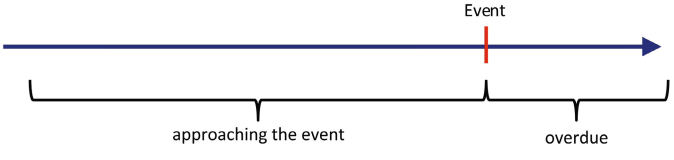

Fig. 3. Presentation concept for reminders with light

Afterwards, we have designed four different mappings of light parameters (Lumicons) exemplarily to encode the type of event, priority, time left to the event, and overdue as follows, in order to qualitatively measure the preferences of potential users.:

1. Lumicon 1: (type of event, color), (priority of the event, intensity), (time left to event, saturation), (overdue, duration)
2. Lumicon 2: (type of event, color), (priority of the event, intensity), (time left to event, duration), (overdue, saturation)
3. Lumicon 3: (type of event, color), (priority of the event, saturation), (time left to event, intensity), (overdue, duration)
4. Lumicon 4: (type of event, color), (priority of the event, saturation), (time left to event, duration); (overdue, intensity)

3 Results from Our User Studies

We performed different end-user studies in the context of our research project. A very initial study suggested that older persons rather like portable lamps, instead of integrated lights into cupboards, floor or ceiling. The two-stage process of reminding was very welcome. A low-fidelity prototype including the modalities auditory output, vibration, and light was tested with 32 typified participants (50% female). The results show that light output is mainly accepted in combination with acoustic stimuli. In another study with 6 participants (50% female) we tested the four above-mentioned Lumicons for calendar events and asked the participants to rate the different mappings on scale from 1 to 10 with regard to visibility, intuitively, ambience and acceptance. The results show that the participants favor Lumicon 1 (mean 7,75), followed by Lumicon 3 (mean 6,67), followed by Lumicon 2 (mean 5,17), followed by Lumicon 4 (mean 4,67). A further study in the IDEAAL room with 6 participants (50% female) aimed to investigate the effectivity of perception when changing Lumicons over time – changing light parameters dynamically – while performing a task (e.g. reading, solving crosswords). The study showed that the perception or non-perception mainly depends on the light color and rhythm. Some of the events have been missed by the participants, which might be an indication that for important situations different modalities should be used in addition to light or the way (location, projection size etc.) should be improved. The time left to the calendar event, was not perceived accordingly by all participants. This also needs further investigation in the future.

4 Conclusion and Outlook

In summary, light has a high potential to serve as presentation technique in households, in particular for unobtrusive and private information presentation. As a portable consumer device, it is not stigmatizing: a light device can be moved wherever the user needs it and does not require any expensive installations. However, the use of light for information presentation is just in the beginning of research. Many further investigations have to be performed for evaluating the specific design of Lumicons and their long-term acceptance. In the upcoming two years of our project, we will conduct further long term studies in the households of older persons.

Acknowledgments. The Lower Saxony research network Design of Environments for Ageing acknowledges the support of the Lower Saxony Ministry of Science and Culture through the Niederschsisches Vorab grant programme (grant ZN 2701). We further thank Sören Samadi, Eike-Michael Meyer and Markus Meis for their help conducting the presented studies.

References

1. Boll, S., Heuten, W., Meis, M., Meyer, E.M.: Development of a multimodal reminder system for older persons in their residential home. Informatics for Health and Social Care, Special Issue Ageing & Technology 35(3-4), 104–124 (2010)
2. Meyer, E.M., Heuten, W., Meis, M., Boll, S.: Multimodal presentation of ambient reminders for older adults. In: AAL Kongress 2010. VDE (2010)
3. Rogers, Y., Sharp, H., Preece, J.: Interaction Design: Beyond Human-Computer Interaction, 2nd edn. Wiley (2007)
4. Shneiderman, B.: The eyes have it: A task by data type taxonomy for information visualizations. In: IEEE Visual Languages, pp. 336–343 (1996)