

Motivational Aspects of Using Augmented Reality Glasses in Care

Markus Jelonek, Michael Prilla

Human-Centered Information Systems, Clausthal University of Technology

Abstract

This paper shows different motivational aspects of using Augmented Reality (AR) glasses in care to support informal and formal caregivers. For this we present the idea of “CareGlasses” (“Pflegebrille”) which will be tested and used in domiciliary care. The motivation to use AR-glasses when carrying out care tasks is analyzed on multiple dimensions by providing specific scenarios which show potential motives for the usage of the “CareGlasses”.

1 Introduction

In the project „CareGlasses”¹ we are developing a concept to use Augmented Reality (AR) glasses in the context of domiciliary care to support professional (formal) as well as informal caregivers like relatives of the patients or friends. Especially informal caregivers should be supported as they do care without a professional education in care on top of their daily lives. With “CareGlasses” we are developing a solution for domiciliary care that systematically supports the caregiver.

AR itself can be regarded as adding virtual information into the real world to enhance the perception of the reality of the user (Carmigniani & Furht 2011). AR glasses (such as the Google Glass) allow to supplement the real world with additional information, and enable the user to interact with information systems while still having both of their hands available for other activities.

We think that solutions like “CareGlasses” will only succeed if we strengthen the bidirectional relationship of formal and informal caregivers and support their collaboration. For this, synchronous tasks like the preparation of care plans as well as asynchronous tasks like monitoring patients’ parameters should be considered in the design. Especially for informal

¹ German project title: „Pflegebrille“. <https://www.in.tu-clausthal.de/index.php?id=1646&L=1>.

caregivers the glasses provide the potential to increase their self-confidence in providing care when it reflects their value that they contribute in care activities.

2 State of the Art

The successful integration of augmented reality and especially augmented reality glasses has been shown in several cases, e.g. in learning and educational environments (Dunleavy & Dede 2014). A study using augmented reality in a visual art course has shown positive impact on the motivational factors of attention and satisfaction of the students (Di Serio et al. 2013).

Ksoll et al. (2013) present a concept to simulate ambient assisted living (AAL) solutions in the normal living environment to increase life quality in different life stages, especially of elderly people. They show that elderly people too, are able to use new technologies, like augmented reality glasses, if the technology is introduced well. An overview of potential contexts of use can be found in Carmigniani & Furht (2011).

However, there is hardly any research available on using augmented reality in (intensive) care. Among the few exceptions, Hondori et al. (2013) describe how AR may support in rehab, and McNaney et al. (2014) describe how patients suffering from Alzheimer's disease can benefit from using AR glasses. None of these approaches, however, addresses other groups such as caregivers. During this project we will analyze the potential use of AR glasses in care settings under different circumstances by trying to support a variety of different scenarios. These scenarios will be developed after the use of ethnographical research with observations and interviews of the focus groups of caregivers and patients to examine motivational factors of using AR glasses in care.

To consider the motivational factors to use technological devices, one common model that is used is the Technology Acceptance Model (TAM) by Davis (1989). In the TAM, the role of the perceived ease of use and the perceived usefulness of a system is examined from users' perspective to define general factors that determine user acceptance. While the original model does not take emotional or social factors into account, studies suggest that these factors play an important role (Thompson 1998).

A model for motivational design processes is ARCS (Attention, Relevance, Confidence, Satisfaction) by Keller (1987) that uses motivational characteristics and presents systematic motivational design steps. It has been studied in and for the context of learning and educational settings and has been updated to take volition, the motivation to action, into account in ARCS-V (Keller 2016).

As daily lives strongly change when relatives need care, the concept of "CareGlasses" needs to take informative, emotional and social factors into account, as for example in domiciliary care, professional and informal care are intertwined and need to support each other. For this, however, social processes as building trust or gaining awareness and transparency are needed.

3 Scenarios and Motivational Design Concept

The development of “CareGlasses” will be done based on a participatory, user centered design approach. It starts by using an ethnographic research approach with field observations and interviews to gain knowledge about and to understand the context of domiciliary (intensive) care. For this approach, three potential user groups have been identified: informal caregivers, formal (or professional) caregivers and patients. The project focuses on so called intensive care, in which patients who otherwise would need to stay in hospital receive care at home. These patients can be a very heterogeneous group with patients that cannot move their body or interact with the outside world to patients that can almost live a normal life but, for example, need a ventilation machine for some hours during the day.

Based on these three groups, one may think of a variety of different scenarios that will, depending on the certain scenario, impact either one, two or all groups at once (see Prilla 2016 for an overview on these scenarios). One particular scenario in intensive care could be the remote video support of an informal caregiver by a professional caregiver. As most AR glasses provide a video camera, informal caregivers could share the view of the camera with a professional caregiver, who could then instruct the informal caregiver synchronously to e.g. control a ventilation machine of the patient. A asynchronous scenario would be displaying care related information such as annotated educational material on “CareGlasses”. An informal caregiver could use this function to display relevant instructions for a certain care task. A mockup of how this could look like from the perspective of the user is shown in Figure 1.



Figure 1: Mockup of supporting information on the display of a CareGlass

However, user acceptance and motivation should always be considered during the design process, so that the potentials will actually result in benefit, as we aim to strengthen quality of the social and cooperative relationships of informal and professional caregivers. We believe that “CareGlasses” only will succeed if informal caregivers see their practice as equally important as the practice of professional caregivers and will be motivated to use “CareGlasses” if they see their value in care. Especially for informal caregivers, who are often relatives of the patient, “CareGlasses” should increase their quality of life and satisfaction as well as reduce their uncertainty and insecurity about carrying out caregiving activities. Therefore, we try to find motivational requirements that engage users to use the “CareGlasses” intrinsically. We

expect that the motivational aspects to consider will be found both in the individual and social benefit of “CareGlasses”: While “CareGlasses” obviously needs to provide benefit to single caregivers, its full potential is supposed to be in supporting the cooperation among formal and informal caregivers. To explore motivational aspects and potential barriers we will create of domiciliary care, we identified three levels:

On the **individual level** we will look at the motivation to use CareGlass as a single person. Possible areas of application on this level include:

- Displaying information: This could include vital parameters of the patient, which could help all three user groups, for examples by reducing uncertainty of informal caregivers.
- Add reminders for tasks: By digitalizing the individual care plan of a patient, reminders could be added for different tasks that have to be done. This would improve the practice of informal and formal caregivers as they would be notified on the display if tasks are not done.

On the **social level** we will look for motivation for using the “CareGlasses” as a collective, that is, within the groups and across groups. Possible areas of application on this level include:

- Documentation: Generating a shared distribution of information by documenting all relevant actions and incidents during the care process. This includes leaving informal notes on the day of the patient, which helps the different caregivers to work together in a process of shared rather than split caring (cf. “shared doctoring” in Mol 2008).
- Patient documentation: Patients that are able to use “CareGlasses” could use it to document their daily well-being and share it with the caregivers.

In **cooperative level**: Motivation to use the “CareGlasses” by supporting cooperative processes of care as informal and formal caregivers work together. Possible areas of application on this level include:

- Remote support: If an informal caregiver is insecure about the actions and tasks that have to be done, a formal caregiver can be called via the CareGlass. The video would be streamed to the formal caregiver which could then instruct the informal caregiver.
- Documentation: Patient transfer between caregivers will be easier and more transparent as documenting information prevents to forget mentioning relevant information during the transfer.

However, as we have not yet ethnographically explored the domain of intensive care, the development of further scenarios will follow, including changes on the scenarios presented above. For this, patients, their relatives and professional caregivers will be acquired which will be serving as the focus group. After the observations and interviews, we will analyze the collected data for further scenarios and reflect on the existing ones.

To prevent possible rejections of “CareGlasses”, the first tests with users will be taking place as soon as a prototype is ready that has already implemented certain requirements taken from the scenarios. This way, the purpose and the usefulness of “CareGlasses” should be better visible to the single user.

We also consider it as important to analyze “CareGlasses” from the patients perspective. Do the glasses increase the feeling of social distance between the patient and the caregiver or do the glasses have a negative impact on the communication between both parties? Such cases could lead to a rejection and should therefore be integrated into the design process. One possible solution could be that patients should be able to know what the glasses are showing the user by mirroring the display of the glass to a second screen.

4 Summary and Outlook

In this paper we present a setting of using AR glasses in domiciliary care to support informal as well as formal caregivers. Hereby, we present different motivational dimensions which we believe reflect motivations to use the “CareGlasses”, strengthen the relationship between informal and formal caregivers and increase self-confidence of informal caregivers.

During the starting phase of the project, the focus will be first set on domiciliary care, which then will be extended on other areas of care, like ambulatory or inpatient care. This however, will lead to a wider range of different scenarios and requirements, that have to be analyzed by considering the motivational aspects of use. Since care is a sensitive area, ethical and privacy issues must always be taken into account for all scenarios and development steps.

References

- Carmigniani, J., & Furht, B. (2011). Augmented Reality: An Overview. In Furht, B. (Ed.): *Handbook of Augmented Reality*. Springer New York. [pp. 3-46].
- Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319–340.
- Di Serio, Á., Ibáñez, M. B., & Kloos, C. D. (2013). Impact of an augmented reality system on students’ motivation for a visual art course. *Computers & Education*, 68, 586–596.
- Dunleavy, M., & Dede, C. (2014). Augmented Reality Teaching and Learning. In Spector, J. M., Merrill, M. D., Elen, J. & Bishop, M. J. (Eds.): *Handbook of Research on Educational Communications and Technology*. Springer New York. [pp. 735-745].
- Hondori, H. M., Khademi, M., Dodakian, L., Cramer, S. C., & Lopes, C. V. (2013). A Spatial Augmented Reality rehab system for post-stroke hand rehabilitation. In *MMVR*. [pp. 279-285].
- Keller, J. M. (1987). Development and use of the ARCS model of instructional design. *Journal of Instructional Development*, 10(3), 2–10.
- Keller, John M. (2016). Motivation, Learning, and Technology: Applying the ARCS-V Motivation Model. *Participatory Educational Research*, 3(2), 1–15.
- Ksoll, M., Prilla, M., Herrmann, T., Rashid, A., Zentek, T., & Strehler, M. (2013). Virtual Living AAL-Lösungen spielend im Alltag verstehen. In *Mensch & Computer Workshopband*. [pp. 383-389].
- McNaney, R., Vines, J., Roggen, D., Balaam, M., Zhang, P., Poliakov, I., & Olivier, P. (2014). Exploring the acceptability of google glass as an everyday assistive device for people with parkinson’s. In

Proceedings of the 32nd annual ACM conference on Human factors in computing systems. [pp. 2551–2554].

Mol, A. (2008). *The logic of care: Health and the problem of patient choice*. Routledge.

Prilla, M., Herrmann, T., & Ksoll, M. (2016). CareGlasses: Supporting Collaboration between formal and informal care givers with Augmented Reality. In *Workshop on Interactive Systems in Healthcare (WISH 2016) at the ACM Conference on Human Factors in Computing (CHI 2016)*.

Thompson, R. (1998). Extending the Technology Acceptance Model with Motivation and Social Factors. *AMCIS 1998 Proceedings*.