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Development of an Everyday Persuasive App for Movement Motivation for Older Adults

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Abstract. This paper intends to give a short overview on the development of a persuasive widget system to increase the level of physical activity in the context of participatory IT research for and with older adults. The complete work was embedded in the three-year research project Cognitive Village.

Introduction

Older adults are increasingly shaping the image of society and thus the everyday lives of all citizens. Accordingly, every fourth German is over 60, every fifth over 65, which in 2014 accounted for 21% of the population (Statistisches Bundesamt, 2016). Industry as well as the research sector are trying to accommodate this and to support older adults or people in need of care with modern technology, e.g. Ambient Assisted Living (AAL) systems. Applications in the field of prevention, e.g. in the fields of nutrition and exercise, are increasingly receiving attention as a

contribution to a longer and pain-free life (Statistik Austria, 2016). In this context, the focus is on adaptive persuasive systems that adapt contents based on persuasive communication to the behaviour, experiences or environment of the users and encourage changes in behaviour. But it is clearly noticeable that many AAL projects in the field of persuasive systems have little (qualitative) empirical approach, and that the conceptual and design work is therefore based more on existing literature or available statistics. The approach is comprehensible, but the often lacking practice can be criticized, because many concepts only prove their effectiveness in the real everyday context. Authors therefore call for an intensive involvement of stakeholders in the design process, for example using participatory design methods (Hirschheim/Klein, 1994; Chatterjee/Price, 2009). Works such as by de Oliveira et al. (2010) and Kumahara and Mori (2014) show how many projects in the development of persuasive systems are far removed from potential users and real usage contexts. For the design of persuasive systems to work in practice and have sustainable success, it is particularly important to understand and co-explore concrete needs together with the users in order to carefully embed motivational strategies for behavioural change in everyday practices and conceptions (Patrick et al., 2009). The paper describes a sensor-based flower-shaped widget that was developed and implemented to increase movement for seniors within the three-year BMBF-funded research project "Cognitive Village" on the basis of the participatory design approach.

Requirement analysis

In order to identify the usage requirements, ten participants aged 67 to 82 years participated, who received various digital devices in the process of the research project. Different qualitative methods such as focus group sessions, interviews and technology probes (Müller et al., 2017) were used. Requirements for the persuasive system could be derived and prioritized from the needs. These included the presentation and personalization of the system, autonomy awareness, key figures such as current steps, the absence of warnings and low usage hurdles.

Design idea and description of functions

Based on the requirements, potential design ideas were conceptualised by the author, outlined and extended with functions. The selected idea flower widget featured nine elements, which were adopted in modified form until the final prototype.

Window glass. At the window, the current local weather is always indicated on the ZIP code, which also changes the window glass. For special days, such as the user's

birthday or Christmas, special matching elements are placed in the background or on the windowsill to personalise the overall scene.

Plant in a pot. The plant is the primary element of the widget. The flower grows in the initial phase in 20% steps and always symbolizes the steps taken on the last day. The size of the growth depends on the filling state of the water can. There are different flowers and colours. At 100%, the flower should appear relatively large and powerful so that the user feels a positive user experience and is happy to have reached his daily goal the day before.

Water can. The water can shows the current number of steps in 20% stages, which was set individually beforehand. The More water collected with the walked steps, the more the flower blossoms the next day. The pot is emptied in the morning. In addition, the water can should encourage the user to drink and show in a simple way how much steps the user had moved.

Sticker (Achievements). Sticker, are small encouraging messages for the user and show pictorially reached daily goals of the whole week. These stick to the window glass in the background. Since there are several sticker variants and these appear in random order. If the user has collected three stickers nevertheless, he has the possibility to collect cups.

Calendar. The calendar shows the current date to the user. It is mainly about the last synchronized status.

Notebook. The notebook shows the current and if desired also the personal maximum steps.

Settings. In the settings the user can enter a personal title, his name, his target steps and his Zip code so that the local weather can be called up. In addition, the user can also find a selection of flowers.

Different modes. In addition to the planned interactive elements, various modes are used to make the widget content look more realistic. Accordingly, a distinction is made between five different modes, between which the widget changes depending on location, time and date.

Hardware implementation and software architecture

For the use of the app the sensors of a Smartwatch (Huawei Watch and Nokia Go) are used to generate data (steps), which can be viewed at the end of an iterative data processing process in the form of a changed flower widget, which is integrated within the Cognitive Village Dashboard open.Dash[1]. Open.Dash is an open source visualization framework written mainly in Javascript. It offers users a dashboard connected to existing data sources, a user administration and other http/websocket

1 open.Dash: Vordefinierte Visualisierungselemente zum einfachen Erstellen von Smart Home Ansichten und der Möglichkeiten zur Exploration von Daten und freien Gestaltung individueller Visualisierungselemente. (2016). https:// opendash.de/. – (June 2017)

sources. The dashboard and widget were used via a web browser, in the case of Cognitive Village with a Samsung tablet. If the user moves so that the watch detects a change, the generated user data will be sent to a middleware by an automated process. For synchronization, storage and forwarding of the data, a smartphone was used. The middleware receives the data, processes it and assigns it to the respective functions. The devices synchronize every 10 seconds and store the data on the smartphone, even if the Internet connection fails.

Summary

All individual design ideas and iterations were explored, developed and finally used over several weeks in intensive cooperation with the older adults. With the strong participative and everyday approach, not only the visual elements were designed and selected, but also successfully led to technology adoption and long-term usage motivation.

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