A Taxonomy of Notification Technology for Assisting the Caregivers of Elders with Cognitive Decline

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Abstract. According to the latest United Nations estimations, people with dementia worldwide will increase to over 100 million by 2050 [1]. This is significant not only due to the number of people affected by such disease, but also by the number of people required to care for those patients. The overall objective of our work is to study how ambient intelligent technologies can assist the elder’s caregiver in his/her task of providing high quality care. This paper addresses the issue of information notification for the provision of care, so that the information is current, relevant and appropriate to assist the caregiver. Based on a literature survey, we propose a taxonomy of notification technologies. The resulting taxonomy not only provides a detailed understanding of current notification technologies to assist the elder’s caregiver, but also identifies and proposes new areas of opportunity of notification systems.

Keywords: Alzheimer’s disease, caregiver, notification system, ambient intelligent technologies.

1 Introduction

According to the latest United Nations estimations, there are 30 million people with dementia worldwide, and that this number will increase to over 100 million by 2050 [1]. This is significant not only due to the number of people affected by the disease, but also by the number of people required to care for those patients. The main caregiver of an elder with cognitive decline (CD) is the person who handles the basic needs of the patient and that oversees him/her on a daily basis.

The wellness of an elder with CD depends on the quality of care that a caregiver can provide, which in turn may depend on three aspects: (1) the information that the caregiver has on the elder’s disease, (2) the care situations faced by the caregiver and (3) the caregiver’s quality of life. On the other hand, it is also true that as the elder’s CD progresses his level of independency will be reduced and the health care tasks of the caregiver will increase; as a consequence, a caregiver might not be able to attend the care situations that arose in the care of elders. To cope with this, studies have emphasized that is important to provide to caregivers awareness about care situations by considering the stage of elder’s CD [5].

The overall objective of our work is to study how ambient intelligent technologies can assist to the elder’s caregiver in his/her task of providing high quality care. This
paper addresses the issue of the notification of information aiming at providing awareness to the caregiver about the relevant care situations that arose in the care of elders with CD. Based on a literature survey, in Section 2 we present a taxonomy of notification technologies, an analysis of this taxonomy that allowed us to identify areas of opportunity, showed in the Section 3 and finally our conclusions in the Section 4.

2 A Taxonomy of Notification Technologies

Before describing the proposed taxonomy, it is necessary to define what we mean by notification. According to the Merriam-Webster dictionary, notification is the act to report “something” with a certain purpose. Mühl et al. [6] define notification as part of an event-based system, where an event is something that can be observed and notification is a description of such event. We mean by notification the act of sending a message through the appropriate mechanism to reach a certain purpose.

The literature review was analyzed following the 6 W’s questions approach, considering not only the data, but also its surrounding context (Figure 1).

Our taxonomy was generated by grouping the aspects of the W’s that are related. In doing so we identified four dimensions of our taxonomy: content, time, actor and presentation (Figure 2), which are describe in the following lines in more detail:

Content (What?). This dimension revises the type of message to be sent, which could be of three kinds: report, is a message that provides a description of the characteristics and circumstances of an elder’s health status; reminder, is a message that notes when its time to execute an activity or an action, and alarm is a message which aims at warning you about an event. For instance Jaichandar et al. [3] explores how to send alarms when the temperature of the elder’s bed is high, while others have explored how to notify caregivers about previously scheduled events as reminders [11,19] and how to report information associated with the ADL (Activity of Daily Living [4]) executed by an elder[7].
Time (When? and Why?). This dimension studies when it is appropriate to deliver a notification considering the context of both the sender and the receiver. Such delivery time is related to the purpose of the notification either: before, an event occurs with the aim at preventing something; during, the event is occurring, and after, the event occurred just to inform that something has happened. For example, Giroux et al. [8] and Mynatt et al. [14] reported during the execution of ADL’s to remind the elder in the footsteps of such activities, while others have explored to notify before [13,15] or after[16] the event occurred.

Actor (Who?). This dimension refers to the individual or group of individuals that will receive the notification, such as: the elder (healthy, ill) and caregivers (formal, informal or professional [16]). For instance Paganelli et al. [9] and Chung-Chih et al.[10] notify information to the group of caregivers that takes care of an elder while other systems notify only to the elder [18,20].

Presentation (How? and Where?). This dimension refers to how the notification will be presented and in which device will be shown, either in a passive or active manner[17]. As stated by Berlage and Sohlenkamp, a passive message is displayed without the intervention of the actors while an active one requires some level of intervention of them. For example Hoey et al. [12] presents notifications in a passive manner as an audio cue when the elder is unable to interact with a device because he is washing his hands; while Marmasse [2] uses an active presentation.

3 Opportunities of Research

As shown in Figure 2 we identified areas of opportunity for the development of notification systems in support for the caregivers of elders with CD. For a clear understanding we group them in three topics:
• Prevention Systems. There are some projects that have explored how to send reminders and alarms before an event happen with the aim at avoiding a dangerous situations. However these projects are oriented only to elders and not to caregivers. In addition, none of these projects have explored active mechanisms to engage a user in the discovery of such events.

• Detection systems. As shown by the figure 2, notification issues to either report or remind an event or activity to caregivers have not yet been explored.

• Recovery systems. There are a few projects that have explored how to send alarms to caregivers after an event happened but not following a passive approach.

4 Conclusions

The taxonomy presented not only provides an understanding and detailed view of the current technologies proposed to assist in the notification of relevant events that arose in the care of elders with CD, but also aims to identify new areas of opportunity. We are currently executing a workplace study in a nursing home in the city of Ensenada, México to identify relevant care situations that could be enhanced with notification technologies. We are also using our taxonomy for the development of unexplored notification systems with the aim at helping caregivers to improve quality of care.

References


