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Master thesis report for the MSc Embedded Systems

TU Delft – Interactive Intelligence

User valued smart reminders: Finding Appropriate Moments for Support in Socially Adaptive Electronic Partners

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# Abstract

This project will focus on finding what defines an appropriate moment in regards to providing support through a Social Adaptive Electronic Partner (SAEP). It paves the way to ultimately answering the question “Given a user’s daily activity, what is considered an appropriate time for support feed-back, taking into consideration the user’s norms and values, to achieve a certain goal?”. **TODO**

# Table of common terms

|  |  |
| --- | --- |
| **Term** | **Description** |
| ADL | Activities of daily living |
| SAEP | Socially Adaptive Electronic Partner |
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# Introduction

The use of technology to support the daily lives of people is an ever-prevalent topic. Through applications in smart homes, wearables, virtual coaches and many others, we can improve our health, efficiency and be more connected. Conversely, the abundance of apps and notifications causes us to grow immune to the constant stream of information that is presented to us in a daily basis [1]. Especially the elderly or people with a mental impairment could benefit from an effective support agent [2]–[7]. In order to create a truly effective support agent, it is crucial to not only generate feedback in relation to the user’s actions but to provide this feedback at an appropriate time.

But what actually is an appropriate time? The appropriate time for feedback is inherently linked to the nature of the user’s action. To illustrate this, consider the following example throughout this report.

An elderly gentleman, Peter, often forgets to close the garden doors before leaving the house or going to sleep.

In this example, timely notification is of the essence. Preferably, notification just before sleeping or leaving the house is desired. Generally, these are quite predictable activities. In the current technological landscape, a simple scheduled notification would be the likely solution. Possibly a geofence[[1]](#footnote-1) may be used to trigger a notification when leaving the house, but this will be post factum.

Identifying such an appropriate time for support feedback for a specific scenario is not difficult. The difficulty of this lies in the generalization. While the above examples can be implemented relatively easy at design time, diversions from normal behavior are not handled. Existing technologies are often made by hardwiring norms and as such are very rigid and unable to adapt to evolving norms [8]. Furthermore, dealing with different problems, such as remembering to turn on the alarm system before leaving work, would require a completely different implementation. Nonetheless, generalization requires analysis of goals and the values underlying the user’s daily activities.

## Approach

The problem of finding boils down to a few steps; each worth further analysis in their own right.

Working our way back, the first question that arises is what defines the goal. The goal is defined by the users and can be anything such as: *“I want my garden doors to be closed when I go to sleep or leave the house”.* Assuming we know the user’s activities of daily living (ADL), and optionally the status of the garden doors at any moment, the first step is analyzing which prerequisites there are to attaining that goal. Usually, a goal is not an independent action taken, but rather the consequence of a series of actions. As such, knowledge is required on how a goal be deconstructed into a number of distinct prerequisites.

In order to analyze arriving at this goal, some sort of model needs to be created from the user’s ADL. Once this model has been created, we can use it to analyze the limits of the possible moments for support. More directly, the prerequisites will indicate a number of actions that will have to have been completed, but also some actions may not have been completed. For example, a user will first have to arrive home, but should have received the support feedback before leaving once again, when the user will need their keys. However, Finding the most suitable moment for support is dependent on more than just this.

Finding the most “appropriate” time for the support feedback boils down to finding a moment which is both maximally effective and minimally invasive. Depending on the chosen solution, a number of other values are negatively affected. For example, sounding an alarm in the middle of a person’s sleep may be very effective, but it sure is annoying. The problem is, however, that it’s difficult to quantify invasiveness.

Summarizing, the required steps are:

* Definition of the goal and its prerequisites
* Analysis and modelling of the user’s ADL
* Analysis of effectivity
* Analysis of invasiveness

*(This should, however, be analyzed with respect to the consequences of not remembering.) In case Peter forgets before sleeping, he will either wake up with a sense of insecurity, or if he wakes up at night, he will have to get out of bed and properly interrupt his sleep. If he forgets and leaves the house, the only solutions may be to return home, to ask a friend, or to leave it be. In all cases, his value of security will be diminished, let alone if a break-in were to actually happen.* ***Dit moet nog ergens***

# Related work

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1. A virtual geographic boundary, defined by GPS or RFID technology, that enables software to trigger a response when a mobile device enters or leaves a particular area. [↑](#footnote-ref-1)