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NUBSL – A Freely Placeable, Low-cost Notification Utility

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Abstract

We propose a tangible notification utility for remote maintenance of flats or houses in the context of "Internet of Things", focusing on two core aspects: First, an alert feature in case of urgent problems which immediately informs the user about threats, damages or events with high priority, utilizing sound and light to ensure immediate response. Additionally, passive reminder functionality was implemented, which is related to tasks or events with low priority, in order to inform the user without distracting him from his current objectives. The novelty of the approach is the versatility of the devices, their mobility and the ability to place them anywhere in proximity to the user.

1 Introduction and Related Work

The manifold opportunities of the "Internet of Things" enabled by the distribution of sensors and actuators in everyday things and their connection to smart objects results in a growing autonomy of daily life systems (Fleisch 2010). As a result the demand of remote maintenance and monitoring arises (Wittenberg 2004).We propose a tangible solution for notification of non-critical tasks as a digital post-it and for remote maintenance in daily life, e.g. the monitoring of one's own flat during a longer vacation or business trip. Instead of using smartphones for this task, tangible interfaces provide several benefits. A robust tangible device can be used under conditions where smartphones are difficult to handle, e.g. factory settings, in which the user may be restricted in hearing or in performing touch gestures (Ziegler et al. 2011). Another benefit of a tangible device, which serves only a single purpose, is the opportunity to give it to friends or colleagues during a longer absence, which usually is not done with the personal smartphone. In addition, low manufacturing costs unlock all kinds of domains for tangible user interfaces, because the destruction or the loss of such a device is not as bad as losing a smartphone with all its saved personal data.

There are several approaches regarding remote maintenance. Ziegler et al. propose a device for factory settings, which is using a display on top of gloves and a rotating button at the belt to interact with remote data under harsh working conditions (Ziegler et al. 2011). Atzori et al. mention monitoring, alarm systems and the prevention of thefts as scenarios for smart objects in the context of smart homes. In their paper they also cover the idea of an intelligent

utility which reminds users about the location of misplaced or missing objects (Atzori et al. 2010). The StaTube from Hausen et al. is a presence indicator located on a user's desk. It is a desktop lamp connected to the user's Skype account and consists of several rings, each representing a Skype contact. The topmost ring stands for the user's own account. Every ring can be illuminated in the color of the connected contact state. Thus the user can see if others are available without checking the online status with an extra device. The topmost ring informs attendant colleagues if the user does not want to be disturbed (Hausen et al. 2012). StickEar from Yeo et al. is an input/output device that enables sound-based interactions for applications such as remote sound monitoring, remote triggering of sound, autonomous response to sound events, and controlling of digital devices using sound (Yeo et al. 2013).

2 Concept NUBSL

Our concept consists of two parts – one device could be used as a reminder for non-critical tasks and one is for urgent notifications, which are triggered by a connected monitoring system (e.g. a system installed in the users flat). The device itself is a small plasticine ball, which can be carried along anywhere. Therefore, it could be placed at the user's desk during work, in the car, when on the road or on the backpack when travelling (Figure 2). The concept behind this approach is related to the idea of Tangible User Interfaces as "Ambient Media", that remain unrecognized by the user, and only act in case of urgent problems or when the user (un)intentionally touches them (Ishii 2008).

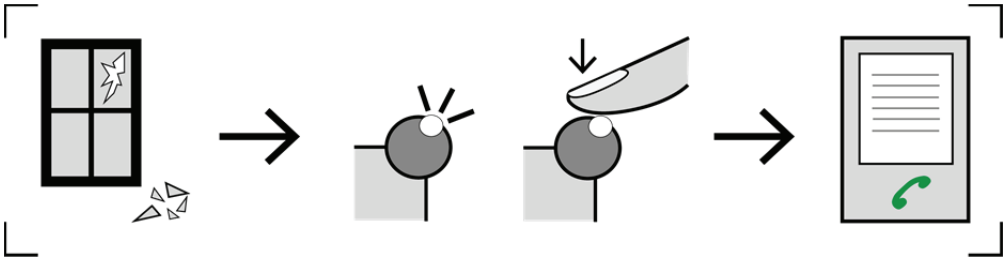

Figure 1: An example for remote monitoring: In case of an urgent event, a message is sent to the NUBSL, which immediately starts to blink and replays a predefined sound. Warned by the alert, the user presses the button on the device and a prepared message is displayed on his smartphone or any other computational device he wants to.

The proposed device allows recording messages in order to remind the user of less important things. Therefore the user has to press and hold the device. A light indicates that the device is ready for recording. To recall the message later, the user has to tap the device to replay the message. The device can be placed at any surface (e.g. at the edge of a table or a screen, see Figure 2). This flexibility in mounting allows either the use of NUBSL as a constant reminder or as a quite inconspicuous solution, which reminds the user infrequently. If the user does not remember the exact task by looking at the device, a tap on the device replays the recorded message or additional information.

Direct notifications for high priority incidents need to be communicated to the user in a different way. In order to get the user's attention immediately, the device gives a visual and acoustic signal to the user as soon as the notification arrives (see Figure 1). With a slight press on top of the device a prepared message is instantly sent to the user's mobile phone or

computer including information about the current problem and offering a prepared solution, which, for example, could consist of a message to a contact person or the police. In addition, it is also possible to make use of NUBSL as a calendar, which informs the users about upcoming appointments or deadlines.

3 Realization and Implementation

In order to achieve a flexible placement of the NUBSL prototype, it was realized by using plasticine and Sugru (Sugru 2013) as base material. Inside the device, there is a speaker, a RGB-LED, a microphone and a button to implement the functionality described before (see Figure 2). For the audio output and input a voice recorder was disassembled and the parts were connected to an Arduino™ controller (Arduino 2013). Several parts of the voice recorder are controlled by the micro-controller as well as the communication with the user's home. In case of an alert, serial port communication is used, e.g. sending prepared notifications to the smartphone.

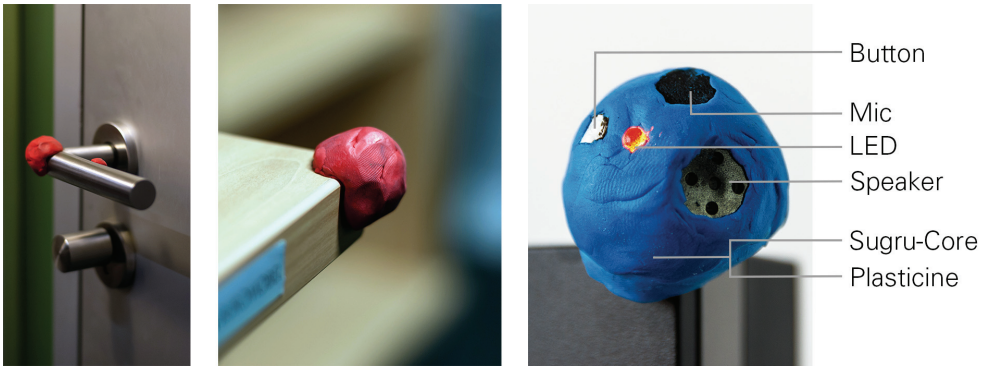

Figure 2: NUBSL can be placed everywhere you want. Right: prototype receiving an urgent message.

4 Conclusion and Future Work

We created a concept for a flexible device, used for notification and remote monitoring. The concept consists of two parts, the first one addressing the recognition of low-priority notifications, which are noticed only incidentally by looking at or touching the device. The second purpose is to submit direct notifications for high priority events. The concept was realized using an Arduino™ micro-controller to trigger visual and acoustic signals. The critical reflection on the created prototype and the experiences with it shows the strengths of the concept and points to areas of further improvement. The focus on two distinct core functions leads to an easy understanding of the device and a very simple interaction concept. The biggest strength of the device is its versatility.

Although utilizing a simple concept, it can be used nearly everywhere to setup a short reminder, but also prevents unexpected events from remaining unnoticed. However, there are also areas of improvement: In its current implementation neither the Arduino™ board nor an adequate power supply are integrated into the device. Ongoing miniaturization should help to

resolve that issue. Therefore the portability, as well as the usability could be enhanced. Another improvement could be the use of a smartphone or a PC application, which simplifies the configuration of the device. Currently the NUBSL-concept focuses solely on the aspects of notification issues, so the next steps contain a deeper integration of concepts for remote monitoring and connecting the device with these systems.

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