

WatchMe: Wrist-worn Interface that Makes Remote Monitoring Seamless

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ABSTRACT

Remote monitoring allows us to understand the regular living behaviors of the elderly and alert their loved ones in emergency situations. In this paper, we describe WatchMe, a software and hardware platform that focuses on making ambient monitoring intuitive and seamless. WatchMe system consists of the WatchMe server application and a WatchMe client application implemented on a regular wristwatch. Thus, it requires minimal effort to monitor and is less disruptive to the user. We hope that the WatchMe system will contribute to improving the lives of the elderly by creating a healthy link between them and their loved ones.

Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User Interface.

K.4.2 [Computers and Society]: Social Issues—Assistive technologies for persons with disabilities.

General Terms

Design, Human Factors

Keywords

Assistive interface, ambient display, health monitoring.

1. INTRODUCTION

As people age, incessant monitoring by their children/guardians or caretakers becomes indispensable. With busy schedules, it is immensely difficult for young people in a family to stay close to the older family members [9]. Thus, remote elderly sensing/monitoring systems that help to keep track of the behavior of elderly parents or loved ones has become important. These systems provide an opportunity for the elderly to stay healthy in their homes instead of moving to a strange place like elderly nursing homes where the rate of depression is high [8]. Moreover, social isolation can be eliminated to some extent through reminding them of the care bond they have with their loved ones. Technologies that promote these kinds of interactions have shown to reduce loneliness and depression among the elderly [3, 12]. However, most of the existing non-invasive remote monitoring systems are difficult to use due to the technical complexity required to interact with them [10, 5].

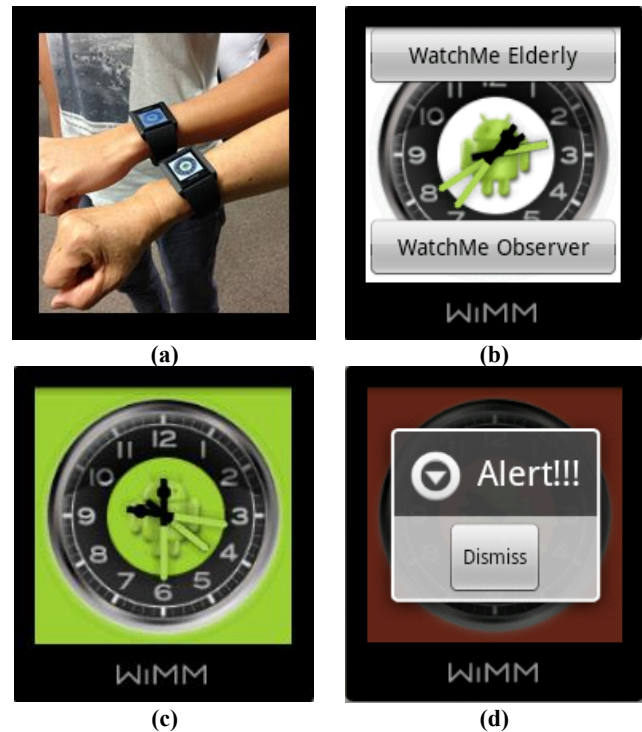


Figure 1. WatchMe client application

This motivated us to design the ‘WatchMe’ platform. WatchMe is a hardware and software platform that makes ambient monitoring seamless. One of the major benefits of WatchMe is that this monitoring device is as simple as a regular ‘wristwatch’ and requires no complex technical configurations. Caretaker’s WatchMe watch can be paired with the WatchMe watch of the person who needs support, using a simple tap gesture. In addition to the uncomplicatedness of pairing and switching among different caretakers, the wristwatch interface requires minimal effort for ambient monitoring. It is also less disruptive compared to having to take a device, such as a mobile phone, out of the pocket periodically, to check the condition. The suggested platform can also be used to monitor and collect health related data constantly and recognize significant patterns to identify prominent psychological conditions.

2. RELATED WORK

There have been attempts (‘Digital Family Portrait’ [7], ‘CareNet Display’ [2]) of monitoring the behavior and health condition of the elderly using a portrait of the elderly that acts as the ambient display. These systems require complicated installations of sensors and cameras in the home where the older family member lives. Shimokakimoto and Suzuki propose an intuitive interface similar to a chair, which is employed to investigate physical and

psychological activity of the body while the user is relaxing in a normal environment [10]. The system proposed by Segura et al [11] has mapped the urine output and the movement of a patient to an ambient display of blinking and moving flower-like objects. In addition, smart-phone based applications and other stand-alone devices for remote elderly sensing already exist in the market (e.g. www.medapps.net). Most of those either requires the use of a dedicated extra device or they do not provide an easy-solution for pairing the remote observer and the elderly user [1, 6].

3. WATCHME SYSTEM

The WatchMe system consists of two major modules: WatchMe server and WatchMe client application (Elderly/Observer). The architecture of this system is shown in Figure 2, where the WatchMe server was implemented on Java-SE 1.7 as an http server and the WatchMe client was implemented on a wristwatch running Android 1.6 (<http://www.wimm.com>). Although several WatchMe devices are connected to the WatchMe Server, only the paired devices communicate with each other.

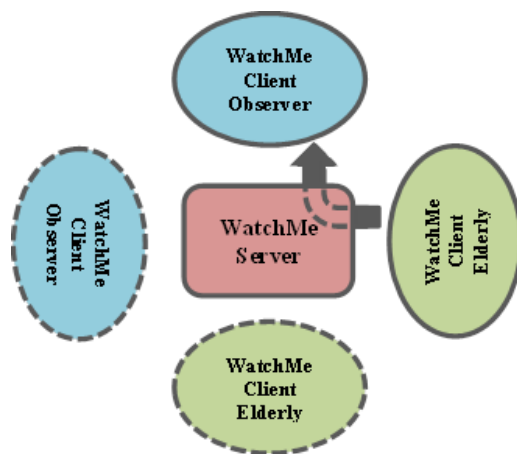


Figure 2. Overview of the WatchMe system

The process of remotely monitoring health condition is initiated with the pairing of two WatchMe clients. For the pairing, two watches running the WatchMe client application need to be in close proximity and the WatchMe wristwatches tapped (Figure 1a). Then, the application displays a window on two screens to select the role—WatchMe Observer for the caretakers, WatchMe Elderly for the elderly person to be monitored (Figure 1b). From this point onwards, remote sensing is enabled and both WatchMe applications show a regular watch face with a green color background to indicate successful pairing (Figure 1c). For the current implementation, we chose to monitor the movements using the inbuilt 3-axis accelerometer of the wristwatch. However, our modular implementation allows the system to be extended with different sensors attached directly to the watch or via bluetooth to monitor conditions such as blood pressure, heart rate, etc.

The WatchMe client (Elderly) application on an elderly person's watch monitors the accelerometer data and pushes the results to the WatchMe server. WatchMe client (Observer) application on the caretaker's watch periodically communicates with the WatchMe server to update itself. The background color of the caretaker's watch face changes from green to red corresponding to small movements (small variations of accelerometer data) to large movements (large variations of accelerometer data) of the elderly person's watch. The current implementation also monitors for emergency situations such as a fall based on the readings of the

accelerometer data [4]. When a fall is detected, the WatchMe Observer's watch face background becomes red and the application alerts the caretaker with a pop up message and vibration (Figure 1d). At the same time, a similar pop-up message with vibration alert is shown on the elderly person's watch, which can be used to disarm a false detection of a fall.

4. CONCLUSION AND FUTUREWORK

WatchMe is still a work in progress. So far, we have developed a modular platform that makes the ambient health monitoring of elderly people intuitive and seamless. We plan to conduct a formal user study to validate our decision of using a wristwatch as an ambient monitoring system. In future, we will explore integrating more sensors (such as blood pressure sensors and temperature sensors) with the WatchMe client. This will be useful for predicting and preventing hazardous health conditions. We also plan to extend this work beyond the assistive interface domain and explore the use of wrist-worn interfaces for social and professional networking.

5. ACKNOWLEDGMENTS

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