ANDROID-BASED APPLICATION TO ASSIST DOCTOR WITH ALZHEIMER'S PATIENT

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ABSTRACT. Alzheimer's disease is one of the leading diseases that contribute to dementia cases. The Alzheimer's patient suffers from memory loss and losing judgment due to its effect on the human brain. Alzheimer's patients need to be monitored and assisted in their daily life especially for medication. Proper medication may reduce the effect of Alzheimer's disease on the patient. The Android-based mobile application is one of current technologies that can be used to assist doctors to monitor Alzheimer's patient medication. The application alert patient when to consume the medicine based on the schedule provided by the doctor. The application has been evaluated by doctors, where the responses are very satisfactory.

Keywords: Mobile technology, m-health, Alzheimer's disease, Android, short message service

INTRODUCTION

Alzheimer's disease is one of the dementia syndromes. Dementia is a syndrome due to the illness in of the brain that disturbs human memory, thinking, orientation, comprehension, calculation, learning, language and judgment. World Health Organization (WHO) estimates that in 2010, more than 35 million people living with dementia with new case occurs every four seconds (World Health Organization, 2012). Alzheimer's disease contributes 60% to 70% of the dementia cases.

In Malaysia, a foundation called Alzheimer's Disease Foundation of Malaysia (ADFM) has been set up to promote awareness of Alzheimer's Disease among Malaysian and provide support to the patients and their family. Based on the information publish on ADFM website, the number of Alzheimer's patients in Malaysia is estimated at 50,000 and most of them are not diagnosed (Alzheimer's Disease Foundation of Malaysia, n.d). The figure is expected to rise as the ageing population increased.

Alzheimer's patients are overwhelming for the caregivers and adequate support from the community. However, the current living conditions in most countries reduce the quality time of the family members. Thus, maximum care and attention to the Alzheimer's patients is difficult. One of the serious attentions that the caregivers should monitor is the medication. Medication may help to reduce the effect of the disease and with certain medication and treatment the patient may survive from Alzhiemer (Ministry of Health Malaysia, 2009).

The advancement in information and communication technology (ICT) may reduce the burden of the caregivers. The existence of mobile devices and high speed communication technology enable the caregiver and the doctor to monitor Alzheimer's patient in the distance.

In this paper, Android-based application called Alzheimer's Patients Medical Care System (APMS) is proposed. APMS is aimed to assist doctors to monitor their Alzheimer's patients, especially for the medication. During medication time, APMS sends notification messages to remind a patient about the medicine that he or she has to take according to the schedule provided by the doctor. The doctor can also monitor the condition of a patient according to the feedback provided by the patient's caregiver through APMS. Based on the feedback, a doctor may change the medication schedule and refer the patient for further treatment.

MOBILE AND ANDROID-BASED COMMUNICATION TECHNOLOGY

Mobile technology is one of the major advancements in information technology (IT). It facilitates collaboration, interaction, access, discovery, discussion, and sharing of information. Thus, provides freedom and widens the scope of communication by supporting wireless and mobile devices, such as cell phones and Smartphones. A call can be made to and from any location using this technology. In addition to voice communication, mobile technology provides interactive short messaging service (SMS) that can be used to alert a person about a certain event or to announce specific information (Yengin et al., 2011).

This technology can be used in various areas, such as social activities, education, business, and medicine. Mobile technology is employed in e-health applications, such as telemedicine; it improves communication among medical practitioners as well as among doctors and patients. Mobile health care (m-health) is one of the e-health applications that uses mobile devices to deliver medical services to patients (Mechael, 2009). Wireless health care delivery is enhanced by the integration of multimedia technology (Istepanian and Lacal, 2003). Both doctors and patients benefit from mobile technology because it allows them to communicate, share information, set up reminders, and record activities (in digital diaries) (Challa, et al, 2011). Furthermore, doctors can also access the record of their patients remotely.

Android is an open-source operating system for mobile devices, which has been increasing in prevalence. Creating an Android application includes setting up and developing environments on a machine. Fundamental tools for developing Android applications are AndroidManifest.xml file, activities, intents, and XML layouts, as reported by a number of authors. Jackson (2011) outlined the "three major components of an Android development environment: Java, Eclipse, and Android" and provided directions for downloading and installing the necessary files to establish this environment. Felker (2011) reported that Java JDK, Android SDK, Eclipse IDE, and Android ADT are needed to develop, install, and configure any Android application on a machine. These steps are standard, as observed in many Android development books and in the official Android Web site.

METHODOLOGY

The current study adopts the methodology of Vaishnavi and Kuechler (2008). This methodology consists of five phases: awareness of the problem, suggestion, development, evaluation, and conclusion. These phases are shown in Figure 1.
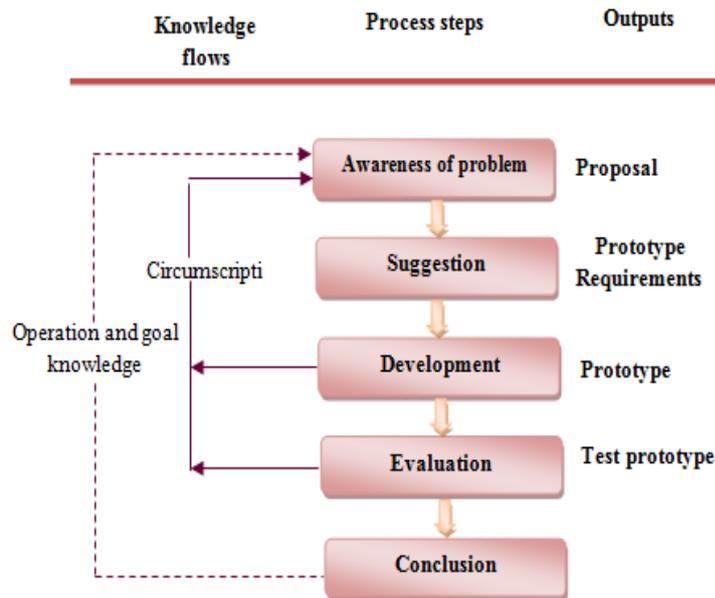
Figure 1. Research design methodology (Vaishnavi & Kuechler, 2008)

The Unified Modeling Language (UML) was used to model the logical design of APMS. The Android application for APMS was developed using the Java language and SQLite database. The usability of the prototype was assessed using the IBM Computer System Usability Questionnaire (Lewis, 1995). The questionnaire has 19 questions with Likert scale from 1 to 7. Four doctors were selected to access the usability of APMS.

APMS DESIGN AND IMPLEMENTATION

The APMS has two main components (actor and use case), and two actors (doctor and patient). The doctor has the authority to handle six use cases, and the patient has the authority to handle two use cases, as shown in Figure 2.
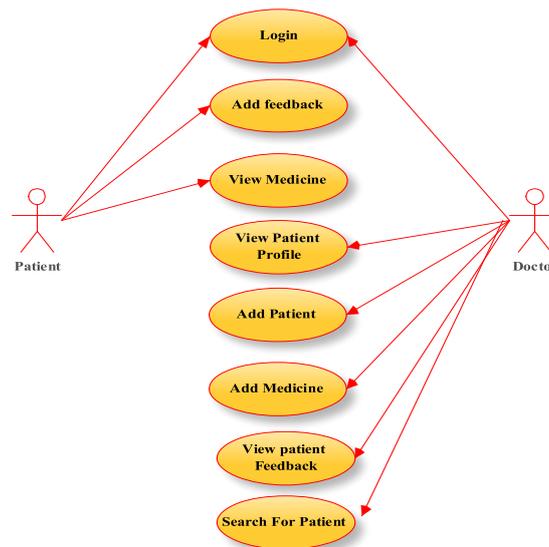

Figure 2. Use case diagram for the APMS prototype

APMS consists of an Android application page such as medicine, a list of patients, SMS sender, feedback, for measuring the vital parameters; a controller for collecting data from different equipment and sending it to a server; a server for processing the data and communicating a server for processing the data and communicating the details on the Android device of the doctor. The server maintains a database of the patients' details as shown in the Figure 3.
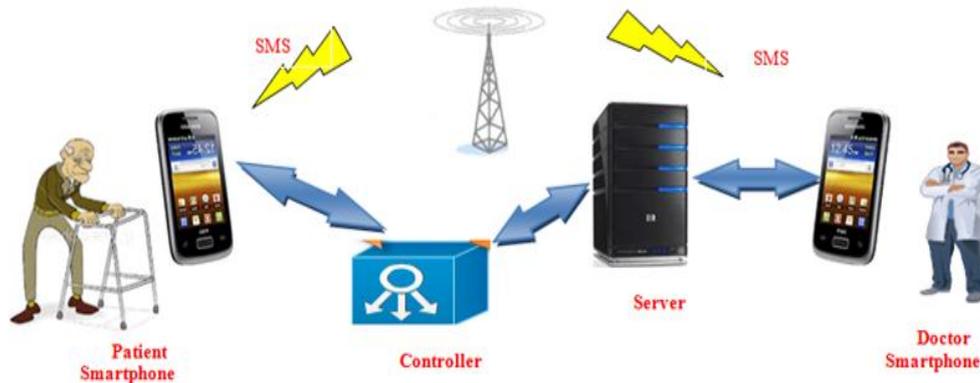

Figure 3. The design process for APMS

The doctor interface contains of five main functions as shown in Figure 4. The doctor can view the patient profile and patient feedback. The doctor can also add new patients and new medicines; he or she can even perform a quick patient search. The patient can view his or her medication schedule such as time to consume his medicines and the dosage (Figure 5).
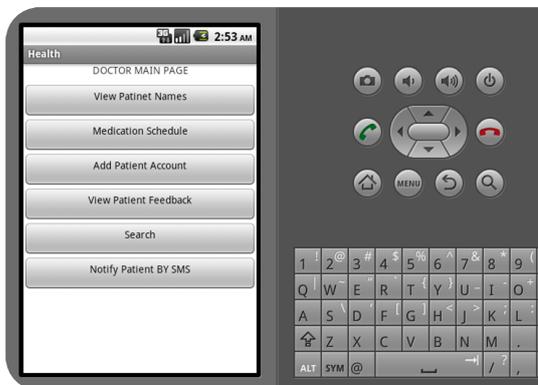

Figure 4. Main Doctor Interface

Figure 5. Medication schedule interface

APMS EVALUATION

Four doctors were selected to access the usability of APMS. Each of them is given an explanation and demo on how to use the prototype. Later, they were asked to use the prototype and answer a set of questions to access the usability of the prototype. The result is shown in Table 1. The finding shows that the mean for each question is more than the median. This indicates that the respondents are overall satisfied with APMS. The respondents agree that APMS is easy to use, fast, effective and efficient tool to assist doctors monitoring Alzheimer's patient.

Table 1. Usability of APMS

		Mean
Q1	Overall, I am satisfied with how easy it is to use this system.	6.75
Q2	It was simple to use this system.	5.75
Q3	I could effectively complete the tasks and scenarios using this system.	6
Q4	I was able to complete the tasks and scenarios quickly using this system.	6.5
Q5	I felt comfortable using this system.	6.75
Q6	I was able to efficiently complete the tasks and scenarios using this system	6.25
Q7	It was easy to learn to use this system.	5.75
Q8	I believe I could become productive quickly using this system.	6.25
Q9	Whenever I made a mistake using the system, I could recover easily and quickly.	5.5
Q10	The information (such as online help, on-screen messages and other documentation) provided with this system was clear.	6.25
Q11	The system gives error messages that clearly tell me how to fix problems.	5.75
Q12	It was easy to find the information I needed.	6.75
Q13	The information provided for the system was easy to understand.	6
Q14	The information was effective in helping me complete the tasks and scenarios.	5.5
Q15	The organization of information on the system screens was clear.	6.25
Q16	The interface of this system was pleasant.	6.25
Q17	I liked using the interface of this system.	5.75
Q18	This system has all the functions and capabilities I expect it to have.	6
Q19	Overall, I am satisfied with this system.	6.75

CONCLUSION

Mobile technology has been deployed in this study. These technologies are vital not only to support communication but going further as human digital assistant. The practicality of mobile technology in medical applications makes it a suitable tool for assisting special-care patients with chronic diseases such as Alzheimer's disease. In this paper, Android-based mobile technology has been implemented to assist doctors to manage and monitor their Alzheimer's patient. The application also serves as a support tool for Alzheimer's patient by reminding them about the medication.

The response from the doctors shows that the proposed application is a suitable tool to support and assist doctors to monitor and communicate with their Alzheimer's patient.   In future, further assessment need to be conducted to evaluate its usability among Alzheimer's patients and their caretakers.

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