Chapter 14
Mobile E–Health Information System

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ABSTRACT

A mobile e-Health information system (MEHIS) aims to speed up the operations of health care in medical centers and hospitals. However, the proper implementation of MEHIS involves integrating many subsystems for MEHIS to be properly executed. A typical MEHIS can consist of many components and subsystems, such as appointments and scheduling; admission, discharge, and transfer (ADT); prescription order entry; dietary planning; and smart card sign-on. This paper describes the development of a MEHIS with open-source Eclipse, using currently available health care standards. The author discusses the issues of building a mobile e-Health information system which can help achieve the goal of ubiquitous and mobile applications for the personalization of e-Health.

INTRODUCTION

The explosive proliferation of information sources such as blogs (Chen et al., 2007), social networks (Tsai et al., 2009), and medical records, have been spurred by the growth of the information technology. An electronic health record (EHR) system allows a patient’s medical reports and results to be ubiquitously available to clinicians anytime. The EHR is a collection of electronic health care data about patients and general populations, and is the main technology used to integrate health care information in both paper format and in electronic medical records (EMR) for improving the quality of health care (Gunter & Terry, 2005). The EHR is the key in development of a truly digital hospital, where daily record-keeping and operations are performed exclusively with computers. Although EHRs have been a health care priority in many countries, progress in implementing EHRs has lagged behind the latest information technologies available, and only a few health care establishments actually use them (Weiss, 2002). The issues that impede the widespread implementation of EHRs include data sharing among departments, security, privacy, and confidentiality (Weiss, 2002). In addition seamless integration of e-Health services allow the creation, exchange and manipulation of medical data (Amoretti & Zanichelli, 2009).

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A typical EHR system (EHRS) consists of several subsystems, which may be independently designed and developed (Tsai, 2010). One problem with an EHRS is that the subsystems are usually integrated in an ad-hoc fashion, without proper consideration of the overall system. For example, subsystems that are designed using conventional non-object-oriented design may be difficult to fully integrate with those subsystems designed using object-oriented design. An EHRS that integrates the various heterogeneous subsystems together can never achieve the quality and reliability of a system that is designed from the ground up. Contrary to popular belief, such a system may not necessarily be more expensive to implement than trying to integrate an existing system.

The vast growth of wireless and mobile devices has created a large demand for mobile information content that is personalized for the user (Tsai et al., 2010) as well as a mobile Web of semantic data and services (Yee et al., 2009), context-aware mobile learning (Chia et al., 2011), geographic search (Tsai, 2011), anomalous behavior detection (Thing et al., 2011), and other topics in handheld computing research (Hu et al., 2010). Thus, the mobile e-Health information system (MEHIS) can be developed based on the design of the EHRS services. MEHIS can consist of many different components and subsystems, such as appointments and scheduling; admission, discharge, and transfer (ADT); prescription order entry; dietary planning; routine clinical notes; lab and radiology orders; picture archiving, and smart card sign-on.

In this paper, we first use Eclipse and UML (Unified Modeling Language) to design and implement an EHRS based on existing EHR models and frameworks. Once the design of all the subsystems have been completed, the implementation and integration of the EHRS are relatively straightforward and likely to be less costly than patching together multiple legacy subsystems. Using Eclipse as the design environment can also speed up the implementation phase, as the tight integration with the programming language Java using the Eclipse JDT (Java Development Tools) can ease in the transition from design to implementation (Tsai, 2006). These tools include perspectives, project definitions, editors, views, wizards, refactoring tools, a Java compiler, a scrapbook for expression evaluation, and search tools (D’Anjou et al., 2005) that can work together with design and testing tools to create a highly integrated development environment suitable for software development across heterogeneous platforms.

After the EHRS is designed, the MEHIS can be implemented using the similar platforms, by implementing smaller services (Kwee & Tsai, 2009). This paper describes the development of a MEHIS with open-source Eclipse, using currently available health care standards. We discuss the issues of building an adaptive and personalized e-Health information system and the use of ubiquitous and mobile applications for the personalization of e-Health.

This paper is organized as follows. First, we describe the different e-Health architectures, which include CEN ENV, openEHR, HL7, and Eclipse Open Healthcare Framework (OHF). Then, the design of the mobile e-Health Information System is presented. Next, we describe the implementation of MEHIS with different components. Finally, the last section summarizes the entire paper.

RELATED WORK

Due to the popularity of mobile applications, many healthcare applications now are available to run on mobile devices. A handheld system that provides medical staff with information based on their location was used to retrieve medical information relevant to the user’s current activity, such as a patient’s medical record made available when the physician is near her bed (Rodriguez et al., 2004). The Intelligent Control Assistant for Diabetes (INCA) created a mobile intelligent
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