Development of Mobile Application for Android Platform: Medical Guide

Jamal A. Hassan¹* Salar Kheder Shaikhah² and Ibrahim Shamal Abdulkhalieq³

¹Electrical Engineering Dept. /College of Engineering, Salahaddin University-Erbil, Kurdistan Region, Iraq
²Hawler Polytechnic University, Erbil Technical Engineering College, Department of Information System Engineering, Erbil-Iraq

INTRODUCTION

Nowadays, huge numbers of health organizations causes difficulty to find what you want. Thousands of doctors, hundreds of hospitals and pharmacies are located in different geographical places, it takes time and money to search for them in traditional way like searching by car, asking from relatives and friends don't lead to good result, as well as websites are not efficient to use our directory in most cases, because many people of our society are not familiar with using website.

Since mobile applications are user friendly they are the best choice to be used as health directory, because Many web sites were implemented to work as business directory and rarely these sites focus on health even if they have sub-parts in this field but they do not fulfill the demand and do not have enough information, while most people use mobile applications due to simplicity to use and they do not need extra device to access the services. Recently many applications were developed for the Kurdistan Region market, even some of them were applications of health field but no one focused on this field as a guide line to direct the patients to correct target easily.

A health system is proposed for pregnant women in [1]. The proposed system works based on mobile Geographic Information System (GIS) to select closest care Centre or hospital maternity on Google map for the pregnant woman. But due to problems of accessibility for the General Packet Radio Service (GPRS) or data network online
applications have weak points. Hopeful hearts is proposed in [2]. Authors have used mobile as a platform for a healthcare, so that people can get factual information about their health and can have command on their health. It will help them to learn about their health and understand their illness. In this paper Mobile based healthcare application 'Hopeful Hearts' has been proposed. Application which will suggest diet and physical activity based on six input parameters. The input parameters are BMI (Body Mass Index), BMR (Basal Metabolic Rate), working hours and user current body conditions (i.e. Body Temperature, Heart rate and SPO2 via Sensors). Decision-Tree is being used to make all suggestions. The application supports continuous monitoring of user health. The proposed system is scalable for all Android Based Mobile Devices [2]. In Hopeful hearts side of health issue is covered but it doesn't consider as a guide.

An emergency mobile application system is proposed in [3] with support of GIS, and GPRS networks, but the problems of network connectivity also is ignored for emergency case.

In this paper, as a solution for many emergency cases and to direct the patients to right target; an offline mobile application is proposed for the health guide under the name Medical Guide. The application contains many efficient features for searching, and the application is connected with a website for getting extra information. Each participant of the application can has its own user and he/she can update its information beside that the doctors can access their accounts in the program and see their activities with patients. The application is in Kurdish Language and it is designed to be user friendly.

1. Android Technology

Android is a software platform and operating system for mobile devices based on the Linux operating system and developed by Google and the Open Handset Alliance [4]. It allows developers to write managed code in a Java-like language that utilizes Google-developed Java libraries [4]. Open source software is currently one of the most debated phenomena in the Software industry, both theoretically and empirically. At the most basic level, the term open source software simply means software for which the source code is open and available. Android is such an operating system for low powered devices, that on battery and are full of hardware like Global Positioning System (GPS) receivers, cameras, light and orientation sensors, WiFi and Universal Mobile Telecommunication System (UMTS) connectivity and a touch screen. Like all operating systems, Android enables applications to make use of the hardware features through abstraction and provide a defined environment for applications [5]. To summarize, the Android operating environment can be labeled as [6, 7]:

- An open platform for mobile development
- A hardware reference design for mobile devices
- A system powered by a modified Linux 2.6 kernel
- A run time environment
- An application and User Interface (UI) framework.

2. Android System Architecture

The Android software stack can be subdivided into five layers: The kernel and low level tools, native libraries, the Android Runtime, the framework layer and on top of all the applications [6]. Figure 1 outlines the current (layered) Android Architecture.

The modified Linux kernel operates as the Hardware Abstraction Layer (HAL), and
provides device driver, memory management, process management, as well as networking functionalities, respectively. The library layer is interfaced through Java (which deviates from the traditional Linux design). It is in this layer that the Android specific libc (Bionic) is located. The surface manager handles the user interface (UI) windows. The Android runtime layer holds the Dalvik Virtual Machine (DVM) and the core libraries (such as Java or IO). Most of the functionalities available in Android are provided via the core libraries [5, 6].

The application framework houses the API interface. In this layer, the activity manager governs the application life cycle. The content providers enable applications to either access data from other applications or to share their own data. The resource manager provides access to non-code resources (such as graphics), while the notification manager enables applications to display custom alerts. On top of the application framework are the built-in, as well as the user applications, respectively. It has to be pointed out that a user application can replace a built-in application, and that each Android application runs in its own process space, within its own DVM instance. Most of these major Android components are further discussed (in more detail) in the next few sections [5, 6].

3. Open Source Platform

Open source software development represents a fundamentally new concept in the field of software engineering. Open source development and delivery occurs over the Internet. Developers are not confined to a geographic area. They work voluntarily on a project of their choice. As new requirements emerge, the software is enhanced by the user/developers. In this paper we show a comparative study of open source and closed source software development approaches and present a software life cycle model for open source software development [4].

Bruce Perens defines that Open Source is a Specification of what is permissible in a software license for that software to be referred to as Open Source. Developing done by “Anyone who contributes to the open Source project is an open source developer.” such as a User of the software, a developer who develops the Software, a debugger or hobbyist who likes spending time on open source, or a promoter who funds such a Development. Eric states that developers are attracted towards open source development because that gives them an opportunity to demonstrate their ability. So they voluntarily select a project and start contributing. Open source developers are involved in a variety of activities such as

![Figure 1: Android system architecture.](image-url)
designing, coding, debugging and utilizing. Each activity occurs simultaneously. Parallel development and debugging is the key to open source success, users also play a vital role in the debugging process by reporting bugs to developers or sometimes fixing it themselves. Developers are well aware that users are the best testers [7, 8].

4. System Design for application

The diagram for the overall system of medical guide and explanation of the relation between website and the android application software is showed in figure 2. Also, the relation between internal and external databases is explained. Two different database sources are used in the application; offline database and online database. Each database has its own function on the application. Any mobile application without database considered as static and its information is not editable. Medical guide application has its own database that can be edited by the administrator. An internal database is placed on the application which is SQLITE file. The application reads SQLITE file to get information about the content of the all branches (Doctors, Pharmacies, Hospitals, ect.). This internal database gives ability to the application to work offline which is one of the most important features of the application due to low accessibility of internet in Kurdistan Region. So the user can access the data of the application without needs for the internet.

The second database is external and the users of application can get benefits in online. The external database has many functions and they fulfill the application to become one of the most power full application.

Figure 2: Overall system of Medical Guide application

The external database sends notifications and attentions for the users about any subject related to the application program. The external database sorts the name of the participants (e.g. Doctors) in the list due to rates, likes and visitors of pages, as well as records the notifications that come from the installation of the application by any device which be helpful to know the application is installed by how many devices. All the dynamic information are stored on external database that is connected with the PHP script on the server and the server is connected with MYSQL database. The external database also contains the updates about the new participants, when the devices that the application is installed on it is connected to the internet the internal database fetches the new information to the application, by this process the internal database is adjusted when the device connected to the internet.

5. System Implementing and testing

The medical guide system consists of website and mobile application software. Both, website and mobile application are implemented and tested in real time with all the features of the system. Figure3 show the activities and pages of the mobile application. For simplicity; three levels of pages are designed and the health parts are classified within these three levels. Additional to the
The web site is created using PHP Scripts. The website is dynamic using MYQSL database. The website database is a copy of the application database addition to some extra information and subjects. The user can get same information of the application in the website, as well as its database should be daily adjustable with the application. As explained in previous section, inside the page of any participant there is a button that directs the user to the web site in case he/she want to get more information.

![Figure 4: Home page of Medical Guide website](image)

New participants of the application can send their request via a form in the website with all necessary information and GPS information as shown in figure 5.

![Figure 3: Mobile application, Medical Guide](image)

**Application Architecture**

A- **Web site Implementation**
**B- Mobile Application Implementation**

Android application usually created by java class code and xml language for design. The Medical Guide application is implemented using android Studio. Internal database that is offline database is implemented using SQLITE which is a standard database for android and IOS applications.

Figure 6 shows the main page of the mobile application. There are three health groups and four other pages that support the program, additional to the page of website. The health page groups contain the list of most fields of health. Additional page can be added to the program easily. When the first group/page is opened a list of different health needs to be opened as shown in figure 7. The list contains Doctors, Pharmacies, Laboratories, dentists, x-ray centers, beauty centers, and eyes centers. Each type contains subgroups. For example the Doctors page contains all the specialist types of doctors.

When a sub-group is opened (for example Doctors, as shown in figure 8 a new window is opened which contains a list of specialist doctors by clicking the button of each specialist the new list be opened that all Doctors' name are listed. The names are sorted from A to Z alphabetic for easy eye search. The last page is subscriber page; it contains the information about the subscriber (for example Doctor), contact information and detail about the specialization as shown in figure 9. Also, this page contain a button of map by clicking it the map to be opened and the geographical place of the subscriber is determined by detecting the longitude and latitude of the place as shown in figure 10. Also, inside the same page the user can contact with the website, by clicking the website button the application directs the user to the page of the same subscriber in the website; this is used in case the user needs for information about the subscriber. The website is the support part for the mobile application because when all information is added to the application the size of the application to becomes huge and it will be not interested.
6. CONCLUSION

Medical Guide can be considered as one of the most powerful applications. It can be used online and offline. The offline features of the application are enough for the necessary requirements of user while the online features make the application to be unique in Kurdistan Region. Medical Guide can be used as a directory, or as first aid application and even can be a reference for getting medical information. Its internal and external databases give ability to the application to be dynamic. Also, the website of the application will be another support for the program.

Medical Guide is designed in a way to be friendly and very flexible in using; also many icons are used to help the persons who cannot read, so everybody can use Medical Guide without facing any problem.

References


