

Mobile Application for Diabetes Risk Diagnosis and Information Based on Android

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Abstract—Mobile telecommunications technology, called mobile phone is in great public demand. Technological developments especially in the field of mobile telecommunications are occurring very rapidly due to quick and easy communication and information exchange need. The objective of this research is developing the Diabetes Risk Application (which is) implemented on Android Smartphone. The research methods are data collection, system requirements analysis, application design, implementation and testing. This application was built in Java programming language that uses Android SDK. Testing application conducted with the aim to show that this application based on Android has successfully developed. Users can use this application to know the level of diabetes risk themselves. The results of application testing done showed that this application has been successfully developed.

Keywords-Android; Diabetes Risk; Diagnosis; Health; Information.

I. INTRODUCTION

Mobile telecommunications technology, called mobile phone is in great public demand. Technological developments especially in the field of mobile telecommunications are occurring very rapidly due to communication and information exchange need quickly and easily.

Android is one of the most widely used operating system in smart phones. It can be seen from Gartner's statistics which showed that Android sales are on the first rate [1]. Android counted for 52.5 % of smartphone sales as shown in figure 1. Smartphones counted for 26 percent of all mobile phone sales.

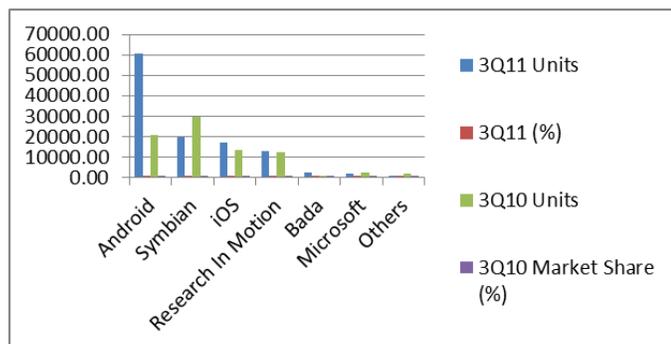


Figure 1. Gartner Q3 2011 and 2010 Smartphone Statistics [1]

Apart from selling the most popular in the marketplace, Android is one of operating system applied in mobile devices. Android is a subset of software for mobile devices that includes an operating system, middleware and core applications released by Google. Anyone can create new applications in it, because it is an open source. One is a mobile health application.

Health is the most important part of our life. But a few people still care about their own health. One of a serious disease is diabetes mellitus (DM), a risk factor (FR) of Cardiovascular Disease.

Today diabetes people are not only found in high-income communities, but also in middle and low income communities, both urban and rural because people's lifestyles are not healthy. One of influence risk factors is unbalanced diet and lack of activity. Hence people who get along with unhealthy lifestyle can get diabetes risk. This increases every year.

According to recent WHO report in the world today there are approximately 120 million people with diabetes mellitus and is expected to rise to 250 million by 2025. The high statistical above, the control of these risk factors can be done earlier, which in turn can also be reduced prevalence of DM.

The author will design a mobile application that contains diabetes risk test, diabetes prevention info, and information which hospital provides diabetes program based on Android using Java programming language.

II. LITERATURE REVIEW

A. Use case Diagram

A UML use-case diagram shows the relationships among actors and use cases within a system. UML use-case diagrams filling a supporting role as the "glue" that keeps your requirements model together [2]. Use case diagrams are considered for high level requirement analysis of a system. So when the requirements of a system are analyzed the functionalities are captured in use cases [3].

B. Class Diagram

The class diagram is a static diagram [4]. It represents the static view of an application. Class diagram is not only used for visualizing, describing and documenting different aspects of a system but also for constructing executable code of the software application. The class diagram describes the attributes and operations of a class and also the constraints imposed on the system. The class diagram is widely used in modeling object oriented systems because they are the only UML diagrams which can be mapped directly with object oriented languages. The class diagram shows a collection of classes, interfaces, associations, collaborations and constraints. It is also known as a structural diagram.

C. Activity Diagram

Activity diagram is another important diagram in UML to describe dynamic aspects of the system [5]. Activity diagram is basically a flow chart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. So the control flow is drawn from one operation to another. This flow can be sequential, branched or concurrent. Activity diagrams deal with all type of flow control by using different elements like fork, join etc. The basic purposes of activity diagrams are similar to other four diagrams. It captures a system dynamic behavior. Other four diagrams are used to show the message flow from one object to another but activity diagram is used to show message flow from one activity to another.

D. Sequence Diagram

UML sequence diagrams model a system logic flow in a visual manner, enabling it both to document and validate our logic, and are commonly used for both analysis and design purposes. Sequence diagrams are the most popular UML artifact for dynamic modeling, which focuses on identifying the system behavior. Other dynamic modeling techniques include activity diagram, communication diagram, timing diagram, and interaction overview diagram. Sequence diagrams along with class diagrams and physical data models are the most important design-level models for modern business application development [6].

E. Android

Android is an operating system for mobile devices such as smartphones and tablet computers. It is developed by the Open Handset Alliance led by Google. Android consists of a kernel based on the Linux kernel, with middleware, libraries and APIs

written in C and application software. It is running on an application framework which includes Java-compatible libraries based on Apache Harmony. Android uses the Dalvik virtual machine with just-in-time compilation to run Dalvik dex-code (Dalvik Executable), usually translated from Java byte code [7].

III. RESEARCH METHOD

In conducting this research, the author takes the following steps for Diabetes Risk Application development:

A. Data Collection

This phase requires many resources related to development and understanding of Diabetes Healthcare, the concept of research methods, Android programming and software/tools used. Author had discussions with some doctors to know about the health of diabetes particularly on diabetes risk.

B. System Requirements Analysis

This phase is discussing the problems exist in the development of these applications. After the initial phase of the research had been completed, the obtained data would be analyzed to reach a desired system requirement specification.

C. Application Design

This phase carries out the process of application system design and creates the features.

D. Implementation and Testing

The last phase is implementation of software design created earlier into Java programming language using Android SDK and tested using Android emulator and some Android devices.

IV. RESULT AND DISCUSSION

This section will discuss in detail starts from user requirement analysis, application design, database design, and application testing.

A. User Requirement Analysis

Based on the obtained data from data collection phase, the content needed by user include:

1) *Diabetes Risk Test* : Diabetes risk test is the most important thing in this application. User can determine the level of diabetes risk itself.

2) *Diabetes Prevention Info* : This is additional information on how the prevention of diabetes risk based on diabetes risk level.

3) *Food Information* : This is also additional information on how dosage the necessary food for diabetics.

4) *List of Hospital* : It is name list of hospital provides diabetes program. The user can see phone number each hospital like a phone book.

B. Application Design

Making this design aims to determine a workflow processes in this application either from the use of an outline to detail. The designs will be explained using Unified

Modeling Language (UML) with Microsoft Office Visio 2010 software. It will be made into a four form of UML models, namely use case diagram, class diagram, activity diagram, sequence diagram.

1) *Use Case Diagram* : This phase will explain about the illustration of the interaction between user and system applications made and system functionality based on results of analysis requirement, showed in figure 2.

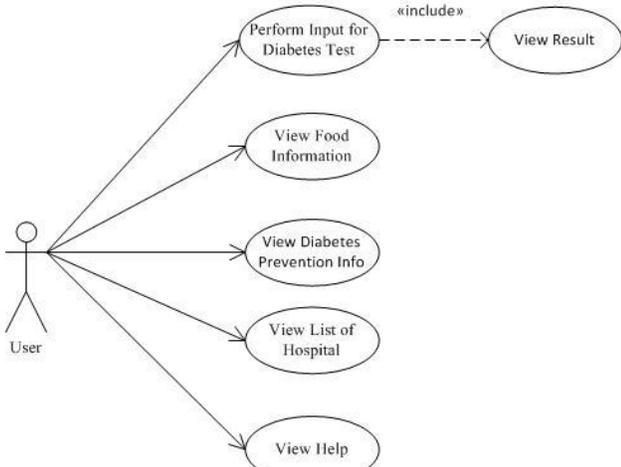


Figure 2. Use Case Diagram

Use case diagram for user is described in figure 2. In this application, user has five activities, which are perform input for diabetes test include view result test, view food information include view food for men and women, view diabetes prevention info, view list of hospital, and view help.

2) *Class Diagram* : Class diagram represents the object orientation of a system and describe relationships between classes in a system made and how they collaborate in order to achieve the goal.

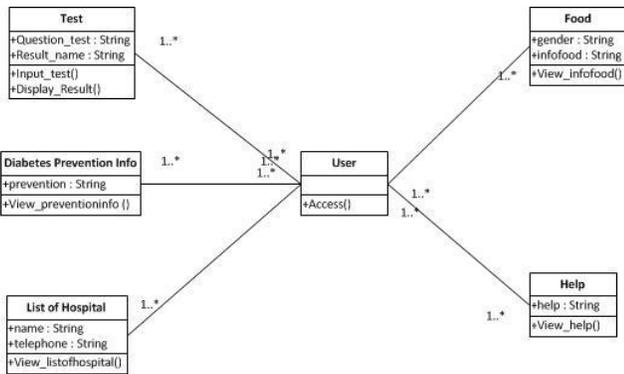


Figure 3. Class Diagram

Figure 3 describes class diagram for user. This class diagram has 5 classes, which are test, diabetes prevention info, list of hospital, food and help. Each class has attributes and operations. User with every classes has a multiplicity many-to-many.

3) *Activity Diagram* : Activity diagram is an illustration of use case diagram. Figure 4 is a scheme of activity or process done by user. First, all user enter into the display of splash screen then the user is able to access all existing processes in the main menu. The user can do diabetes risk test, view food information, view diabetes prevention info, view list of hospital, view help, and exit its process to terminate running applications.

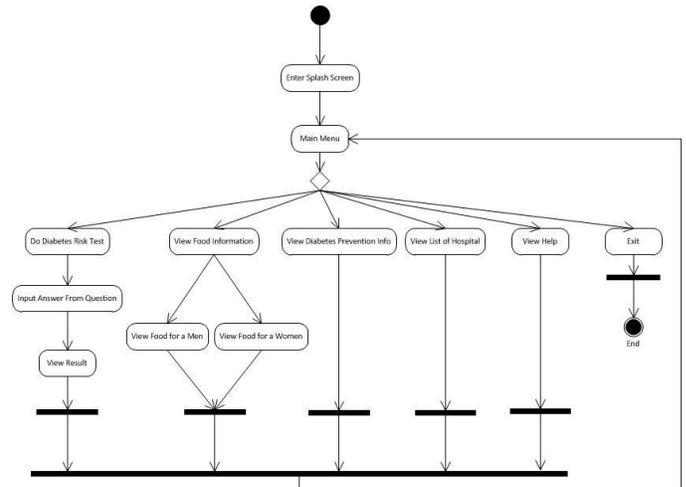


Figure 4. Activity Diagram

4) *Sequence Diagram* : This phase will discuss a diagram showing the interactions between objects in system, arranged in a sequence or time series. This diagram also shows a series of messages exchanged by objects that perform a specific task or action. These objects are then sorted from left to right, actors initiate interaction is usually placed on the far left of diagram. Figure 5 describes sequence diagram for user. This sequence diagram has five objects, they are test, diabetes prevention info, hospital, food and help. This diagram also shows six series of messages exchanged by objects, they are Input_test(), Display_result(), View_preventioninfo(), View_listofhospital(), View_foodinformation(), and View_help().

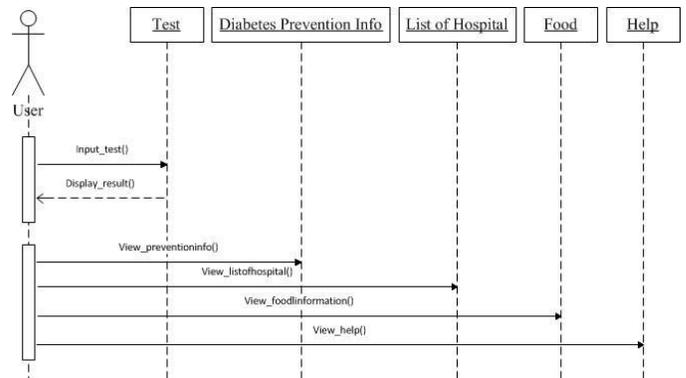


Figure 5. Sequence Diagram

C. Database Design

This phase will explain about database design used in Diabetes Risk Application. The application only uses one database table. It is the table of hospital.

TABLE I. HOSPITAL TABLE

No	Name	Type	Key	Information
1	id_	integer	Primary	ID for hospital
2	name	varchar		Name of hospital
3	telephone	varchar		Telephone number of hospital

D. Application Testing

Application test conducted on an emulator or directly on an Android device. The application test will conduct on a smart phone of Samsung Galaxy Wonder with Android version 2.3 (Gingerbread). The application will be automatically executed after the application had successfully installed. Display of splash screen will appear in figure 6.



Figure 6. Splash Screen Page

Once the splash screen page is loading, main menu page will appear in figure 7.

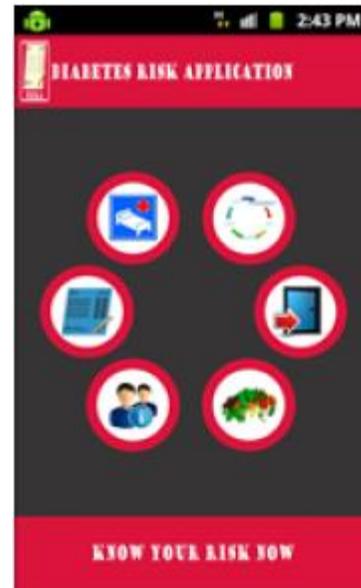


Figure 7. Main Menu Page

There are 6 buttons in main menu page, including diabetes risk test with "paper with a pencil" symbol, diabetes prevention info with "cycle" symbol, food information with "food" symbol, list of hospital with "hospital" symbol, help with "user" symbol and exit with "door" symbol.

If diabetes risk test menu is selected it will display two buttons accompanied by a picture to select the desired menu, two radio buttons and text view as in figure 8.



Figure 8. Diabetes Risk Test Page

This menu will give 7 questions. The user must answer questions by pressing one radio button, and then press the next button. When the last question is the "result", the user can press the button to see the results, illustrated in figure 9.

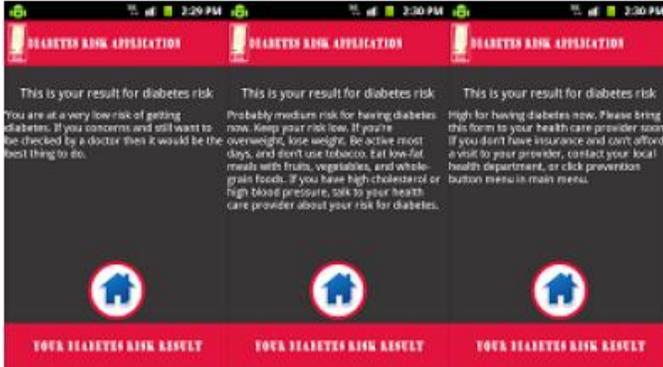


Figure 9. Result Page

The user can press the button with "home" symbol to return to the main menu and the user can select another menu after seeing the results.

If the food information menu is selected it will display an information page about food in accordance with gender. On this menu there are two tabs, for men's tab and for women's tab, and to return to main menu user can press the back button on mobile phone as in figure 10.



Figure 10. Food Information Page

If the diabetes prevention info menu is selected it will display an information page about preventing diabetes and to return to main menu user can press back button on mobile phone as in figure 11.

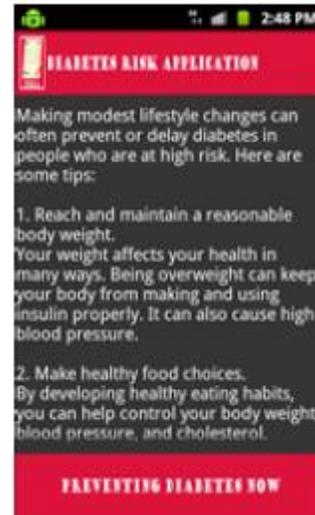


Figure 11. Diabetes Prevention Info Page

If the list of hospital menu is selected it will display name and phone number of hospital provides diabetes program and to return to main menu user can press back button on mobile phone as in figure 12.



Figure 12. List of Hospital Page

If the help menu is selected it will display an information page about how to run the application and to return to the main menu user can press back button on mobile phone as in figure 13.

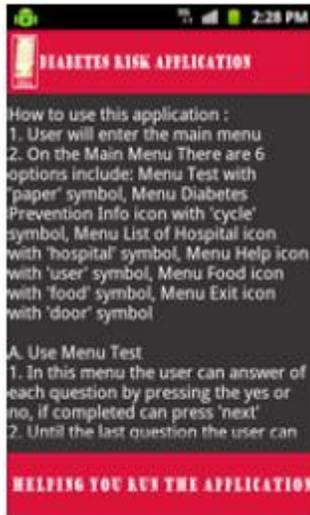


Figure 13. Help Page

V. CONCLUSION

The development of Diabetes Risk Application has successfully made and implemented on android. We can know about health of diabetes, particularly at diabetes risk. The

application testing used android emulator and Samsung Galaxy Wonder device with android version 2.3 (Gingerbread) and generate that all functions in this application ran properly.

Development and improvement are suggested in term of data addition. It is expected that this application is more useful and relevant to user needs in the future.

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