A Framework for Real-Time Android Based Secure Digital Memo System

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Abstract: As our technology grows, people needs for something that eases their life. Android is a mobile operating system developed by Google capable of operating in real time with data processing system. The memo is a short note designating something to be remembered, especially something to be done or acted upon in the future. Real Time Memo is a short note or reminder which communicates two or more devices in live or real time through wireless network. Every organization has their leader or representative that will give out speech or talk to the audience. Sometimes, they accidentally forget the time or skipped out some points which are important. This problem can be solved by using Real Time Memo Application (ReTMA) which will display information advised by Personal Assistant from distant away using his or her device. The result from this project shows a successfully developed application which run as planned, where it displays text synchronously between devices. This application is built as a Task Reminder, Sharing Notes and Real Time Viewer. There will be an authentication allocated to one device called server and others that use this service need to connect to it as Client. The application is expected to be able to increase the efficiency of event management and thus minimizes any wastage of resources.

Key words: Digital memo • Task reminder • User authentication • Android application • Client server

INTRODUCTION

Android is an open source operating system which empowers hundreds of millions of mobile devices in more than 190 countries around the world [1]. It is comparable to Windows operating system that has been powering our computers system since the last few decades. It is capable of doing most of the same things such as run applications, connect to Wi-Fi, take photos and send messages. Android is a single largest installed base of any mobile platform and the number is still growing fast. Unlike its iOS counterpart which only runs on iPhone system, every day another million users power up their Android devices such as smartphones, digital consoles and cameras, for the first time and start looking for applications for gaming, health and other digital contents. Android is incredibly easy to customize, both in terms of how it looks and how it works and the various application stores. With all the power Android have, people keep on demanding for some new technological tools that could benefit the human society at large.

With the growing field of ICT in our world, users always being in search for something more sophisticated and advanced especially in the field of human communication. For an organization, a proper, fruitful, timely and meaningful communications are important as being a part of reflection on the capability of not only the organization but also an individual belong to them. From time to time, the leaders or their representative involves in giving out speech of motivational and technical types to their employee as well as other interested parties.

During a speech, one problem that may arise is the representative tends to forget the important points that suppose to be delivered. This could happen due to unguided speech as well as during questions and answers session. Sometimes, one could accidentally drag the speech beyond the time allocated. The consequences, true meaning of the speech can be misleading beyond its actual intention or misinterpreted by the audience. Consequently, this can slightly damage one’s reputation. Moreover, it will also disrupt the flow of the running event.
We recognized this problem as lacking real-time data sharing tools for exchanging memo. Current practice would need someone to pass over a piece of paper to the speaker containing the skipped out points. Although the concept of real time or live has been implemented by other applications, the memo is one of the famous reminders and taking notes application that actually should have real time or live transmission.

In this paper, we propose an Android Based Memo Application which can communicate in real time mode via a wireless network. The scope of this project is divided into two entities: (1) Users (2) Two-way communication. The users should be able to get real-time or live data Transmission and able to read and write at the Memo Application. Meanwhile, the device should be able to receive and send the data between the users.

This paper consists of six sections. Related Works Section reviews all of the related study regarding to this project. In Materials and Method Section, the discussion will be on the methodology in conducting this project which includes the methods and techniques used. This includes explanation about the implementation and modeling process that has been executed in the project. In Result and Discussion Section, we present the result in the form of fully developed and workable product which is accompanied by the testing results. Finally, conclusion and possible future works are presented in Conclusion Section.

**Related works:** The main objective of this project is to develop an Android Memo Application that communicates between users in real time using wireless network or data network. This section discusses the basic concept of the technologies involved. Besides that, some of the related works will be discussed as well.

**Android:** In the past few years android Operating System (Google Inc.) has been the most rapidly growing Mobile Operating System compared to other Mobile Operating System such as BlackBerry OS (Research in Motion), iPhone OS/iOS (Apple), MeeGo OS (Nokia and Intel), Palm OS (Garnet OS) and Windows Mobile OS (Windows Phone 7) [1].

Yin Yan et al. [2] stated that Android is well-supported Open-Source development environment that eases application development. It is also accompanied by many applications published in online application stores and gives an opportunity to incorporate creative functionalities with less effort.

Fig. 1: Simplified Android

Android can roughly be divided into four layers which are the Application Layer, the Application Framework Layer, the Runtime and Libraries Layer and lastly the Kernel Layer.

The benefit of using Android is its rich with APIs and Libraries. It supports connectivity through Wi-Fi, Bluetooth, 3G and 4G. It also provides native support for various sensors such as GPS, Accelerometer, Camera and Gyroscope. Other than that, it also fosters an intuitive user interface design through a touch screen and gestures [3].

**Real-Time:** Real-time technology has changed our day to day activities. Transportation, medical, academic, social and entertainments all have been affected by this technology as it becomes critical and compulsory in life [4].

Modifying essential Android components such as Dalvik virtual machine and introducing a new Real Time interface for Android developers can improve its Real Time capabilities, without loss of original Android functionality and compatibility with existing applications [5-8].

**Manual Memo System:** A memo is usually an internal working paper written to share information and/or instructions among peers, most often those working for the same organization or those working together on a common project even though they represent different organizations. Because they’re informal working papers, memos are rarely sent to outsiders, especially to those that you or your organization wants to impress. A business letter is considered more formal, more serious, more forceful and more impressive than a memo.
Because they’re written to people who are involved in or at least familiar with your work, your organization and the standard practices of your profession, memos are used as an informal style in which jargon, abbreviations and short-form references to people and organizations are acceptable.

Most memos request specific information, respond to previous questions, share new information, or give instructions to do something. They may also be written to create a “paper trail” for future reference.

Noteworthy, in recent years and many organizations, email has increasingly taken the place of hard-copy memos. In fact, the basic format of e-mail is a direct adaptation of memo format. Consequently, many of the guidelines for writing e-mail and memo are interchangeable.

**MATERIALS AND METHODS**

In this section, we model, design, develop and test the prototype of the Real Time Memo Application. In this project, the modeling of Real Time Memo Application will be explained through Framework and Flowchart, while the design will be explained through Context Diagram (CD), Dataflow Diagram (DFD), Intro, Login, Register, Main and Editor Interface. Testing is important to ensure that the application is able to execute functions the way it was planned for. It is also used for identifying errors within the application. Before going further, we examine some of the tools that are used in this project.

**Android Studio:** Android Studio is the Official Integrated Development Environment (IDE) for Android App Development, based on IntelliJ IDEA. On top of IntelliJ's powerful Code Editor and Developer Tools android Studio offers, even more, features that enhance your productivity when building Android Apps, such as:

- A flexible Gradle-based build system
- A fast and feature-rich emulator
- A unified environment where you can develop for all Android devices
- Instant Run to push changes to your running app without building a new APK
- Extensive Testing Tools and Frameworks
- Built-in support for Google Cloud Platform, making it easy to integrate Google Cloud Messaging and App Engine

**Modelling:** Figure 2 shows the Framework Overview for this Real Time Memo Application. The overview shows the workflow of the whole process within the application and can be treated as a guideline for the user. First, the user needs to register to the application database. During this registration phase, the user needs to enter a name, username, age and password. The data then will be saved into the database. This data will be used to compare with newly registered username to avoid same ID username being used. If the login is a success, then the user authentication is successful. The user then can write, edit and delete the memo while interacting between them.

**Design:** The design is the creation of a plan for the construction of an object or application. Besides, the design can also be defined as an approach to achieve the goal. In this Project, the design will be presented by CD, DFD, Interface Design and Database Design.

Figure 3 shows the Flowchart of the Real Time Memo Application. First, the user needs to register if this is his or her first time using this application. For registration, the user needs to enter a name, username, age and password. During Login, Application will verify the username and password with the database. If the username and password entered different within the database, then the authentication will fail. The user has to re-enter the different username and password if it happened. The ID will be deleted from the database once the user logs out.

**Fig. 2: Framework Overview**

Figure 4 shows the CD of the system. According to the CD, the user is required to register and login to the Real Time Memo Application. Once a user registered, the application will store the ID username and password within the database. During login session, the user is expected to give the same username and password for successful authentication. Following to this, an outstanding or un-updated changes will be immediately notified to all users.
Testing: This section outlines how testing is conducted to portray the capabilities of the functions in the prototype to be executed as it has to be. The testing is divided into two (2) main sections which are System Functionality and User Acceptance Testing. Results obtained from the System Functionality test will be used as a reference for further improvement before it can be tested against actual user. Meanwhile, the result from User Acceptance Test will guide the development team to improve the usability aspects (Easy to use, Efficiency, Satisfaction). The details for each part of testing are as follows:

System Functionality: Before a system can be installed at user’s devices, it needs to be tested against a set of testing elements to ensure it fulfills the functional requirements as well as non-functional requirements [9, 10]. To obtain results for this purpose, two sets of testing will be carried out:

- Black box testing - software tests method in which the internal structure/design/implementation of the item being tested is not known to the tester. These tests can be functional or non-functional, though usually functional. Test design techniques include: Equivalence Partitioning, Boundary Value Analysis and Cause Effect Graphing.
- White box testing - software tests method in which the internal structure/design/implementation of the item being tested is known to the tester. Test design techniques include Control flow testing, Data flow testing, Branch testing and Path testing.

The testing was conducted by two groups of tester. The black box testing was carried out by a group of potential users who are within technical know-how group from department of computer science. On the other hand, white box testing has been executed among development team of the applications. Think aloud has been used as methods to collect the data. The testing conducted purposely to gain validation and verification from the aspects of technical capabilities of the application prototype.
User Acceptance Test: This type of test is carried out to identify whether the system can be accepted by the potential user. For this test, an establish score sheet known as System Usability Score (SUS) will be used.

RESULTS AND DISCUSSIONS

In this section, we present the workable application that was developed earlier. Initially, the user must register with the application. The next process is the login process. During this process, the user must log in using the correct username and password. For authentication, the information will be retrieved and compared with user info file and the user will receive the authentication detail. After successful verification, the user can create Memo and insert its details. Memo detail will be saved in Memo File. Memo details include Add, Edit and Delete Memo. Memo File will send notification back to the user whenever changes take place.

The interface of the application consists of five parts which are Intro Interface, Register Interface, Login Interface, Main Interface and Editor Interface.

Intro Interface: Figure 6 shows the sample of an Intro interface. Within this interface, it displays the logo of the Application and button that will take user to Login interface.

Register Interface: Figure 7 shows the sample of the Registration Interface. Within this interface, it displays the required parameters for registration such as Name, Username, Age and Password. Figure 8 shows the filled up form of Registration process, of which completion is only achievable by pressing the Register button.

The idea is that, the first timer has to create an account before using this service. On the backend side, a row in the user table will be created in the database specific to this user, automatically. In the database table, it will show name, username, age and password. All the information must be filled by the user during registration. User ID will be assigned incrementally by the database itself when data is inserted. A database is a collection of information that is organized to show and store the information.

Login Interface: Figure 9 shows a sample of the Login Interface. This interface will display the username and password text space that the user needs to fill in for the purpose of authentication in order to gain access to the service. Figure 10 shows the login interface with a textual based username and password were entered.

Main Interface: Figure 11 shows the Main Interface. This interface is shown as a result of successful user authentication in the earlier process. Within this interface, the user can choose either to add memo or to log out. Figure 12 shows the Main Interface after user has successfully added some memos. To get more detail about each memo, user can just click on it; information will appear on the screen promptly. At this stage, the user can edit, add and delete the memo or logout from the application.

Editor Interface: Figure 13 shows the Editor Interface. The user can edit his/her memo here and it will then re-display at Main Interface. Figure 14 shows the Delete Memo prompt at Main Interface if the user wants to delete the memo.
Fig. 9: Login Interface
Fig. 10: Login Form

Fig. 11: Main Layout
Fig. 12: Memo Layout
Fig. 13: Editor Interface

Fig. 14: Delete Memo
Fig. 15: Logout Memo
Finally, Figure 15 shows the Logout prompt at Main Interface if the user wishes to logout from the application.

CONCLUSION

At the end of this project, this Real Time Memo Application was successfully designed, tested and it was shown to be able to be used in real environment where it will display text synchronously between the device and act as a Task Reminder, Sharing Notes and Real Time Viewer. Real Time Memo Application (ReTMA) is expected to give a big contribution to the Android users especially corporation and organization as a Reminder or a text for speech or notes that they want to distribute.

According to the result obtained from the technical testing, some improvement needs to be done. For future work, there are some suggestions that can be made to upgrade the application to be more efficient:

- Create Password to secure fundamental memo.
- Create a function to interact with two or more users in the application.
- Create a function so that user can change memo’s background colour, font and size of the text.
- Test the usability aspects of the application using System Usability Scale (SUS)
- Test the User Interaction using Questionnaire For User Interaction Satisfaction (QUIS)

REFERENCES