A Framework For Real-Time Android Based Location Sharing Application Using GPS Localization Method


Faculty of Informatics and Computing, Universiti Sultan Zainal Abidin, Malaysia

Abstract: The world is indeed become global village with all country because of the massive growth in our mobile technology. Today mobile smartphone is almost everything in single human life, it because it deals with many function such as call, messaging, play games, browse internet access for gain information and media social such as Facebook, Google and YouTube. One part people looking in growth mobile technology is information about real-time smartphone location. In other word, to gain someone location just using smartphone and with this information of location kind of bad thing can be avoided such as lost or stolen smartphone, lost the right path and lost track of loves ones. This make the focus is one of mobile application that based on GPS known as Global Positioning System. To achieve objective, the main purpose of this project is subscribe other users location by viewing GPS map location in real times continuously like “Find My Friend” and “Waze” application. But to subscribe other user’s location, need permission of both parties. The added value in this project, the user can send notification to another user when check in someplace. This application will become a part of social networking. It is suitable for parents keep on eye their children movement, friends or group of travel entered the forest and tracking own mobile smartphone.

Key words: Location sharing · Localization method · Global positioning system · Google maps · Location based services

INTRODUCTION

In recent years, we have noticed the immense growth in mobile technology [1]. Today mobile smartphone is almost everything in everyone’s life. Every aspect of our life is influenced by this technology. The technology comes with a support for many functions such as emailing, gaming, browsing the internet for an information and accessing to social networking sites such as Facebook, YouTube and Google.

Most social media nowadays provides a feature called update status for their users [2]. Users are free to update their status, location and tagging their friends wherever they are. However, the location that was updated by the user may not be accurate and could probably be fake. One familiar situation that happens in our daily life is the children lies to their parents by informing them the fake location by updating status via their media social account. The fake location can be created by the children because the original location-based updating that was designed for this media social does not utilize GPS localization method [3]. Nevertheless, there is other suitable and trusted applications that show the true user location such as Find My Friend, Glympse and Family Locator – GeoZilla. However, these applications failed to attract significant enough number of users as the social media did. It is because the social media is far more approachable, with lots of amusement and fun.

The main objective of this research is to propose a framework for an application that can share user’s real-time location via Global Positioning System (GPS) and the internet with social media features such as picture sharing. The prototype will be built on top of Android operating systems. It is equipped with security features called authentication for ensuring each parties to communicate in a secure manner among themselves [4-7].

This application allows user to subscribe each other by viewing GPS map location in real times continuously similar to Find My Friend and Waze. The location will be updated as soon as the user changes their location with the assistance from the GPS. The statistic shows 91% of
social networking users uses mobile phone as a platform [8]. With the additional characteristics that of social media within this application, it should serve as a selling point for this application to be chosen by users with different backgrounds.

The application consists of a server as a platform where connection and communication between android users are maintained. With the help of GPS, each user generates their location and then sends over the wireless network to the server before being delivered to the list of authorized user. The large part of the server will be a database to keep track of users and their locations.

**Related works:** This section is dedicated to establishing the necessary knowledge prior developing this application. This includes the reviewing of an android platform, of which other similar applications are based upon. Some technologies and tools such as the global positioning system, location based services and google map are included.

**Android:** Android is a complete set of the software for mobile devices includes operating systems, device software, middleware and the main user applications are e-mail client, calendar, maps, browser, contacts and so on. Android has the most of its code under Apache License, free software and open source license. Android helps developers to build an application by using Java Language and Dalvik virtual machine with compilation on execution time. Some of the features on Android among others are:

- Framework application, it could recycling and substitution component.
- Integrated browser-based engine Open Source WebKit is also used in the iPhone browser and Nokia S60v3.
- The design of the handset. Platform tailored to the needs VGA (Video Graphics Adapter) more large library of 2D and 3D graphics based on specifications OpenGL ES 1.0 as well as the layout a traditional smartphone.
- Multi-touch. Android has native support for multi-touch available on the latest handsets.
- Support for additional hardware. Android support camera, touch screen, GPS (Global Positioning System), measuring speed, magnetometer, acceleration 2D bit blits (with orientation hardware, scaling, format conversion pixels) and 3D graphics acceleration.

**Existing Applications:** This project refers to existing application same method by using GPS and map such as Glympse, GeoZilla and Find My Friend. The basic feature of these applications is to offer user location update. One will be able to broadcast his/her location as well as track friend/family location at will. Glympse is free application which is very fast and simple in sharing location via GPS. It more functions to tracking application that read location in real time. Glympse is an application not open for big community and it focuses on family and friend. Usually, this application is used for tracking locations of their partners, children and friends. GeoZilla is also capable of sharing route via Twitter and Facebook. GeoZilla is similar to Glympse that uses to track friend and family position by using GPS. Family or friend that using this application will receive notification alert when they go or arrive at certain areas. Some advantages of this application include an ability to force the device to allocate location manually and update friend and family location when they moved around and store location when out network going down and send back to GeoZilla server if network going back online. Find My friend is an application that focuses on locating friend location. This application suite for outdoor activity such as shopping, camping and find a route to a friend house. Find My Friend also an application that functions as GPS tracking to locate a friend in real time. On top of that, user are also offered with information and news about the location of interest.

**Global Positioning System:** The Global Positioning System (GPS) was established in 1973 by United States Department of Defence, it uses to tracking works via a network of satellites in orbit to determine the location user and time through the device [9]. The coordinate data can be generating in the device when there are four or more satellites within line of sight of the device. The coordinate was calculating based on a range of satellites.

Triangulation by multiple satellites locates the device, making GPS become the most accurate method for finding locations. However, drawbacks include the lack of user-accessible GPS capabilities in most personal cell phones and the scarce availability of built-in GPS technology in commercial laptops. Additionally, GPS can be battery intensive and inconsistent or unavailable indoors. The suitable technology that can be used to subscribe another location is GPS because user location will also update as soon he or she change their location. Furthermore, it can locate and track friends via mobile phone gadget. It gives well introductory for readers who are interested in the broad area.
**Location Based Services:** Location Based Services (LBS) are a software application that used concepts of knowledge [10]. The concepts applied by using a mobile device which it can locate user everywhere. In mobile data services, it emerges as a killer application. This is due to the rapid development of wireless communication and location positioning technologies that have been provided. There are many services provided by LBS such as health, work, personal life, etc. it can adapt with various facilities.

**Google Map:** The Google Maps launched in 2005 has revolutionized online mapping service applications on the World Wide Web. Based on Asynchronous JavaScript and XML (AJAX), a new type of client/server interaction was introduced in Google Maps to maintain a continuous connection between the client and the server for immediate downloading of additional map information [11]. In addition, Google also provides programmers its extensive sources of code called the Application Programming Interface (API). The API consists of a set of data structures, object classes or functions that can be used by a programmer using JavaScript, PHP or another scripting language [12]. With the current version 3, it is not required to register the API key to use the Google Maps.

**MATERIALS AND METHODS**

This section describes the materials and methods that has been used to complete this project. This includes some of the tools for developing this application such as android studio and the concept of location tracking that are used for this project. For the development of the product, we start off with system modelling and design for this social media location-sharing mobile application which would result in the development of the product and finally followed by testing of the complete product. The design is the process of resulting product and it proposed a framework of thinking. It represents a model on how to achieve a specific goal in the project. Whereas, a model present set of strategy on which to achieved design goal. Both have a relation. This section also introduces system framework, context diagram and data flow diagram as tools prior developing the application. It is to serve as a guidance for the whole progress of this project implementation.

**Android Studio:** Android studio is an official IDE for android development which is based on IntelliJ IDEA. It is launch on May 16, 2013, at Google I/O conference by Google’s Product manager, Katherine Chou. If offers many features such as flexible Grade-based build support, build variants and multiple APK file generation, code templates for better UI in designing and coding. It helps to build common app features and rich layout editor with support for drag and drop theme editing. Tools provided is location-based App on Emulator which gives debugging services. However, JDK version 7 and above is required in this software. Otherwise, it cannot function. Besides the advantages, there is also disadvantages in that it is hard to manage multiple projects.

**Location Tracking:** GPS based location tracker is an application with GPS services which would help in locating geographical position of an individual in the single entity of large set communities depends on their current location [13]. This location would be displayed on the map view on our android set and display function can analogue to the current usage of Google Maps, Nokia Maps and iOS Map Service. Some key points about the application, all users’ locations would be retrieved from an online database so as to centrally control the permissions for viewing. For restricting user access, user authentication would be required. In addition, periodic refreshing has to be present so that each time the geo–location changes or after a fixed interval of time the values in the database should be updated. All devices would be having a unique ID (UID) and this would be used for searching for the user. The application would have additional support in terms of:
- To view street and satellite
- Add pinpoint on the maps
- Getting address information from the map
- Locating multiple users by using multiple pinpoints
- Zooming in and zooming out on map
- Using user data manipulation (password)
- Change of UID support

**Modelling:** Figure 1 show the project framework for this mobile application. It illustrates how the two different users can subscribe and share their location and picture. It involved two entities, in this scenario, User 1 wants to subscribe User 2 location that is already registered in this application. First User 1 must register to the application server. Then application server will approve the registration by replying the status accept or not in case anyone has registered the same identity before. Before User 1 can subscribe to User 2 location, she needs to know the details about User 2. This mean, they both must have been a friend before. Otherwise, User 1 needs to initiate friend request and user 2 must approve. Once they
became friends, they can access each other location by retrieving their longitude and latitude anytime or anywhere using GPS to generate their location as long as they have access to the network. By retrieving longitude and latitude, users can view the map to get current location and picture of their friends.

**Design:** The design is the creation of a plan for the construction of an object or an application. In this project, the design will mainly be presented by Context Diagram (CD), Data Flow Diagram (DFD) and Interface Design. Figure 2 shows the CD for the proposed application. It only involves users, application and Android system. First, the user must register to the application. All the detail about the user will be kept in the system’s database. After the registration process was done and successful, the user will key in their usernames and passwords for user login. The application system will verify username and password that was keyed in by the user before the other steps can proceed against the one
stored in database. The user can add friends that are also registered with this system to subscribe location and picture of other users directly through the system.

Once they are listed as a friend, they can subscribe their location at anytime. The server will pop up the longitude and latitude of the user when they check in and share a picture. After that, the map can be used to view the point that user checks in as well as the picture.

A few diagrams have also been used to describe and elaborate the system flow. Figure 3 shows the DFD level 0 that have been proposed in this project. In DFD level 0, its point out two entities. A user acts as an internal entity and a friend acts as an external entity. Both friends can do the same function in this application. This diagram is used is to improve the understanding of the proposed project that will be developed.

There is five processes include in this DFD. They are registration process, followed by login, add friends and request friends to subscribe location and viewing location. All the processes will relate with two files, user files and location file. Both files function as data storage. Registration information of users will be located in the user file. Username and password will undergo login process and the system will update the login status to the user.

The user must add friends before they can get the location update from their friends. The system will check the list of a friend in the user file. Then approval status to subscribe location will be notified whether the friend information is valid and exist in the user file. Once it is approved, a user can subscribe location and retrieve longitude and latitude that are stored in the location file. After the retrieval is a success, it will automatically view both map and picture for the user.

Testing: Software system testing is conducted on a completed, integrated system to evaluate the system’s compliance with its specified requirements [14-15]. System testing is an investigatory testing phase, where the focus is to have almost a destructive attitude and test not only the design but also the behaviour and even the believed expectations of the user. In this project, we define a set of test cases for testing the functionality correctness according to the requirement specification. The test has been executed by 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. Results obtained from the system testing will be used as reference for further improvement before it can be tested against actual user.
RESULTS AND DISCUSSION

In this section, we developed our proposed system accordingly at the same time ensuring that the information system is operational following to specification. The testing has also been done to detect possible errors and discrepancies in the products. In this application, the interface consists of a few parts, most importantly are registration interface, login interface, menu interface, friend’s list interface and sharing interface.

Main Interface: Figure 4 shows a main interface to this application. Here, a user is given two choices; for one who already registered, she can proceed to login process, otherwise she need to first sign up for registration.

Registration Interface: Figure 5 shows a registration interface of the application running on Android smartphone Nexus 5. Before user using this application, she needs to register with click sign in button on the login interface. Then it goes to register interface. Fill in all the required information. After successful register, back to login interface to log in this application.

Login Interface: After successful registration, user credential will be stored in the database. A user is now allowed to access the fully-featured application by providing the correct username and password as that given during the registration. This can be done via the login interface which is similar to the main interface.

Menu Interface: Figure 6 shows menu interface after successful login on this application. In this menu, interfaces show icon and name that we register and 3 function button List Friend, Share Fun and Gallery View. This 3 button has 3 different functions that hyperlink to another interface.

Friend’s List Interface: Figure 7 shows Friend’s List Interface after clicking List Friend button. Within this interface, it shows a list of user that register in this application and it import all user data name from the database. This interface function like tracking after click one of the name of the user list it will show the latest GPS coordinate that user update on google map location as in Figure 8.

Sharing Interface: If user clicked on Share Fun button from Menu Interface, a Share Status interface as in Figure 9 will appear. Within this interface, we have three different functional button to choose, sharing pictures, posting status and generating coordinate. Choose Picture button access picture from smartphone storage whereas Generate Coordinate button instructs the smartphone to generate one’s location coordinates. Finally, post status button is responsible for uploading selected picture and generated coordinate to the database to share with another user.

Testing: The application approach is the methods that are used to evaluate the functionality of every module within the application using a set of test cases. In this section, there are four test cases which are Login And Register, List User View, Post Status and Gallery View.
Table 1: Test Case Login And Register

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
<th>Expected Result</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Press Sign In button</td>
<td>Open register interface</td>
<td>Success</td>
</tr>
<tr>
<td>2.</td>
<td>Insert register information and press register button</td>
<td>Register successful</td>
<td>Success</td>
</tr>
<tr>
<td>3.</td>
<td>Insert correct username and password</td>
<td>Open menu application interface</td>
<td>Success</td>
</tr>
<tr>
<td>4.</td>
<td>Insert incorrect username and password</td>
<td>Pop up message retry login and redirect to login interface</td>
<td>Success</td>
</tr>
</tbody>
</table>

Base on Table 1, only authorized and authenticated user can access the application with register first.

Table 2: Test List User View

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
<th>Expected Result</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Press Friend List button at Menu interface</td>
<td>Open View all user data name that registers in this application</td>
<td>Success</td>
</tr>
<tr>
<td>2.</td>
<td>Press name on the list</td>
<td>Open Maps with the latest location</td>
<td>unsuccessful</td>
</tr>
</tbody>
</table>

Base on Table 2, it about lists user view interface. All user data name that register in this application.
Table 3: Sharing Status

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
<th>Expected Result</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Press post status button</td>
<td>Open post status interface</td>
<td>Success</td>
</tr>
<tr>
<td>2.</td>
<td>Press choose picture button</td>
<td>Open phone storage to select picture</td>
<td>Success</td>
</tr>
<tr>
<td>3.</td>
<td>Press Generate coordinate</td>
<td>Appear coordinate number below picture</td>
<td>Success</td>
</tr>
<tr>
<td>4.</td>
<td>Press Upload</td>
<td>Pop up image upload successfully</td>
<td>Success</td>
</tr>
</tbody>
</table>

Table 3 shows the main function of this application share picture and coordinate.

Table 4: Gallery View

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
<th>Expected Result</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Press gallery view button</td>
<td>Open gallery interface</td>
<td>Success</td>
</tr>
<tr>
<td>2.</td>
<td>Press fetch images button</td>
<td>Import all image in database</td>
<td>Success</td>
</tr>
<tr>
<td>3.</td>
<td>Press Previous and next button</td>
<td>View previous image and latest image</td>
<td>Success</td>
</tr>
<tr>
<td>4.</td>
<td>Press view map button</td>
<td>Open Google map to allocate picture location</td>
<td>Success</td>
</tr>
</tbody>
</table>

Table 4 shows the function to view all image and coordinate that user post. All test cases were run and successfully tested the product without any failure.

**CONCLUSION**

Location sharing application can be one of the most important thing that we would expect in various situation such as military exercises, asset monitoring and tracking and business activities. In this research, we have successfully designed, developed and tested this application. Moreover, security is also the main concern of this application. In future progress, this application system need be secured with using encryption technique.

**REFERENCES**

