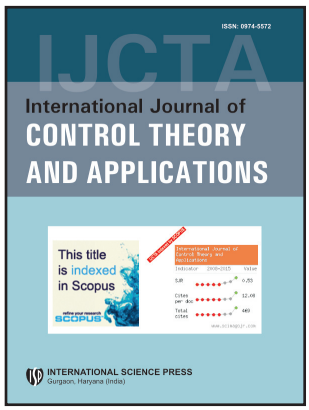

International Journal of Control Theory and Applications

ISSN : 0974-5572

Volume 9 • Number 44 • 2016

Emergency Finder: Tracking System for Nearest Emergency Services

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Abstract: GPS tracking is becoming the most popular method used to detect current location of moving objects. This method uses GPS technology together with satellite communication to identify a location in real time. Generally, most GPS tracking is used for traffic congestion and location and very few use it for other purposes. To this date, there is no GPS application that is used to determine the nearest emergency services location. Determining the nearest emergency service location in an emergency situation, at unfamiliar location is a very critical task. Consequently, using the existing general GPS tracking does not provide a good solution. Therefore, this research provides a specific GPS tracking application to determine the nearest emergency services for the user, named Emergency Finder. Emergency Finder was tested and compared with several existing GPS tracking applications such as Waze and Here for the efficiency and functionality evaluation. As the result, Emergency Finder is more efficient compared to other GPS tracking applications.

Keyword: GPS Tracking System, Global Positioning System, Emergency Finder, mobile application.

1. INTRODUCTION

Emergency situation need an immediate action in order to recover the situation. For local people, locating the nearest emergency services would not be a problem, where else, for tourist or visitors, it can be a problem. Emergency happens unpredictably and requires people to change their concentration and consideration promptly to the situation [1]. At the point when disasters turn out to a huge scale, it might expose and produce a negative outcome to the event. One of the reasons why people are late to the emergency destination is because they wasted the time finding the exact route and location in an unfamiliar area [2].

People can navigate through the sign board however it may take more time to find the emergency location. People can also navigate using other applications available in the market but it requires some time to explore and understand the application [2]. People can also use the ambulance services for emergency transportation but study showed that patients who use their own-transport in emergency situations have increasing arrival time which is 66% compared to the arrival by ambulance [3].

These problems give motivation into developing an application to minimize the finding time to the emergency location. Furthermore, this application will help user to find the location and provide the estimated arrival time

based on the user's current location to the emergency location by using GPS. In addition, researchers are aware that mobile platform and Smartphone are the most relevant things for the human beings. Most operating system provides functionality which helps the developers to build a simple application to ease the users. Because of quick development and immense changes in Android, researcher uses Android to design the above-mentioned application so that the technology is worth to be used.

For further discussion, this paper is divided into several sections. Second Section discusses the Tracking System; the Third Section is about Other Technology Used; Fourth Section is on Other Applications used for tracking; Fifth Section is about System Development; the Sixth section discusses the System Testing and lastly the concluding remark in the Seventh Section.

2. TRACKING SYSTEM

Tracking system services depends on the services coverage of the nearby areas. For this matter, related technology is implemented in order to track the pertinent location. Technology such as: Real Time Tracking and Global Positioning System are the backbone of these applications.

A. Real Time Tracking

Real time tracking is a feature of the new Intelligent Transportation System (ITS) designed to make riding the transport easier and faster for the public. This tracking uses GPS as a medium to track user's current location in real time. Real time tracking system is to enhance user's current location. This system utilizes the Global Positioning System (GPS) to obtain location information and velocity detection. These data are then calculated to allow users to know the current location [4].

B. Global Positioning System (GPS)

Global Positioning System (GPS) is a technology powered by solar energy where satellites send down radio signal to GPS units. Receivers will use the information to determine the current location (which is shown by latitude, longitude and elevation). GPS uses 27 satellites (24 active, 3 are meant for backup) to allocate position request by GPS receiver [5]. The Global Positioning System is having 24 satellite groups, which can tell a current location in three dimensions. As for measuring the distance, four GPS satellites is used to establish three coordinates of user position through latitude, longitude, and altitude. According to [6] the GPS works in three operations. Firstly, the satellites that allocates the position information. Secondly, the ground stations that are used to monitoring the satellites data updates on the position and finally the receiver that manages all of these information.

Both information of real time tracking and GPS information are used to map the navigation route. This is done at server level. In addition, route planner will be used as a tool for finding optimal route from one place to another. A list of places provided from start to the end with crossroads and direction is produced. User mapping module is developed to show user about the current position in a drawn map. A few processes are involved: first, the module will load related map file from server. Secondly, the module will base on the latest user position data in the server database received from the application to coordinate the current user position into the map loaded in user display. Concurrently, this module continuously updates the user position in the map if the user makes any movement.

3. OTHER TECHNOLOGY USED

The most important factor to develop an application is combine several technologies together. In this project, new technologies were developed and implemented such as Mobile Application, GPS and Internet Connection. Other than that, Google Maps is used to visualize the area. Google Maps is based on JavaScript Library. In this

research, Google Maps uses the web browser as a client. It also uses API to support the additional user defined overlays which consist of markers. Besides that, Google also released Google Earth and standalone 3D desktop application to visualize the similarity of the object through the internet [7].

Nevertheless, Google API is a service that retrieves data about places using HTTP request which response the locations by latitude and longitude coordinates. The limitations of service allow user to request 1000 per 24-hour period using API key [8]. Since the starting of Maps Application Programming Interface (APIs) in 2005, many web developers, including geographer and non-geographer, recommended mobile development and utilized this service to increase Internet Applications. However, most of third party applications were used to customize the maps and produce their own annotated Google Maps using their GPS data.

Not to forget, smart phone is the most suitable platform to be used to identify location. A statistic showed 72% of the smart phone users use their phones to determine location, and become the second higher of using maps [9]. This proves that smart phone technology is the best platform to locate a location and destination. As for the best operating system, Android has integrated with GPS that allow smart phone user to operate the tracking application easily. In order to develop the application, Google provides several convenient tools for developers which can easily customize the needs. Besides, Google Map was also provided for developer to easily plug into their application and retrieve using internet connection. In this project, Android was chosen as the platform to develop the application. This is because it is suitable for most users and also due to the price range if compared to iOS.

4. OTHER APPLICATIONS

Two popular applications for location tracking are WAZE and HERE. Waze is an application which is used the most by all Smartphone users to find location. It is a GPS based geographical navigation application that allows user to navigate through mobile phone. The GPS provide and support the information which is related to travel times and routes details. This application supports most of the mobile operating system such as Android, iOs and Symbian. This application is free to download and install to the Smartphone. Waze allows their users to report accidents, traffic jams, driving speed, and police traps. This application requires internet connection to update the current issues. Besides that, this application also has the voice navigation function the make it easier for the user to navigate. The application also offers their user to customize their account and upgrade their status in the community.

For the safety, Waze do not allow their user to navigate the application while driving [10]. Meanwhile, Here is originally developed by Nokia and was released in 2014 for Windows Phone. The improvement of this application supported for Android and iOS platforms. This application has a special feature which can support both online and offline mode for navigation. It also provides text-to-speech "Hi-Fi" navigation voice to give a huge quality services to their users. Same goes to other maps; it allows their user to find the location by keyword such as destination address, landmark or business name. Both WAZE and Here are popular and most used location tracker applications. These two applications are used in testing phase to evaluate the developed system efficiency.

5. SYSTEM DEVELOPMENT

System development starts with the First Phase, which is data collection involving collecting edges and vertexes which are defined using Keyhole Markup Language (KML). It uses a tag based structure with nested attributes and elements based on the XML standard. All tags must appear exactly as listed in KML reference because the tags are case sensitive. In this project, edges are referring to road segment and they are links that act as infrastructure that supports movement between nodes. As for vertexes, they are referring to nodes that define the start edge and last edge of the road segment.

Second Phase in Development System is the Interface Design. In this phase, users are required to select the nearby hospital and start tracking the location at the application interface. The request was sent to the server and the application was retrieve and display back to the application interface. Therefore, a simple interface design (Figure 1) is relevant in order to simplified the navigation and reduce the user distraction.

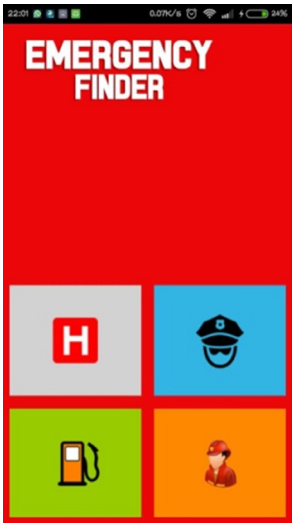

Figure 1: System Interface Design

In the Third phase, development phase, Android Studio is used as a tool to program the mobile application. Android Studio uses Java Language to give command to the application. The completed programming code is compile and run to create 'apk' file. The code that has been programmed can be modify and re-compile to the application which will overwrite the previous one.

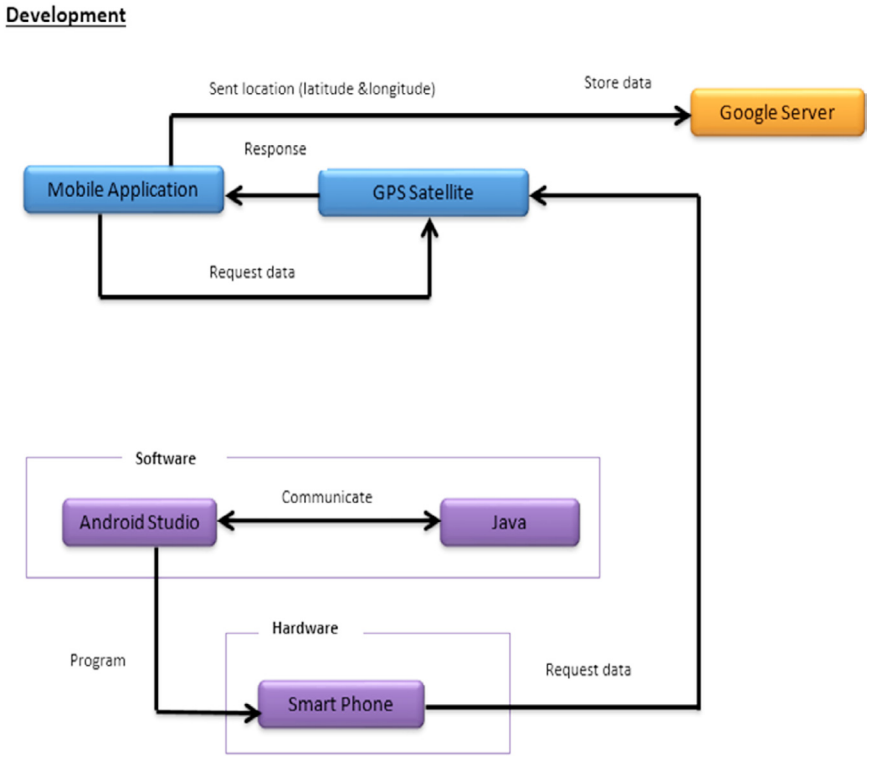

Figure 2: Development Phase

Figure 2, illustrates the process involved in development phase. Initially the GPS receiver must be able to receive signals from at least three satellites to calculate the two-dimensional positions which are latitude and longitude. The GPS will integrate together with smartphone which will request data through satellite. GPS satellite will later response to the mobile device and send the data to the server. These three phases iterate until the system has fully implemented. Finally, the System is tested for its efficiency and functionality.

6. SYSTEM TESTING

The application was tested for its efficiency and functionalities. Testing was done in three different locations using three different keywords with three different application location trackers. Realizing that several factors that could cause longer time of using several applications during testing such as poor internet connection and poor GPS connection, each test of locating location by keyword is done ten times and average of the time is recorded. For example, at location U12 Desa Alam, keyword 'Hospital' using application WAZE is run 10 times and the average of 19 second is recorded as in Table 1.

Table 1
Test Result Record

Location	*Keyword*	*Application/Time Taken*		
		WAZE	*HERE*	*Emergency Finder*
U12 Desa Alam	Hospital	19 second	31 second	18 second
	Clinic	20 second	28 second	
	Medical	20 second	28 second	
		Average = 19.6	Average = 29	
Kuala Terengganu	Hospital	24 second	30 second	20 second
	Clinic	25 second	33 second	
	Medical	25 second	31 second	
		Average = 27	Average = 31.3	
Sungai Petani	Hospital	20 second	31 second	18 second
	Clinic	22 second	30 second	
	Medical	19 second	30 second	
		Average =20.33	Average =30.3	
Average Total		22.33 second	30.2 second	18.6 second

Three different locations throughout Malaysia have been selected to avoid bias. As for the comparing applications, WAZE and Here are selected for this testing purpose. Based on Table 1, Emergency Finder had clearly recorder shortest time for all sets of testing. The average total recorded for WAZE is 22.33 second, Here is 30.2 second and Emergency Finder is 18.6 seconds only. In an emergency situation difference in few second does bring a lot of difference and it could involve precious life.

7. CONCLUSION

The mobile application using Android platform was developed to help the user to know the accurate location and arrival time. Implementation was done successfully and the result for the application has achieved the functionalities. Every single phase for implementation was described in this chapter. The outcome of this project was discussed for next chapter after the application tested.

Emergency happen unpredictable and cause people to panicked and lost their concentration and consideration. Due to this reason, people are late in reaching the emergency destination as they are wasting their time finding the route and location of the nearest emergency services. This research is to develop a simple emergency finder based on current location and showing a clear navigation. A set of tests has been conducted towards the system application of emergency finder and the outcome has been collected and analyzed. Based on the result, system application is efficient compare to another two-popular location locater. It is hope that this research able to help those people in need and guide another researcher to build other system application with similar technology and method used in this research.

Acknowledgment

The authors would like to thank Ministry of Education (MOE), MALAYSIA and Universiti Teknologi MARA for their financial support to this project under the Fundamental Research Grant Scheme (FRGS) [File No: 600-RMI/FRGS5/3 (132/2015)

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