



Mobility Monitoring System Using Smartphone Technology

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ABSTRACT— *Smartphone's redefined the usage of mobile phones in the communication world. They are equipped with numerous sensors and sophisticated features which helps the users to keep in touch with the modern world. GPS are one such thing that are usually found embedded in these phones, there is already a notable rise in applications that take advantage of the offered geographical positioning functionality. This paper appraisals the "method of using smartphones for monitoring the mobility of a user". Then we describe the implementation of the method and an application on an Android mobile in detail.*

Keywords— **Android, Embedded System, GPS, GSM, Mobile App, Mobile Communication, Mobility, Monitoring.**

1. INTRODUCTION

GPS (Global Positioning System) is increasingly being used for a wide range of applications. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth. GPS is made up of three segments: Space, Control and User. GPS has become a widely used aid to navigation worldwide, and a useful tool for map-making, land surveying, commerce, scientific uses, tracking and surveillance, and hobbies such as geocaching and way marking.

Monitoring the navigation of a vehicle or a boat or a person or any other thing plays a key role in the personal or public security. But none of the present GPS systems satisfy the requirements for the safety for the navigation as they can't help in case if there is a need to trace previous location of the user or alert on certain constraint. Therefore, monitoring based on these conditions has received a significant amount of attention. As the electronic techniques advance, computing machines have been miniaturized and smart phones are equipped with powerful processors and large memories. Consequently, various services have become available on smart phones. Since a smart phone is a personal device, it is an excellent candidate device on which a context-aware service may be provided. GPS are once such thing that can serve various purpose.

This paper adds on the versatility and the usefulness of a GPS enabled smart devices in the navigation safety. Since a smart phone based approach for navigation monitoring is a good match for developing regions because it avoids the need for expensive and specialized monitoring infrastructure. The main objective in this paper is to help in monitoring the navigation by limiting the area of navigation via geo-fence technology and



collecting location data time-to-time and storing in a remote database. While navigating beyond border (geo-fence) specified by monitor, an alarm is generated indicating that the user has crossed the border. With this alarm, the user can be caution and come back inside the limits of geo-fence. Additionally, a message is send to the monitoring station indicating that an object has crossed the border. Thus guards can be alerted to assist and provide additional help to those user if needed. Also, provide a solution to alert the user from monitoring station in case of any emergency.

The stimulus for this work was to provide a solution for frequent incidents of fishermen from Tamil Nadu getting arrested or shot in the Sri Lankan's maritime boundary have enraged all citizen of the state. From the fishermen's point of view, straying takes place inadvertently, due to sheer ignorance about maritime boundaries. At times, the drift is because of engine failure or strong currents. At the same time however, quite a few Indian fishermen engage in free floating to exploit marine resources in Sri Lankan waters, knowing full well, the risks involved in crossing the International Maritime Boundary Line (IMBL). Growing markets for marine resources has forced Tamil Nadu fishermen to take risks.

1.1 Android Platform

The application is developed in android platform. Since Android is founded on open source philosophy, user customization is possible to a greater extent. Also, android is the preferred choice of the present generation. So, developing the application in Android is more feasible than on other proprietary platforms because, the applications developed in android are compatible on all the Open Handset Alliance devices. Tablet PCs and smart phones are becoming more available and cheaper from brand name firms. So, the equipment is affordable, rugged and easily installable in a vehicle.

II. EXISTING SYSTEM

At present, there are few existing systems which helps to identify the current position of an object using GPS system and view them in an electronic map. GPS provides the fastest and most accurate method for users to navigate, measure speed, and determine location. Hindrances in these system were:

- They can only able to localize the user and does not store any of those location related information anywhere for any future references.
- It won't be able to limit a user to a particular geo-fence area.
- It doesn't have the ability to alert a user or monitor in any case of emergency at any cost.

III. PROPOSED SYSTEM

The mobile application uses data from GPS sensor to determine whether the user is within the geo-fence i.e. he is inside the boundary as specified by the monitor and stores these data in a database for future references. This system can be used to monitor users



navigation time to time as well as previous ones from data acquisition equipment (tablet pc/smartphone), which captures GPS values. The proposed system evaluates the user's location from time to time. It has the ability to alert the user with an alarm when the limit of the geo-fence is crossed and sends a message to the base station where the user is being monitored. The system is also capable of sending alerts whenever there is a danger to the user either by monitor to sender or vice-versa. This application can be particularly important for monitoring kids, vehicle, trawling, etc.

3.1 Advantages

- Since location data of the user are stored time to time, it becomes very easy to determine where the user was at a particular time.
- It can limit a user to a particular geo-fence area and alerts monitor when this limit is crossed.
- It has the ability to alert a user or monitor in any case emergency.

IV. METHODOLOGY

An Android Tablet PC was used for testing. The user starts the application at the beginning of the trip. The embedded Google map shows the user, area in which he can navigate along with his current location. The system automatically starts collecting the location data time to time and these location data are stored in the database. These data are used for tracking the object and detecting whether the user has crossed the geo-fence (limit within which the user can navigate). Once it is detected, an alert message is sent to the monitor as well as the user stating that the safe navigation area has been crossed with corresponding location data. Whenever there is a need to send some message to user by monitor or vice-versa it can be achieved through Google's Cloud Messaging Service. At the end of the session any action against user can be taken based on the data that was logged. After reaching the destination, he stops the application. Admin uses a PHP based system to view the logged user data and also to send alert messages.

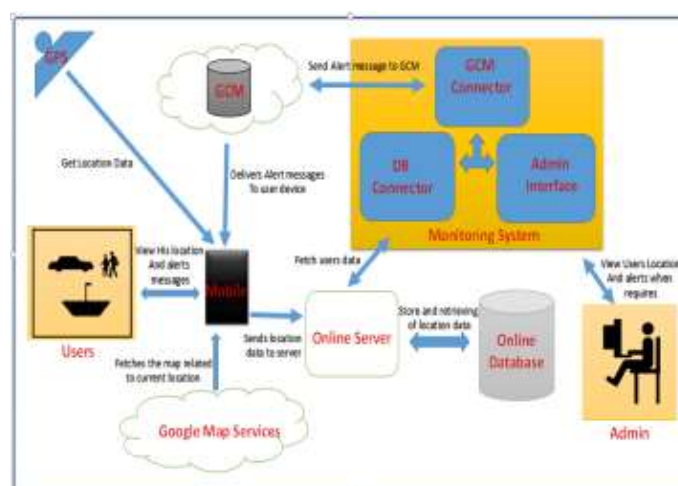


Figure 1: Block diagram of proposed system



4.1 Process Flow

Figure 2 shows the process flow of the entire system. First the application is started and then the user starts navigating. The application then continuously logs the location data and checks if the geo-fence area is crossed by the user. When this event occurs an alert message is send to the user and the monitor by the application. It repeats this task until the application is stopped.

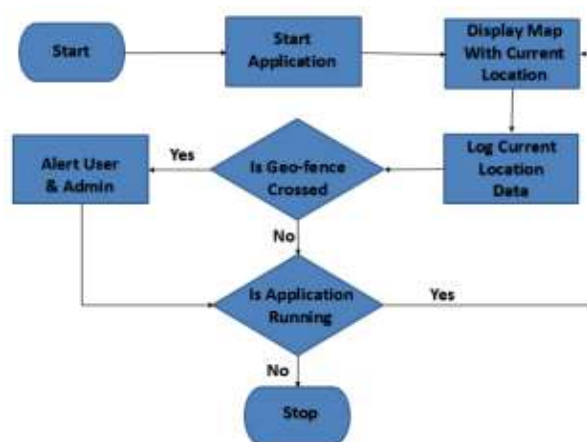


Figure 2: Process Flow of the main module

This system has the following modules:

- Localizer
- Monitoring System
- Alert Vendor

Localizer module is where the user's location data is collected and shown on his mobile along with the Google map service. It also uploads the user's location data to the remote database.

Monitoring System is split into two online and offline parts. The offline part analyses the location data collected locally on the mobile device and alerts the user as well as the app admin when the mobility constraints are violated by the user as specified in means of geo-fence. The online part helps in locating the user whenever the admin need to conform his location.

Alert vendor uses the Google's Cloud Messaging for Android (GCM) services to send any message to the user either any alert or emergency by the admin.

V. OUTPUT

The following figure shows the online system where the user's location are recorded time to time and displayed to the authenticated user (admin). It is sophisticated with



Google map so that the admin can clearly know the user location rather than confusing raw location data.

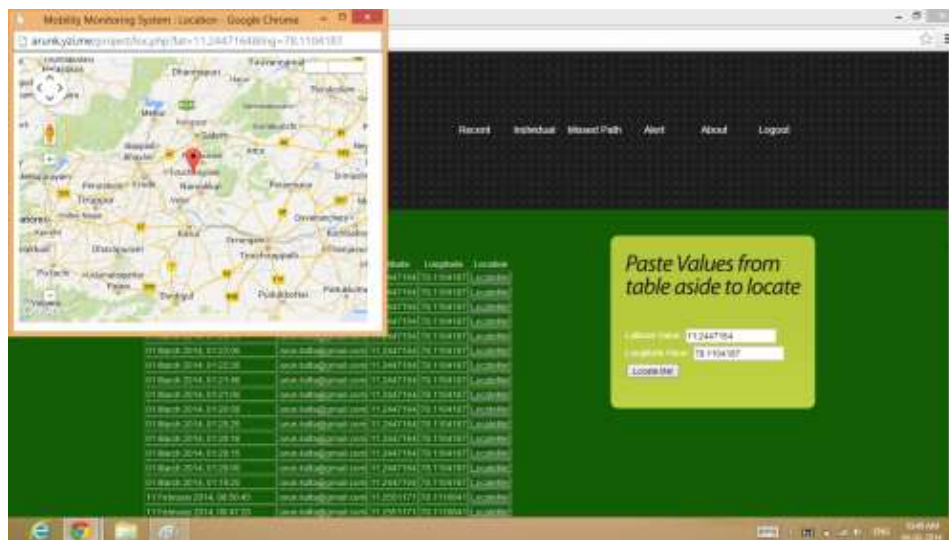


Figure 3: Online monitoring system.

The following figure shows the online system through which emergency alert messages can be send to the users by the admin.

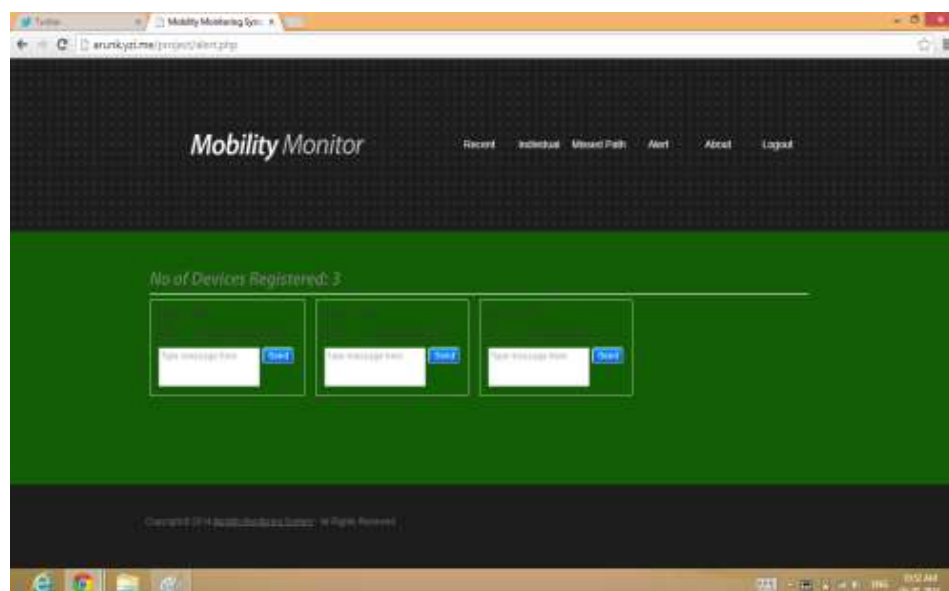


Figure 4: Alert vending system.

The following figure shows the mobile app in action. The first shows the current users location along with geo-fence. The second shows an alert to the user when he has crossed the geo-fence. The third shows message that has been send to admin mentioning which



user has crossed the limit of mobility. The final one shows the emergency alerts send by the admin to the user.

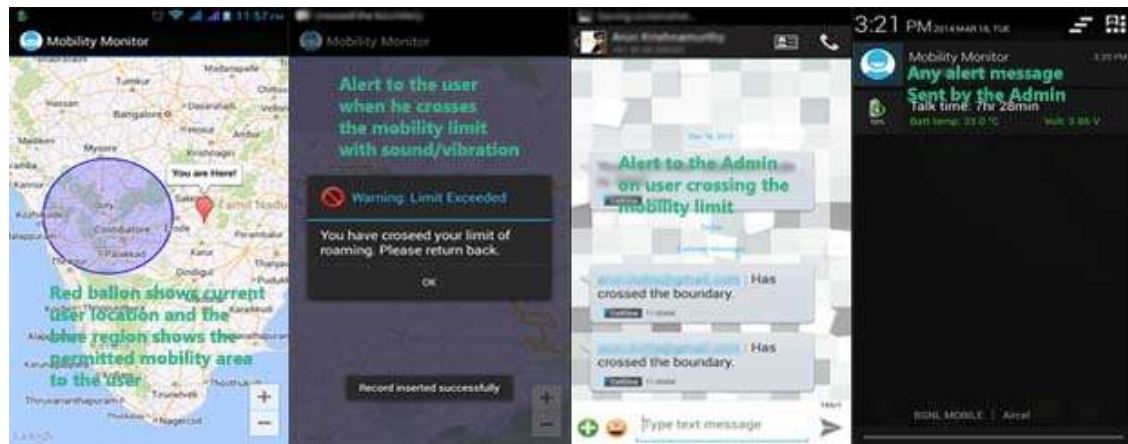


Figure 5: Mobile app in action.

VI. HOW IT CAN BE USED

The proposed system can be used in two way:

- Personalized
- Public

In personalized, it can be used by a family to track the family members. In public, the public organisation such as transportation departments can use to track the suspicious vehicle movement or terrorism activity.

VII. CONCLUSION AND FUTURE ENHANCEMENT

The Proposed mobile application gives far better security and a personalized monitoring system compared to others. However, more features can be added to make it more sophisticated application. The main advantage is the compactness and low cost of the system.

Proposed system focus only on software based solution. It can be extended to an embedded system i.e., controlling the vehicle of the user through wireless technology to stops his mobility which helps in make a better security system.

REFERENCES

- [1] Shashanka Chigurupati, Sowmya Polavarapu, Yasesvi Kancherla, A. Kousar Nikhath, "Integrated Computing System for Measuring Driver Safety Index" International Journal of Emerging Technology and Advanced Engineering, Volume 2, Issue 6, June 2012.



- [2] K. Suresh Kumar and K. Sharath Kumar “Design Of Low Cost Maritime Boundary Identification Device Using GPS System” International Journal of Engineering Science and Technology Vol. 2(9), 2010, 4665-4672.
- [3] P. Mohan, V. N. Padmanabhan, and R. Ramjee, “Nericell: Rich monitoring of road and traffic conditions using mobile smartphones” SenSys’08, November 5–7, 2008, Raleigh, North Carolina, USA, ACM 978-1-59593-990-6/08/11.
- [4] Wang Ershen, Zhang Shufang, Hu Qing, Lifang and Liang “Design of information display and control instrument based on SoC for AIS and GPRS monitoring system”. This paper appears in: Industrial Electronics and Applications 2008, ICIEA 2008, 3rd IEEE Conference.
- [5] R. Chang, T. Gandhi, and M. M. Trivedi. Vision Modules for a Multi-Sensory Bridge Monitoring Approach. In IEEE Intelligent Transportation Systems Conference, 2004.
- [6] Shwu-Jing Chang “Vessel identification and monitoring systems for maritime security”. This paper appears in: Security Technology, 2003. Proceedings. IEEE 37th Annual 2003 International Carnahan Conference, 14-16 Oct. 2003.
- [7] Reynolds J.C, Denaro R.P and Kalafus, R.M “GPS-based vessel position monitoring and display system”. This paper appears in: Aerospace and Electronic Systems Magazine, IEEE (Volume:5 , Issue: 7).
- [8] Practical aspects of Embedded System Design using Microcontrollers by Jivan S.Parab, Santhosh A.Shinde, Vinod G.Shelake, Rajanish K.Kamat, Gourish M.Naik.
- [9] GPS-based vessel position monitoring and display system. This paper appears in: Aerospace and Electronic Systems Magazine, IEEE Publication Date: Jul 1990.

BIOGRAPHY



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