ROAD ASSISTANCE SYSTEM TO WARN ON DANGEROUS LOCATIONS USING GPS

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الملخص

تحدث معظم الحوادث كنتيجة لعوامل تراكمية – مثل حالة السيارة ، وتصميم الطريق ، وحالة المرور ، وحالة السائق ، والمهارة والخبرة ، والظروف البيئية أو حالة الطقس. هناك ارتباط كبير بين هذه العوامل وتكرار الحوادث في نفس المنطقة. لذلك ، تمثل الحوادث في موقع معين معلمة جيدة لمدى خطورة الموقع. ومع ذلك ، لا يعرف السائق حاليًا بشكل طبيعي وبسهولة مدى خطورة طريق قيادته إلى وجهة ما ، خاصة في طريق قيادة جديد. علاوة على ذلك ، لا يتضمن نظام تحديد المواقع العالمي الحالي هذه المعلومات في نظامهم. في هذا المشروع ، تم اقتراح نظام مساعدة على الطريق للتحذير من المواقع الخطرة باستخدام GPS. سيقوم النظام بتنبيه السائقين لأي مناطق خطرة واردة على طريق قيادته باستخدام معلومات صوتية ورسوم بيانية على جهاز محمول. تم تنفيذ نظام عميل / خادم محمول يعمل بنظام Android يركز على طريق بطول 3 كيلومترات في Parit Raja Johor لاختبار هذا الاقتراح. قدم مركز شرطة على مستوى المنطقة جميع سجلات الحوادث لهذا المشروع. تم اختبار النظام مع عدد من المستخدمين من خلال تثبيت التطبيق على أجهزتهم وقد قدم استجابات جيدة وواعدة من حيث سهولة الاستخدام والأداء. مع مجموعة بيانات أكثر شمولاً في الوقت الفعلي ، قد يساعد هذا النظام في تقليل حوادث الطرق عن طريق تنبيه السائقين في أقرب وقت ممكن في أي مكان.

الكلمات الدليلية: تصميم الطرق ، الحوادث ، العوامل التراكمية ، المواقع الخطرة ، نظام تحديد المواقع العالمي (GPS) ، السائقين ، الاجهزة المحمولة.

Abstract

Most accidents occur as a result of cumulative factors - such as the car's condition, road design, traffic condition, driver's condition, skill and experience, and the environmental or weather condition. There is high correlation between these factors and the recurrence of accidents in the same area. Therefore, accidents at a particular location represent good parameter of how dangerous a location can be. However, currently a driver does not normally and readily know how dangerous his driving route to a destination, especially at a new driving route. Furthermore, current popular GPS does not include this information in their system. In this project, a road assistance system to warn on dangerous locations using GPS is proposed. The system will alert the drivers of any incoming dangerous areas on his driving route using sound and graphical information on a mobile device. An Android based mobile client/server system focusing on a 3-km route in Parit Raja Johor has been implemented to test this proposal. A district level police station has provided all accidents records for this project. The system has been tested with a number of users by installing the application on their devises and it has given good and promising responses in terms of usability and performance. With more comprehensive real-time dataset, this system may help to reduce road accidents by alerting the drivers as early as possible at any location.

Keywords: road design, accidents, cumulative factors, dangerous locations, GPS, drivers, mobile device.

Introduction

Application software is a subclass of computer software that employs the capabilities of a computer directly and thoroughly to a task that the user wishes to perform [1]. It programs interact with systems software; system software then direct computer hardware to perform the necessary tasks [1]. The open and extensible architecture has become the trend for smart phone operating systems; it will take the place of the classical systems. The Global Positioning System (GPS) is a global Navigation satellite system deployed by the US Department of Defense and maintained by the US Air Force. GPS is a space-based radio navigation system that

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المجلة الدولية للعلوم والتقنية
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ISTJ

provides accurate location and timing services to anyone with a GPS receiver. This service, made available to civilians in 1996 for navigation purposes, is free of charge, can support an unlimited number of users, and functions anywhere in the world. Starting in 2004, the mobile phone industry began successful tests to incorporate GPS receivers into mobile phone devices to support 911 emergency locations [2].

Maps have been developed based on existing technologies such as GPS. These navigation systems are appreciated and enjoyed by many users and can provide directions from one place to another. However, there are some limitations to these systems. Their capability is often restricted to street maps, and many times they are not able to effectively help navigating inside a particular location such as a university campus, an amusement park, an adventure park, a zoo, a market, or a hiking trail [2].

In this project, we introduce a framework to develop a mobile application based on the Android platform. The application allows the user to specify address of central location of a region and a radius around it and alerts the driver when he/she enters the dangerous locations. It uses both Global Positioning System (GPS) and Network Location Provider to acquire user location information. GPS, a satellite-based navigation system provides location information to Android devices that come with built in GPS receivers. Network Location Provider on the other hand uses cell tower and Wi-Fi signals to provide location information. provided. The formatter will need to create these components, incorporating the applicable criteria that follow.

It follows with the design of the proposed system, implementation, and testing. To assist the development (OOSD) will be used. OOSD consists of four phases which are object-oriented analysis, object-oriented design, object-oriented implementation, and object-oriented testing. This method is suitable for this project because it's easy to maintenance, reliability, and reusability.

Related work

A. Road Accident in Malaysia

In today of the Malaysia's mass media like television, newspaper, and radio, we can see and hear many tragic and unfortunate news about the road accidents that causes many innocent lives die or injuring suffered. Road safety has become the serious issues nowadays as traffic accidents in Malaysia has been raising at the average rate of 9.7% per annum over the last 3 decades [3]. To date, there are many accidents occur along Jalan Ayer Hitam – Batu Pahat, based on the statistic of road accident at federal road, FT050 in Johor. The accidents involve cars, lorry, bicycle, pedestrian and mostly motorcyclist [4]. The vehicles were believed to be increased on the road due to the land use such as Fujitsu factory, wood and timber factory, shops, school, and university along both side of the road. Therefore, KM 19,KM 20, KM 21, KM 22 and of the FT 050 were chosen for this project. Police station has provided all accidents records from 2009-2013, we have done the statistical of accident in Parit Raja road from 2009-2013 shown in figure 1.
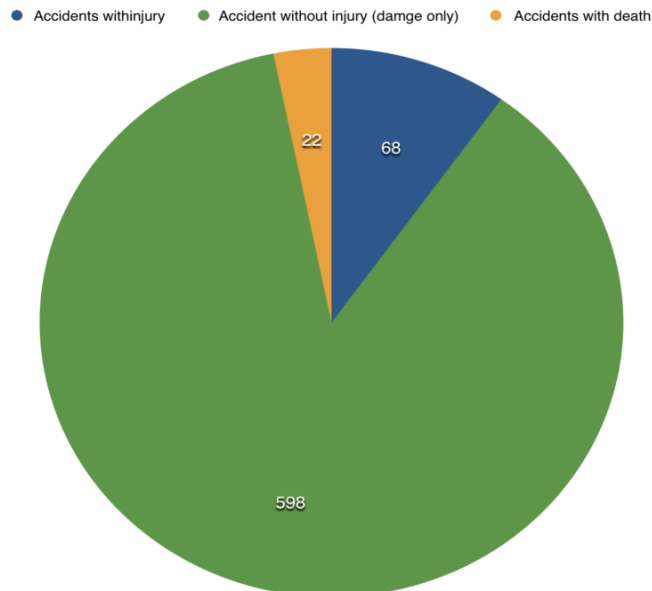

Figure 1. Number of Accidents in Parit Raja, Malaysia

Based on figure 1, we can see the big numbers of the accidents from 2009 to 2013, and it cost many accident cases 22 people died sense 2009 in 3 kilometer distance only while 68 of them they had difficult operation, and 598 of drivers they had lose their car with damaged car only.

B. Location Based Services

Location Based Service (LBS) has been considered as the most potential part of wireless value-added services. However, the development of Location Based Services, which needs lots of data to transmit, is strictly limited because of the limited bandwidth of wireless network. With the emergence of 3G and 4G technologies, wireless network speed is greatly improved, which will provide more information to users easily, and hence LBS will be greatly promoted. The major requirement of a GPS Locator is the use of Location Based Services (LBs) such as GPS. The GPS Locator allows several operations such as user can get your own current location latitude, longitude and altitude [5]. In addition (LBS) provides a user with contents customized by the user's current location, such as the nearest restaurants/hotels/clinics, which are retrieved from a spatial database stored remotely in the LBS server. LBS not only serves individual mobile users, but also plays an important role in public safety, transportation, emergency response, and disaster management. With an increasing number of mobile devices featuring built-in Global Positioning System (GPS) technology, LBS have experienced rapid growth in the past few years [6].

C. Global Positioning System (GPS)

The most common positioning system today is GPS. It is operated by the United States government and currently consists of 31 satellites in its so-called space segment, which continuously broadcast signals from their medium earth orbits. In the user segment the GPS receivers, such as the ones being integrated in most smart- phones today, receive those signals and can use a minimum of 4 signals to calculate a three-dimensional location based on the signals' propagation delays [7]. Most of smartphones

International Science and Technology Journal
المجلة الدولية للعلوم والتقنية

Volume 32 العدد
أبريل April 2023

المجلة الدولية للعلوم والتقنية
International Science and Technology Journal

ISTJ

are equipped with GPS functional like receivers and supporting application Google map.

D. Google Maps

Google Maps that is started by Google Company is a free electronic map services. In addition, Google Company has also launched a Google Maps API, which makes the developer interested in Google Maps link the free electronic map to their web pages and use the free electronic map to achieve a variety of geographic information system functions [8]. Google maps is a great way of viewing the area around the property that you are interested in, saving you hours of time and frustration being shown properties that do not match your search criteria. Google maps, together with viewing the full video of the property, serves as a powerful tool when short-listing properties that you wish to physically view. This emerging networking promoted entire network's application to a new level formerly the information which is obtained online can only explain what had happened and how it happens, now we even may also know its concrete place through Google Map [9]. Google Maps API is a JavaScript technology-based application programming interface (API) offered by Google. It provides a lot of processing maps service and adding content to maps service. The Google Maps API allows users to embed Google Maps in their own Web pages. The GMap2 class is the core class of Google Maps API. Objects of this class define a single map on a web page. Google creates a new instance of this class by the JavaScript new operator [10].

System Methodology

The designer's goal is to produce a model or representation of an entity that will be developed later. Once system requirements have been specified and analysed, system design. The requirement analysis was presented using Unified Modelling Language (UML) for explaining system's functionality, and it starts by highlighting the components of the proposed system in forms of use case and sequence diagrams. In addition, the proposed database design explains entity relationship diagram and how displays the relationship of entity sets stored in a database. Also every single

International Science and Technology Journal
المجلة الدولية للعلوم والتقنية

Volume 32 العدد
أبريل April 2023

المجلة الدولية للعلوم والتقنية
International Science and Technology Journal
ISTJ

table in our database is connected to each other in order to keep track of the records in the system.

The requirement specification of the proposed system is established through literature review of similar system and interview. Figure 2 illustrates the framework of the proposed system after research is done.
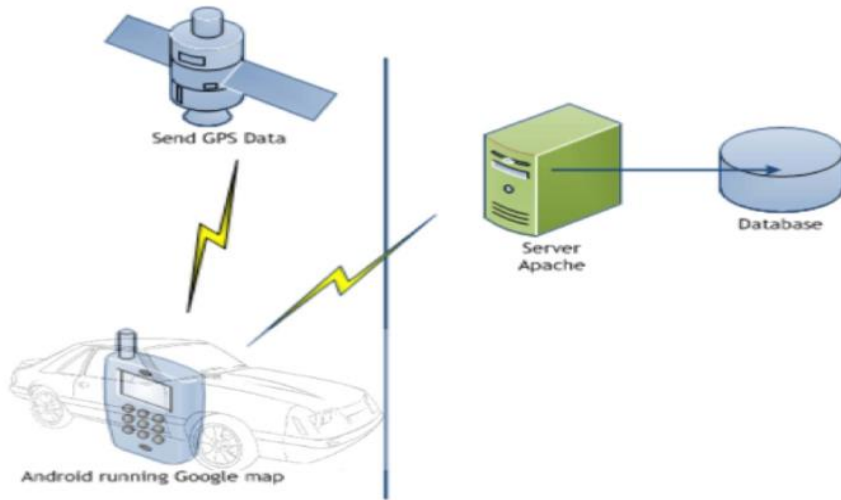
Figure 2. Framework of the Proposed System.

The architecture shown in figure 2 is used to show the research results, store the user details, user review and user invites. The data from android goes to webserver (MYSQL) to database server. MYSQL is used here because of the interaction it can offer with the databases. On Android, HTTP protocol is used to connect with the webserver (MYSQL). JSON (JavaScript Object Notation) is a lightweight text-based open standard designed for human-readable data interchange and it is used in this application to send data from Android device to MySQL Script. When the application is executed, it connects the device to the MySQL script on the server. MySQL script fetches the response data, which is encoded to JSON format and then sent back to the device. The data is parsed and displayed according to the requirement.

A. Process Flow Design

Figure 3 shows the main reason of using Process Flow Design is to show the relation between major parts of the system. Process Flow Design does not include minor parts or components of the system.
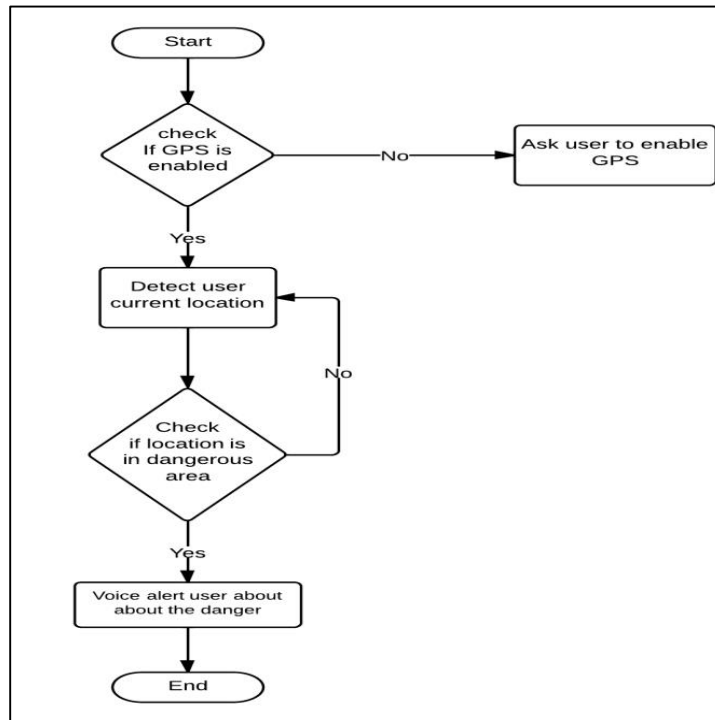

Figure 3. Process Flow Design

B. Identifying Sequence Diagram

Sequence diagram is used to present activities of each actor. However, only user Activities are discussed in this section. Following figures illustrate the sequence diagrams for user activities. Figure 4 shows the sequence diagram for Danger Warner.

International Science and Technology Journal
المجلة الدولية للعلوم والتقنية

Volume 32 العدد
أبريل April 2023

المجلة الدولية للعلوم والتقنية
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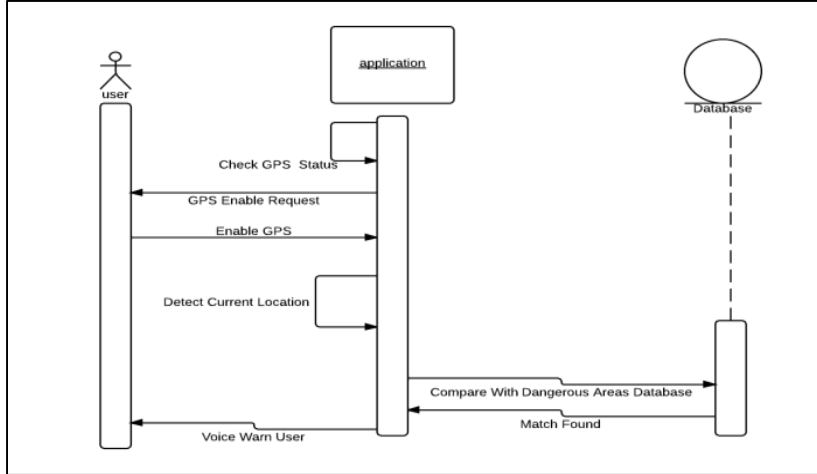
Figure 4. Sequence Diagram

C. Identifying Sequence Diagram

Activity diagrams, which are related to program flow plans (flowcharts), are used to illustrate activities. In the external view, we use activity diagrams for the description of those business processes that describe the functionality of the business system. Figure 5 illustrates the overall use case of the app.
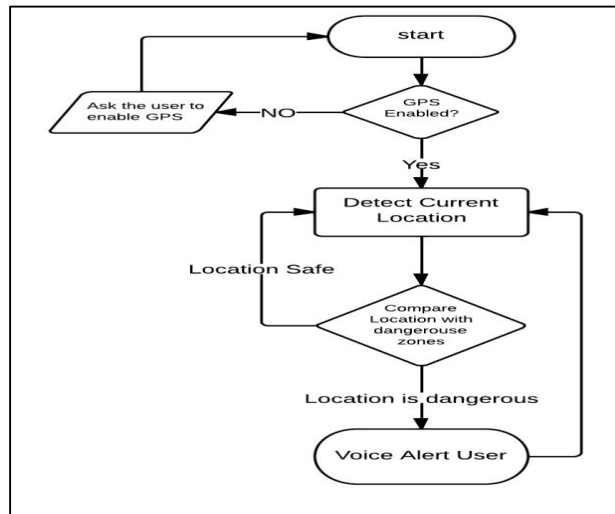
Figure 5. Activity Diagram

Performance Analysis

The implementation and testing of Danger Alert application that is a native mobile application that can warn the user if he/she enters a dangerous zone based on predefined dangerous areas. Most people will try to go fast to reach their distance and while they are increasing the speed in Parit Rajr road without getting acknowledge where dangerous area is in that road. We attempted to write an application that used Android's GPS functionality to help solve that problems by creating zone that show type of dangerous zones according to police reports, furthermore will alert the user by sending an alarm if the device was entering the zone before 150 meters, in addition there is one more function in the app call dangerous places it will help to see the names of the dangerous areas with more description about them.

Using the phone's Internet capability and its GPS coordinates, Google maps API were performed to draw the dangerous zones on the map. The application ran silently in the background and required no configuration to use. Figure 6 depicts the application's output as the user drive before entering the zone. The application's output when the driver was going to enter the zone in figure 7 an audible alarm was played under this condition to warn the user. While figure 8 shows the dangerous places list.
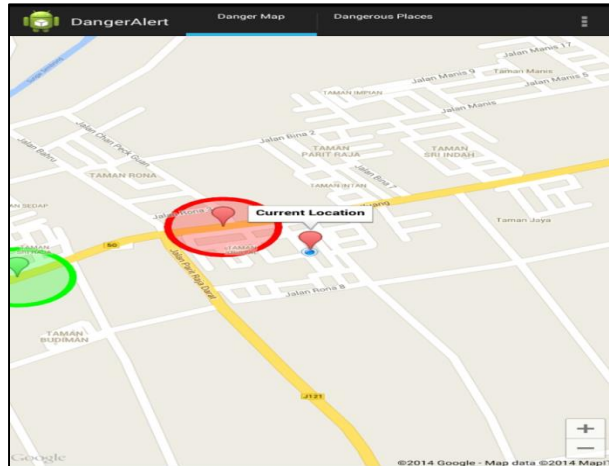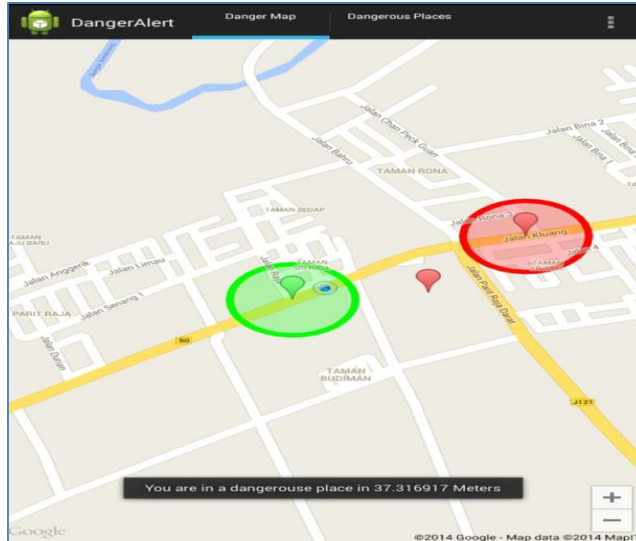

Figure 6. Before entering the zone.

International Science and Technology Journal
المجلة الدولية للعلوم والتقنية

Volume 32 العدد
أبريل 2023 April

المجلة الدولية للعلوم والتقنية
International Science and Technology Journal
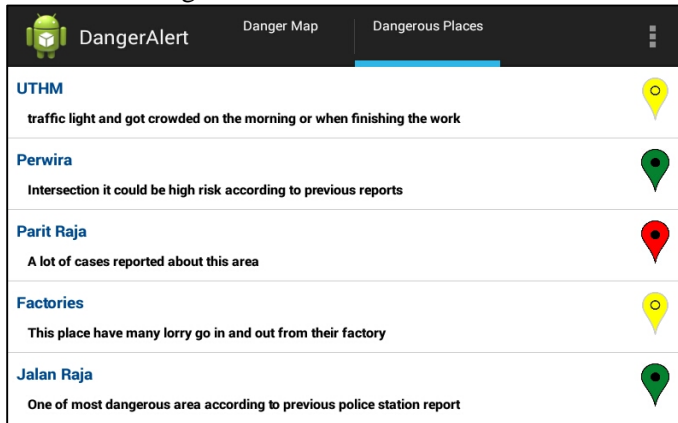ISTJ

Figure 7. After entered the zone.

Figure 8. Dangerous places list.

A. Unit Testing

The unit testing has been done successfully for the app by try all the functional and the button in Danger alert no errors and malfunction found while it is working smoothly without any errors or non functional button also no crash happen to the app while it was running.

B. User Acceptance Testing

User Acceptance Testing is often the final step before rolling out the application. In addition the Danger Alert app given to test before 1 week, and then we have distribute the questioner to the tester to evaluate the system in figure 9 will show the graph of the user friendly while in figure 10 will show the easy to be used.
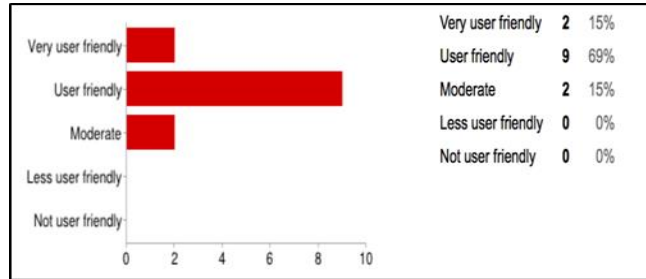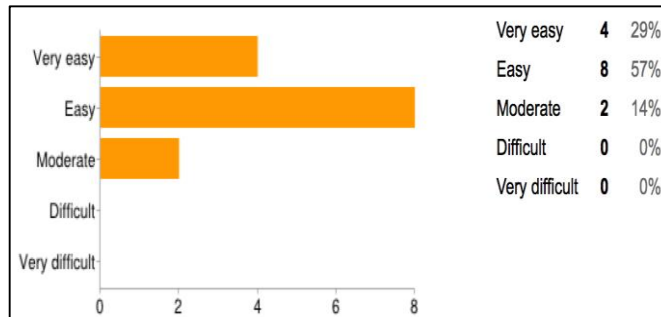

Figure 9. Danger Alert user friendly

Figure 10. Danger Alert ease of use.

Conclusion

In this paper, we present the development of an android app, and our sample application showed how GPS data and Google maps could be combined to keep the people safe from the dangerous area. It focuses on how to give an audible alarm to assist drivers when they enter a dangerous zone, we have been working with local police station to get real data set on dangerous area at Parit Raja. Multiple zones with multiple level of risk have been determined based on those data set.

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