LOCATION-BASED SAFETY ALERT SYSTEM USING ANDROID PHONE

SOO KIN YONG

This Report Is Submitted In Partial Fulfillment of Requirements For The Bachelor Degree of Electronic Engineering (Computer Engineering) with Honors

Faculty of Electronic and Computer Engineering
Universiti Teknikal Malaysia Melaka

JUNE 2014

© Universiti Teknikal Malaysia Melaka

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSTI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : LOCATION-BASED SAFETY ALERT SYSTEM USING ANDROID PHONE

Sesi Pengajian : 1 3 / 1 4

Saya **SOO KIN YONG** mengaku membenarkan Laporan Projek Sarjana Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (√) :

☐	**SULIT***	*(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)
☐	**TERHAD****	**(Mengandungi maklumat terhad yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)
☑	**TIDAK TERHAD**	

Disahkan oleh:

(TANDATANGAN PENULIS)

(COP DAN TANDATANGAN PENYELIA)
HAMZAH ASYRANI BIN SULAIMAN
Pensyarah
Fakulti Teknologi Maklumat Dan Komunikasi
Universiti Teknikal Malaysia Melaka (UTeM)
Hang Tuah Jaya,
76100 Durian Tunggal, Melaka

Tarikh: 6/6/2014

Tarikh: 20/6/2014

© Universiti Teknikal Malaysia Melaka

"I hereby declare that this report is the result of my own work expect for quotes as cited in the references."

Signature : .....

Author : SOO KIN YONG

Date : 6/6/2014

© Universiti Teknikal Malaysia Melaka

"I hereby declare that I have read this project report and in my own opinion this project report is sufficient in terms of the scope and quality for the award of Bachelor of Electronic Engineering (Computer Engineering) With Honors."

Signature : .....

Name : MR. HAMZAH ASYRANI BIN SULAIMAN

Date : 20/6/2014

© Universiti Teknikal Malaysia Melaka

Dedicated to my parents, lecturers and all of my friends who helped me in this project.

© Universiti Teknikal Malaysia Melaka

ACKNOWLEDGEMENT

I would like to express my deepest gratitude to Universiti Teknikal Malaysia Melaka (UTeM) for giving me a chance to enhance my knowledge by conducting this project. Next, I would also like to take this opportunity to thank those who contributed directly and indirectly in helping me to complete this final year porject successfully.

I am deeply indebted to my FYP supervisor, Mr. Hamzah Asyrani bin Sulaiman for his patient and continuous support, guidance, encouragement, as well as supervision throughout the whole development of this project. Also, not to forget all my beloved lecturers who had taught me for the four precious years in UTeM. I would also like to thank to all my family and friends who are always supporting me.

Last but not least, to both my panels, fellow lab assistants and technicians, my beloved coursemates and friends who has been supporting, guiding and helping me to the success of completion of my PSM's project.

© Universiti Teknikal Malaysia Melaka

ABSTRAK

Penggunaan telefon mudah alih adalah dilarang di premis berbahaya seperti stesen minyak dan hospital. Penggunaan telefon bimbit di premis itu mungkin menyebabkan gangguan dan membahayakan orang lain. Oleh itu, langkah-langkah keselamatan perlu diamalkan apabila kita berada dalam premis itu. Malangnya , masih ramai pengguna yang tidak mematuhi peraturan dan menggunakan telefon mudah alih di kawasan berkenaan. Oleh itu , pengesan telefon bimbit digunakan untuk memantau penggunaan telefon mudah alih dalam premis tertentu. Walau bagaimanapun, bukan semua pengesan telefon bimbit adalah berkesan dengan sempurna. Sebagai contoh, seorang bekas pelajar UTeM telah mencipta satu pengesan telefon bimbit tetapi ia tidak dapat mengesan isyarat dari beberapa model telefon. Oleh itu , pendekatan dari segi perisian dilaksanakan. Sistem amaran keselamatan berasaskan lokasi ini akan mengesan lokasi pengguna dengan bijak sepanjang masa selepas ia diaktifkan dalam telefon mudah alih . Ia akan memberi amaran dan meminta pengguna untuk beralih ke mod kapal terbang jikalau sistem mengesan pengguna adalah dalam premis tertentu. Oleh itu, sistem amaran keselamatan ini bukan sahaja bertindak sebagai peringatan untuk mengurangkan peluang bagi kemalangan berlaku kepada pengguna itu sendiri, tetapi juga membawa keselamatan kepada orang ramai.

© Universiti Teknikal Malaysia Melaka

ABSTRACT

There is restriction on the usage of mobile phone in certain potentially dangerous premises such as petrol station and hospital. The usage of mobile phones at those premises might cause some disturbances and hazards. Therefore, safety precautions need to be taken into consideration when we are within the premises. Unfortunately, there are still many users who disobey the rules and use their mobile phone in those areas. Therefore, mobile phone detector is used to monitor the usage in the premises. However, not all the mobile phone detector is perfect. For example, a previous batch student has developed a mobile phone detector but it cannot detect the signals from some phone models. Thus, software approach is implemented. The design of this location-based safety alert system will make the smartphone to intelligently detect the user's location all the time after it is activated. It will alert and ask the user to switch to airplane mode once the system detects the user is in those premises. Thus, the safety alert system not only acts as a reminder to reduce the chance of the accidents occurring to the user itself, but also allocate a safer surrounding to the public.

© Universiti Teknikal Malaysia Melaka

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	PROJECT TITLE	i
	COFIRMATION REPORT STATUS	ii
	DECLARATION	iii
	SUPERVISOR CONFIRMATION	iv
	DEDICATION	v
	ACKNOWLEDGEMENT	vi
	ABSTRAK (MALAY VERSION)	vii
	ABSTRACT (ENGLISH VERSION)	viii
	TABLE OF CONTENTS	ix
	LIST OF FIGURES	xii
	LIST OF TABLE	xiv
	LIST OF ABBREVIATION	xv
CHAPTER 1	**INTRODUCTION**	**1**
	1.1 Overview	2
	1.1.1 Hospital	2
	1.1.2 Aircraft	2
	1.1.3 Petrol Station	3
	1.2 Motivation for research	4
	1.3 Objectives	5
	1.4 Problem Statements	5

© Universiti Teknikal Malaysia Melaka

	1.4.1	Aircraft	5
	1.4.2	Petrol Station	7
	1.4.3	Mobile Phone Detector by Tan Chen Wei	8
1.5		Scope of Works	9
1.6		Thesis Outline	11
CHAPTER 2	**LITERATURE REVIEW**		**12**
2.1		Mobile Phone Detectors Available Today	13
	2.1.1	Wolfhound Cell Phone Detector	13
	2.1.2	Mobile Phone Detector by Tan Chen Wei	14
2.2		Comparison of the Mobile Phone Detectors	16
2.3		Software and Theory	17
	2.3.1	Android Application	17
	2.3.2	Eclipse	18
CHAPTER 3	**METHODOLOGY**		**20**
3.1		The Designing Process	21
3.2		Hardware and Software Development	22
	3.2.1	Software Development	22
	3.2.2	Hardware Development	25
		3.2.2.1 Use of Voltage Regulator LM317T	26
		3.2.2.2 Use of Solar Cell 6V	27
3.3		Designing of the Solar Charger Circuit	28
3.4		Printed Circuit Board (PCB) Layout	29

© Universiti Teknikal Malaysia Melaka

CHAPTER 4	**RESULT AND DISCUSSION**		**30**
	4.1	Result of Solar Charger Circuit	31
	4.2	Result of Eclipse Coding	33
	4.3	Result of Comparison Between The Systems	45
	4.4	The Prototype of the Project	46
	4.5	Discussions	47
CHAPTER 5	**CONCLUSION AND FUTURE WORK**		**49**
	5.1	Conclusion	50
	5.2	Future Work	50
	REFERENCES		51
	APPENDIX		A-1

© Universiti Teknikal Malaysia Melaka

CHAPTER 4	**RESULT AND DISCUSSION**		**30**
	4.1	Result of Solar Charger Circuit	31
	4.2	Result of Eclipse Coding	33
	4.3	Result of Comparison Between The Systems	45
	4.4	The Prototype of the Project	46
	4.5	Discussions	47
CHAPTER 5	**CONCLUSION AND FUTURE WORK**		**49**
	5.1	Conclusion	50
	5.2	Future Work	50
	REFERENCES		51
	APPENDIX		A-1

© Universiti Teknikal Malaysia Melaka

LIST OF FIGURES

FIGURE	TITLE	PAGE
1.1	Passenger using mobile phone on plane	6
1.2	Crossair flight LX 498 crashes	6
1.3	Mobile phone is prohibited in petrol station	7
1.4	Using Mobile Phone while refueling petrol	7
1.5	Accident Site where the Driver Received Call & Explosion of Gas Happened	8
1.6	The Mobile Phone Detector developed by Tan Chen Wei	9
1.7	Basic idea on the software graphical user interface (GUI)	10
1.8	Basic idea on the hardware – solar charger	10
2.1	Wolfhound Cell Phone Detector	13
2.2	The Mobile Phone Detector Prototype	15
2.3	The Completed Prototype for Petrol Pump	15
2.4	Android Logo	18
3.1	The Procedure of Project Flow	21
3.2	Main GUI	23
3.3	Notification GUI	23
3.4	Time Chooser GUI	23
3.5	The process flow of the software	24
3.6	The process flow of the solar charger	25
3.7	Pin Configuration of LM317T	26
3.8	The solar cell used in the safety alert system	27
3.9	The Schematic Design for Solar Charger Circuit	28

© Universiti Teknikal Malaysia Melaka

3.10	The PCB Design for Solar Charger Circuit	29
4.1	The Schematic Design for Solar Charger Circuit	31
4.2	The PCB Front View for Solar Charger Circuit	32
4.3	The PCB Back View for Solar Charger Circuit	32
4.4	Main GUI of the Location-based Safety Alert System	33
4.5	Scrap of the codings to display the map and current location (Part 1)	35
4.6	Scrap of the codings to display the map and current location (Part 2)	36
4.7	Notification is being triggered upon entering the danger area	37
4.8	Scarp of the coding to display pop-up notification (Part 1)	38
4.9	Scarp of the coding to display pop-up notification (Part 2)	39
4.10	Time chooser option menu for the safety alert system	41
4.11	The airplane mode is activated	42
4.12	Scrap of the coding to show time chooser option (Part 1)	43
4.13	Scrap of the coding to show time chooser option (Part 2)	44
4.14	The Completed Prototype for the Location-based Safety Alert System	46

© Universiti Teknikal Malaysia Melaka

LIST OF TABLE

TABLE	TITLE	PAGE
2.1	Comparison between the Mobile Phone Detectors	16
4.1	Comparison between the systems	45

© Universiti Teknikal Malaysia Melaka

LIST OF ABBREVIATION

RF	-	Radio Frequency
GPS	-	Global Positioning System
GUI	-	Graphical User Interface
GSM	-	Global System for Mobile
CDMA	-	Code Division Multiple Access
dBm	-	Decibels Miliwatts
SMS	-	Short Message Service
LC	-	Coil - Capacitor
OS	-	Operating System
IDE	-	Integrated Development Environment
IBM	-	International Business Machines
JDK	-	Java Development Kit
JDT	-	Java Development Tools
API	-	Application Programming Interface
PCB	-	Printed Circuit Board
DC	-	Direct Current
USB	-	Universal Serial Bus

© Universiti Teknikal Malaysia Melaka

CHAPTER 1

INTRODUCTION

This chapter will explain the negative influences of the mobile phone usage in certain premises like hospital, on the plane and petrol station. It will also introduce the similar safety alert system used in petrol station designed by the previous batch student and discuss its limitation.

© Universiti Teknikal Malaysia Melaka

1.1 Overview

Since there is restriction on the usage of mobile phone in certain potentially dangerous premises such as petrol station and hospital, therefore mobile phone detector is needed to monitor the usage in the premises. The usage of mobile phones at those premises might cause some disturbances and hazards. Therefore, safety precautions need to be taken into consideration when we are within the premises.

1.1.1 Hospital

The hospital will define and control their own wireless network equipment and the working frequencies. The wireless network will use with enough certainty to ensure that there will not be interference with the patient monitoring equipment. However, the wide variety of handsets and the multiple operating cellular telephone services nowadays make it harder to ensure that there won't be any interference.

Mobile phones can interfere with pacemakers and other sensitive electronic monitoring devices in hospital. It is a sensible safety precaution, but it is quite conservative since cell phones will disturb less than 4% of devices at distances of less than 40 inches. Still, there are other good reasons to restrict mobile phone usage in hospital. Ringing phones and the conversations can be noisy and disruptive to patients. **[1]**

1.1.2 Aircraft

Passengers are reminded to switch off their electronic devices during the flight. The ban is needed because the radio frequency emitted by cell phones is suspected to malfunction a plane's electronic systems. **[2]**

© Universiti Teknikal Malaysia Melaka

Radio-frequency (RF) emissions from mobile phones, laptops, tablets and other electronic devices might occur at the same frequencies used by aircraft communication, navigation and surveillance radio receivers. The RF emissions could cause fluctuations in navigation readouts, disturbance in other flight displays, and interference with air traffic communications. **[3]**

Mobile phone manufacturers have placed the warnings in their user manuals. For instance, Nokia warns its users that not to use phones on airplanes as this can cause interference with the navigational equipment. **[4]**

1.1.3 Petrol Station

The mobile phones can ignite sparks generated by the phone battery and produce static charge during the transmission. Petrol fuel has low electrical conductivity and does not conduct electricity under normal condition. However, static electricity charge will be produced as the fuel flows through the nozzle. In general, the static charge will dissipate in the range of few seconds to few minutes after reaching the maximum level of the tank. The spark produced needs to be discharged near the tank opening. It is also possible for a spark to discharge directly from the gasoline surface to the grounded nozzle. **[5]**

Studies had been conducted and no concrete proof was found on the safety issue regarding the usage of mobile phones in potentially explosive environments. Even though there is no solid evidence on the ignition source, the usage of the mobile phones while refueling vehicles is strongly prohibited by the authorities because it may divert concentration and lead to spills out and possible accidents. **[6]** Mobile phone manufacturers also strongly emphasize on not using their phones in areas with potential explosive atmospheres, as there are issues regarding to static electricity not associated with mobile phones. **[7]**

© Universiti Teknikal Malaysia Melaka

A mobile phone detector called "Mobile Phone Usage Alert System for Petrol Station", also known as "Call Buster", had been developed by a previous batch student. The mobile phone detector can sense the presence of an activated mobile phone from a distance of 1.5 meters. The detector operates by detecting the incoming and outgoing calls, text messages and video calls. Once the RF transmission signal is detected, the alert system will be triggered immediately. **[8]**

However, not all phone signal can be detected by the mobile phone detector. It had been tested for several times and it was working fine with most of the phones except iPhone and some Samsung Android-based phone models. The circuit of the detector was then modified to fix the problem but it still failed at last.

The scope of the project is to overcome the flaw of the detector circuit. It uses mostly software since the hardware circuit of the detector could not detect some of the phone signals. The idea of this project is to detect the phone location and alert the users when the user is within the potentially dangerous area.

1.2 Motivation for research

Nowadays, the most common problem in this world is the unauthorized usage of mobile phones in prohibited areas such as examination halls, confidential rooms, prisons, colleges, hospitals, airport, court, and petrol station. This best way to prohibit the unauthorized usage of the mobile phones is to disable the communication feature of the mobile phone temporarily. Hence, a software-based location-based safety alert system is designed to detect the user's current location. If the user is near or inside the potentially danger area, the safety alert system shall alert the users by buzzing an alarm sound. Therefore, the user will be informed that they are in those restricted area. They are reminded to activate airplane mode which disable the communication feature of the mobile phone temporarily. Hence, the safety alert system may reduce and minimize accidents in the restricted areas by notifying the user to not use their mobile phone.

© Universiti Teknikal Malaysia Melaka

1.3 Objectives

i. To develop a mobile application that could detect the user's current location.
ii. To switch the phone mode according to the location detected.
iii. To design a solar charger for the phone attached in this alert system.

1.4 Problem Statements

1.4.1 Aircraft

Using mobile phone aboard planes is banned by almost all airlines and by the air traffic regulations of most countries. However, problems can still arise when passengers forget to switch off mobiles.

Mobile phone and other electronic devices can cause the auto pilot to disengage. The instruments which guide pilots in bad weather can also be affected by the electrical signals from such devices. This may bring potentially catastrophic consequences. **[2]**

An inquiry into the crash of Crossair flight LX 498 which crashed just after take-off, is focusing on a link with mobile phones after testing with the Saab 340, a same model of Crossair flight LX 498 airplane. The tests showed that navigation system of Saab 340 could be disrupted by a mobile phone. **[9]**

© Universiti Teknikal Malaysia Melaka

Figure 1.1: Passenger using mobile phone on plane

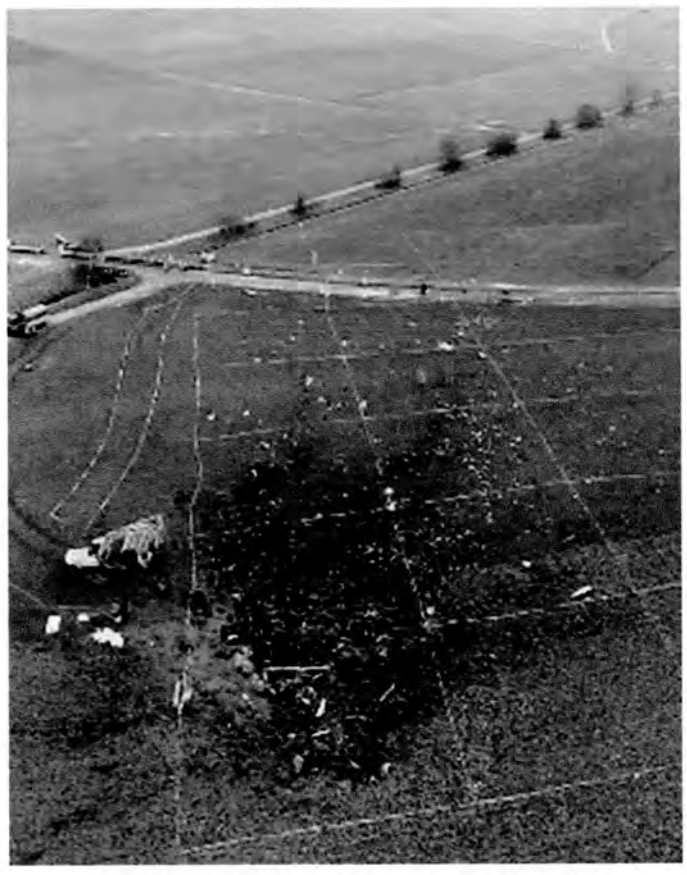

Figure 1.2: Crossair flight LX 498 crashes

© Universiti Teknikal Malaysia Melaka

1.4.2 Petrol Station

Signboards can be found in petrol station to remind users not to use their mobile phones as shown in Figure 1.3.

Figure 1.3: Mobile phone is prohibited in petrol station

However, not much people follows the rules. Some users still make phone call when they are refueling. Figure 1.4 shows a petrol station user making calls while refueling petrol.

Figure 1.4: Using Mobile Phone while refueling petrol

© Universiti Teknikal Malaysia Melaka

The carelessness of users could bring serious consequences to the other users in the petrol station. The highly flammable petrol can cause the tragedy such as fire or explosion. **[10]**

Figure 1.5 shows the accident site at Petronas petrol station. The accident was caused by the usage of mobile phone when a user was pumping gas into the cylinder.

Figure 1.5: Accident Site where the Driver Received Call & Explosion of Gas Happened

1.4.3 Mobile Phone Detector by Tan Chen Wei

A mobile phone detector had been developed by a previous batch student. However, not all phone signal can be detected by the mobile phone detector. It can detect most of the phones except iPhone and some Samsung Android-based phone models. The circuit of the detector was modified to fix the problem but it still failed at last. Therefore, this project will try to solve the problem by using software approach (Android mobile application). The idea of this project is to detect the phone location and alert the users when the user is within the potentially-hazardous area. Figure 1.6 shows the prototype of the mobile phone detector developed by Tan Chen Wei.

© Universiti Teknikal Malaysia Melaka