EVALUATE AND ENHANCE THE PERFORMANCE OF REAL-TIME ACCIDENT ALERT RESPOND SYSTEM IN MALAYSIA BASED ON INTERNET OF THINGS (IOT)

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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This report is submitted in partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering with Honours

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DEDICATION

A very special dedication for my beloved family especially my parents,

Murugan and Marayae

Also for my gracious and supportive supervisor Dr. Norihan binti Abdul Hamid

ABSTRACT

Road accident is a serious issue over the world. It can occur at any time in any time in everywhere. The cases of road accident and road death are becoming common news in Malaysia. The rate of death due to road accident increase due to less of alert notification system provide a facilities fro real-time and fast response. In order to use latest technology that help the rescue team to arrive earlier and victim can be rescue quickly, this thesis introduced a system which is real-time accident alert system through Internet of Things (IoT). This alert notification system is built with Arduino Uno as a microcontroller. Vibration sensor and touch sensor are used to trigger the system when an accident occur. It will be triggered when the vibration level is higher than the standard/normal vibration threshold value. Besides, Applet IFTTT application is utilized to send the location, time and date of the transport that received from GPS module to a specified email. While the GPS modem can track location, time and date of vehicle from satellite. Finally, the data of the vehicle will be sent to the base station and upload to the cloud for monitoring via ESP8266 Wi-Fi module. At end of this project, the rescue team can get the information from the base station which stored in cloud for fast retrieved and manage to reach the accident place in shorter time. Nevertheless, family members also will recieve an emergency email for specific mobile phone number.

ABSTRAK

Kemalangan jalan raya merupakan kes yang serius di seluruh dunia. Kemalangan jalan raya boleh berlaku di mana sahaja dan bila-bila masa. Kes kemalangan jalan raya dan kematian di jalan raya telah menjadi suatu kejadian yang biasa di Malaysia. Peningkatan kadar kematian dalam kemalangan jalan raya ini berlaku kerana tidak terdapat banyak sistem yang memberi amaran pada masa nyata dengan tindak balas yang cepat.Dengan mengunakan teknologi terkini dan mempercepatkan bantuan daripada pasukan keselamatan, tesis ini telah memperkenalkan satu sistem respon amaran kemalangan sebenar melalui Objek Rangkaian Internet (ORI). Pengawal mikro (Arduinio Uno) menjadi pemproses untuk mengawal segala tindakan dalam sistem. Sensor getaran digunakan untuk mencetus sistem. Jika tahap getaran yang lebih tinggi daripada nilai ampang, sensor getaran akan member isyarat kepada Arduino Uno. Global kedudukan sejagat modul (GPS) akan trek kedudukan kemalangan, masa dan tarikh. Selain itu, sistem global komunikasi mudah alih (Applet IFTTT) akan menghantarkan semua data ke e-mel yang dinyatakan. Akhirnya, semua data kemalangan tersebut akan simpan di station pangkalan dan awan dengan mengunakan ESP8266 Wi-Fi modul untuk rujukan masa depan. Dengan ini, pasukan penyelamat boleh mendapatkan maklumat dari stesen pangkalan yang disimpan di awan untuk mendapat maklumat semula dengan pantas dan mereka akan berjaya sampai ke tempat kemalangan dalam waktu yang lebih singkat. Selain itu, pihak keluarga juga akan dapat e-mel tentang kejadian lokasi kemalangan.

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CPU	-	Central Processing Unit
GSM	-	Global System for Mobil Communication
GPS	-	Global Positioning System
Applet IFTTT	-	Applet If This, Then That
IR 4.0	-	Industry Revolution 4.0
Miros	-	Malaysia Institute of Road Safety Research
WHO	-	World Health Organization
IoT	-	Internet of Things
PIC	-	Peripheral Interface Controller
USB	-	Universal Serial Bus
LCD	-	Liquid Crystal Display
SRAM	-	Static Random Access Memory

EEPROM	-	Electrically Erasable Programmable Read-Only Memory
PWM	-	Pulse-Width Modulation
I/O	-	Input/Output
SMS	-	Short Message Service
MMS	-	Multimedia Message Service
ARM7	-	Advanced RISC Machines
RISC	-	Reduced Instruction Set Computer
TCP/IP	-	Transmission Control Protocol/Internet Protocol
ESP8266	-	Espressif System
RFID	-	Radio Frequency Identification
MEMS	-	Micro-Electro-Mechanical Systems
G-Force	-	Force exerted by gravity
PCB	-	Printed Circuit Board
Rx	-	Receiver
Tx	-	Transmitter
Vcc	-	Power supply pin

Gnd	-	Ground pin
CH-PD	-	Power-down mode
ISIS	-	Intelligent Schematic Input System
ARES	-	Advanced Routing and Editing Software
TCP	-	Transmission Controller Protocol
SD card	-	Secure Digital card

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CHAPTER 1

INTRODUCTION

1.1 Project Overview

Rapid growth of population in the world results the large demand to have their own vehicle obviously increase number of vehicles on the road. Road accident is one of serious issue over the world, hence its can occur at anytime and anywhere. According to Malaysian Institute of Road Safety (Miros) report, road accident almost occurs every day. The occurrence of the road accident has increased day by day. Normally when an accident occurs, the nearby people at the incident place will help the victim. However, if the accident occurred in an isolation place means the victim unable to request any help. This system is not just acknowledged where and when the accident happens but helps the rescue team to find and track the right location without delay. The information of the accident is also uploaded to the cloud for future needs.

This project system related with Industry Revolution 4.0 (IR 4.0) as shown in Figure 1.1. The fourth industrial revolution takes the automation of manufacturing processes to a new level by introducing customized and flexible mass production technologies. This becomes possible by introducing self-optimization, self-cognition, and self-customization into the industry. The manufacturers will be able to communicate with computers rather than operate them. The main characteristics of Industry Revolution 4.0 is

- Big data
- Connectivity
- Digitalization
- Artificial Intelligence

This project system is digitalization which working through Internet of Things (IoT). This system can store big data into cloud. Moreover, it is Artificial Intelligence which can capture the accident place using GPS. In addition, this system is related with connectivity which can connect through IoT with GPS and cloud.

Figure 1.1: Industry Revolution 4.0. [1]

1.2 Research Motivation

Road accident is an unforeseen, unplanned event and circumstance. Based on the International Road Federation, approximately 1.3 million people died in road accident per year. 90% of victims from road collision passing away happen in upcoming advance nations. Moreover, yearly road accidents passing away are predicted to be increase to 1.9 million individuals by year 2020 [4]. Car accidents rank as the 9th foremost reason for passing away and record as 2.2% of all passing away worldwide [5].

One of the systems is develop to reduce the rescue time by providing exact GPS location. The system is called vehicle tracking and accident alert respond system. This system provides 2 functions which are tracking and detecting the accident. If a car was lost or stolen, police can track the location and whole day activities of the car through this system. If there is a car collision the system able to detect and automatically send emergency message to the nearest trauma care centre to get help [6].

Some of the rescue teams encounter troubles in contacting the harmed individuals because of late notifications and lack of data of the particular mishap area. Those portable ways need that the injured have to open the application and ask help physically which is not a conceivable for the person who is in serious condition. So that, Internet of Things framework able to send notification to the rescue teams with the exact accident location on the map. This framework provides quick automated vehicle mishap alert and does not need to interact manually whenever there is an accident. The Internet of Things will be useful to the community to make the rescue team to arrive faster to the accident place [7].

Figure 1.2 and 1.3 shows the number of road accident statistics in Malaysia with the number of total registered vehicles, population, road crashes, road death, serious injury, index per 10000 vehicles, index per 100000 population and index per billion from year 1997 to 2016. From the statistic found that in year 2016 was the highest number of road crashes and road deaths which is 521466 and 7152 [2].

General Road Accident Statistics in Malaysia (1997 – 2016)

Year	Registered Vehicles	Population	Road Crashes	Road Deaths	Serious Injury	Slight Injury	Index per 10,000 Vehicles	Index per 100,000 Population	Indeks per billion VKT
1997	8,550,469.00	21,665,600.00	215,632.00	6,302.00	14,105.00	36,167.00	7.37	29.10	33.57
1998	9,141,357.00	22,179,500.00	211,037.00	5,740.00	12,068.00	37,896.00	6.28	25.80	28.75
1999	9,929,951.00	22,711,900.00	223,166.00	5,794.00	10,366.00	36,777.00	5.83	25.50	26.79
2000	10,598,804.00	23,263,600.00	250,429.00	6,035.00	9,790.00	34,375.00	5.69	26.00	26.25
2001	11,302,545.00	23,795,300.00	265,175.00	5,849.00	8,680.00	35,944.00	5.17	25.10	23.93
2002	12,068,144.00	24,526,500.00	279,711.00	5,891.00	8,425.00	35,236.00	4.90	25.30	22.71
2003	12,819,248.00	25,048,300.00	298,653.00	6,286.00	9,040.00	37,415.00	4.90	25.10	22.77
2004	13,828,889.00	25,580,000.00	326,815.00	6,228.00	9,218.00	38,645.00	4.52	24.30	21.10
2005	15,026,660.00	26,130,000.00	328,264.00	6,200.00	9,395.00	31,417.00	4.18	23.70	19.58
2006	15,790,732.00	26,640,000.00	341,252.00	6,287.00	9,253.00	19,885.00	3.98	23.60	18.69
2007	16,813,943.00	27,170,000.00	363,319.00	6,282.00	9,273.00	18,444.00	3.74	23.10	17.60
2008	17,971,907.00	27,730,000.00	373,071.00	6,527.00	8,868.00	16,879.00	3.63	23.50	17.65
2009	19,016,782.00	28,310,000.00	397,330.00	6,745.00	8,849.00	15,823.00	3.55	23.80	17.27
2010	20,188,565.00	28,910,000.00	414,421.00	6,872.00	7,781.00	13,616.00	3.40	23.80	16.21
2011	21,401,269.00	29,000,000.00	449,040.00	6,877.00	6,328.00	12,365.00	3.21	23.70	14.68
2012	22,702,221.00	29,300,000.00	462,423.00	6,917.00	5,868.00	11,654.00	3.05	23.60	13.35
2013	23,819,256.00	29,947,600.00	477,204.00	6,915.00	4,597.00	8,388.00	2.90	23.10	12.19
2014	25,101,192.00	30,300,000.00	476,196.00	6,674.00	4,432.00	8,598.00	2.66	22.00	10.64
2015	26,301,952	31,190,000	489,606	6,706	4,120	7,432	2.55	21.5	9.6
2016	27,613,120	31,660,000*	521466*	7152*	TBP	TBP	2.59	22.6	10.7*

e = Estimated value from Department of Statistics Malaysia
a = Media statement
NA = Not available (The official figures are not available yet)
TBP = To be published

Figure 1.2: General road accident statistics in Malaysia (1997-2016) [2].

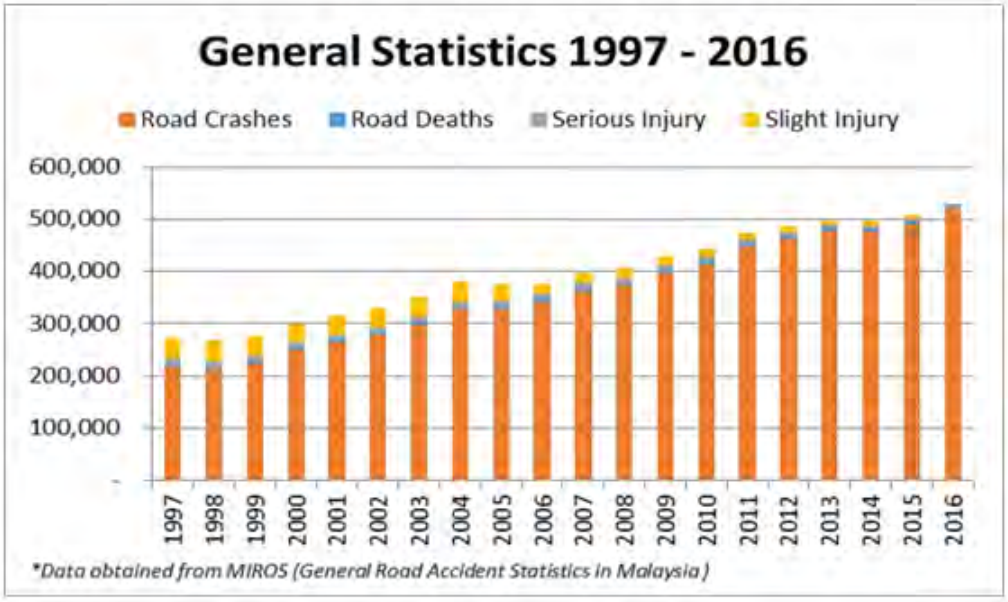

Figure 1.3: The number of road accident statistics in Malaysia from 1997 to 2016 [2].

The data of a number of traffic deaths by country in 2013 was shown by World Health Organization (WHO). Figure 1.3 shows that the number of road deaths in Malaysia is 7129 people in year 2013. Malaysia is in ranked 58 over the world.

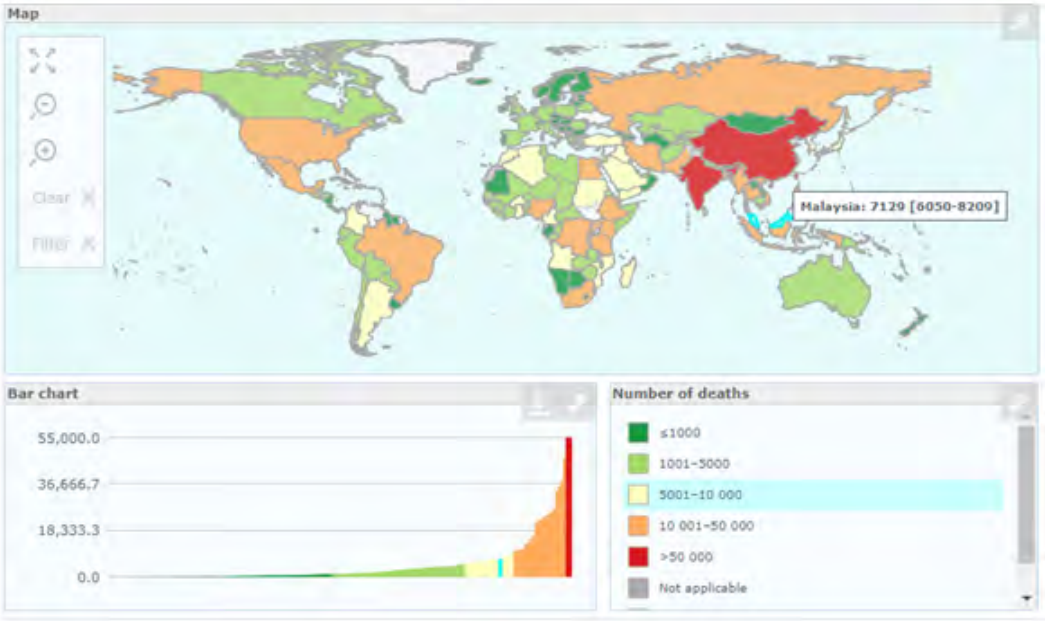

Figure 1.4: The number of road traffic deaths in Malaysia in 2013.

Figure 1.4 shows that the road accident is a major cause of death in Malaysia. People who are killed by road accident are higher than the people who are killed by war and diseases. Road accident usually occurs in a developing country due to the busy life style. Therefore, the road accident has become a serious public health issue in Malaysia.

1.3 Project Objectives

The main objectives of this are:

- To develop a cost effective real-time accident alert respond system through Internet of Things (IoT).
- To analyze the performance of real-time accident alert respond system device.
- To evaluate the performance of the development system.