# THE DEVELOPMENT OF AN AUTOMATIC ACCIDENT ALERT RESPOND SYSTEM THROUGH IOT (AARS SYSTEM)

CHAN SHEAT LEE

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Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer

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**BORANG PENGESAHAN STATUS LAPORAN**
**PROJEK SARJANA MUDA II**

**Tajuk Projek** THE DEVELOPMENT OF AN AUTOMATIC ACCIDENT ALERT RESPOND SYSTEM THROUGH IOT (AARS SYSTEM)

**Sesi Pengajian**

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Signature : .....

Supervisor's Name : DR. NORIHAN BINTI ABDUL HAMID

Date : .....

A very special dedication for my beloved family especially to my parent,

Leow Ah Mooi.

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

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## ABSTRACT

Road accident is a serious issue over the world. It can occur at any time in everywhere. The cases of road accident and road death is becoming a common news in Malaysia. In order to reduce the case of road death, this paper is introduced a system which is used to give notification after the vehicle crash for the purpose of reducing the response time of emergency response. Arduino Mega 2560 is act as a function like CPU which is used for controlling the whole system devices. Vibration sensor is used to trigger the system when an accident occur. It can be triggered when the vibration level is higher than the vibration threshold value. Besides, a GSM SIM900 module is used to send the position, time and date of the vehicle that are received from GPS module to a specified phone number. While the GPS modem can track the location, time and date of the vehicle from satellites. Lastly, the data of the vehicle will be sent wirelessly to the base station and upload to the cloud for monitoring via ESP8266 Wi-Fi module. However if the victim is not facing serious injury, they can press the button for cancelling the message.

# ABSTRAK

Kemalangan jalan raya merupakan kes yang serius di seluruh dunia. Kemalangan jalan raya boleh berlaku di mana-mana dalam apa-apa masa. Kes-kes kemalangan jalan raya dan kematian di jalan raya telah menjadi suatu keadaan yang biasa di Malaysia. Demi mengurangkan kes-kes kematian di jalan raya, kertas ini telah memperkenalkan satu sistem yang dapat memghantar mesej setelah kemalangan berlaku untuk mengurangkan masa tindak balas. Pengawal mikro (Arduino Mega 2560) 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 Mega 2560. Global kedudukan system modul (GPS module) akan trek kedudukan kemalangan, masa dan tarikh. Selain itu, sistem global komunikasi mudah alih (GSM SIM900 module) akan menghantarkan semua data ke nombor telefon bimbit yang dinyatakan. Akhirnya, semua data kemalangan tersebut akan simpan ke awan dengan mengunakan ESP8266 Wi-Fi modul untuk rujukan masa depan. Jika mangsa kemalangan tidak menghadapi sebarang cedera yang serius, mereka dapat menekan butang tersebut untuk membatalkan mesej.

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| | | |
|---|---|---|
| CPU | - | Central Processing Unit |
| GSM | - | Global System for Mobile Communication |
| GPS | - | Global Positioning System |
| Miros | - | Malaysia Institute of Road Safety Research |
| IoT | - | Internet of Things |
| PIC | - | Peripheral Interface Controller |
| USB | - | Universal Serial Bus |
| SRAM | - | Static Random Access Memory |
| EEPROM | - | Electrically Erasable Programmable Read-Only Memory |
| PWM | - | Pulse-Width Modulation |
| I/O | - | Input / Output |
| GPRS | - | General Packet Radio Service |
| AT | - | ATtention |
| SMS | - | Short Message Service |
| ARM7 | - | Advanced RISC Machines |
| RISC | - | Reduced Instruction Set Computer |
| DoD | - | Department of Defence |
| TCP/IP | - | Transmission Control Protocol / Internet Protocol |

| | | |
|---|---|---|
| UART | - | Universal Asynchronous Receiver/ Transmitter |
| CPU-AHB | - | Central Processing Unit–Advanced High-performance Bus |
| ESP 8266 | - | Espressif System |
| RF | - | Radio Frequency |
| MEMS | - | Micro-Electro-Mechanical Systems |
| G-Force | - | Force exerted by gravity |
| MMS | - | Multimedia Messaging Service |
| ITS | - | Intelligent Transportation System |
| PCB | - | Printed Circuit Board |
| Rx | - | Receiver |
| Tx | - | Transmitter |
| Vcc | - | IC power supply pin |
| Gnd | - | IC Ground pin |
| Sats | - | Satellites |
| CH-PD | - | Power - down mode |
| ISIS | - | Intelligent Schematic Input System |
| ARES | - | Advanced Routing and Editing Software |
| TCP | - | Transmission Controller Protocol |
| AARS | - | Accident Alert Respond System |
| SD | - | Storage Car |

# CHAPTER 1

# INTRODCUTION

## 1.1 Overview

The rapid growth population in the world and large demand to have an own vehicle has caused the increasing of vehicles on the road. This phenomenon is getting worst when most of the family is starting to buy multiple cars. Based on Miros survey, road accident almost occurs every day. The occurrence of the road accident has increased alarmingly day by day. When an accident occurs, the nearby people will give a help for the victim. However, the problems still occur if the accident happened in an isolation place without any vehicle passed by. The victim cannot request any help. Besides, sometimes it is hard to track accident location. Therefore this project proposes a designing of an automatic accident alert respond system which is used to give notification after the vehicle crash in order to reduce the response time of emergency response. The information of the accident is also uploading to the cloud for future needs.

## 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 and almost 3000 people deaths per day [1]. The Global status report on road safety 2015 shown that the rate of a road crash is the highest in low-income countries [2]. Most of the road accident is caused by lack of emergency respond time. Sometimes, the rescue time is wasted while waiting for the ambulance.

Malaysia is a developing country. The rapid growth in population and technologies is proportional to the increasing of number of vehicles on the road in Malaysia. Nevertheless, the number of the road accident also is increasing. According to the fact in 1999, the road accidents in Malaysia exceed to 223000 cases. Almost 16 people died per day in 1999[3]. The rate of the road accident is becoming a global issues today. Based on the general road crashes data Miros, the rate of road crashes increases significantly year by year. Although the government has solved the problem by giving a road talk to the road user, penalty and punishment the road user who ignores the road rules, the number of road accident still increases.

The data of a number of traffic deaths by country in 2013 was shown by World Health Organization (WHO). Figure 1.1 shows that the number of road deaths in Malaysia is 7129 people in 2013. Malaysia is in ranked 58 over the world.

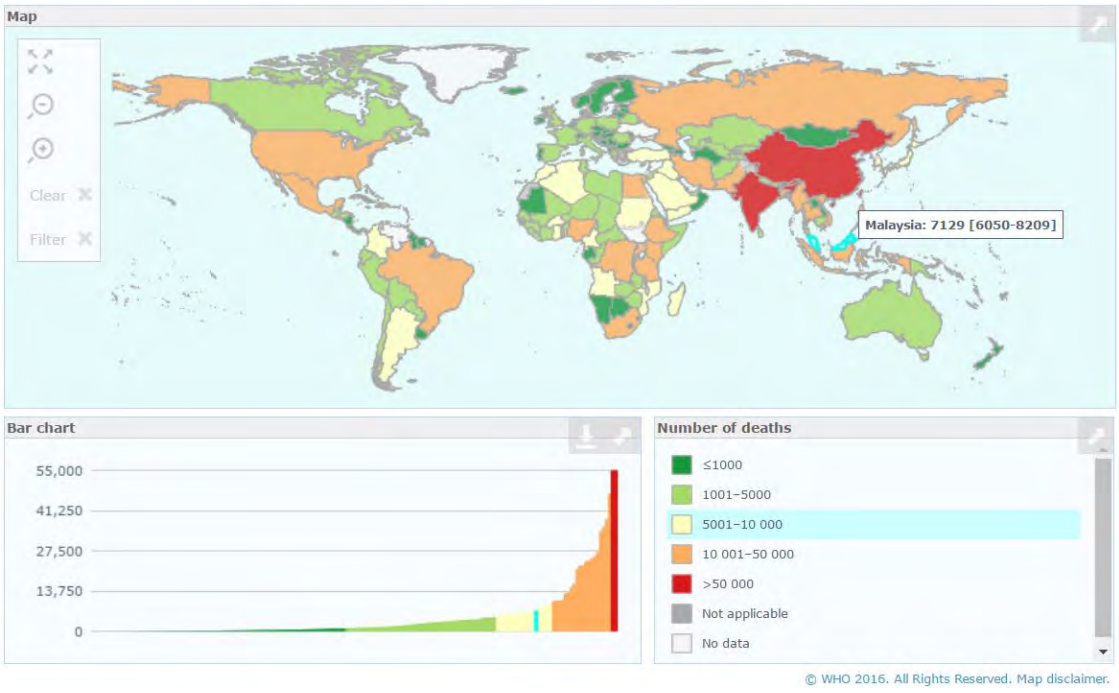


Figure 1.1： The number of road traffic deaths in Malaysia in 2013 [2].

Figure 1.2 show the general road accident data in Malaysia from the year 1997 to the year 2004 by Miros. From the figure, observation found that the figure show the rate of road crash is increasing dramatically from 215632 cases to 476196 cases. Among the road crash, there was also increased in the number of road death in Malaysia. Figure 1.3 shows that in 1997, the number of road deaths were 6302 people and increasing to 6674 people in 2014[4].

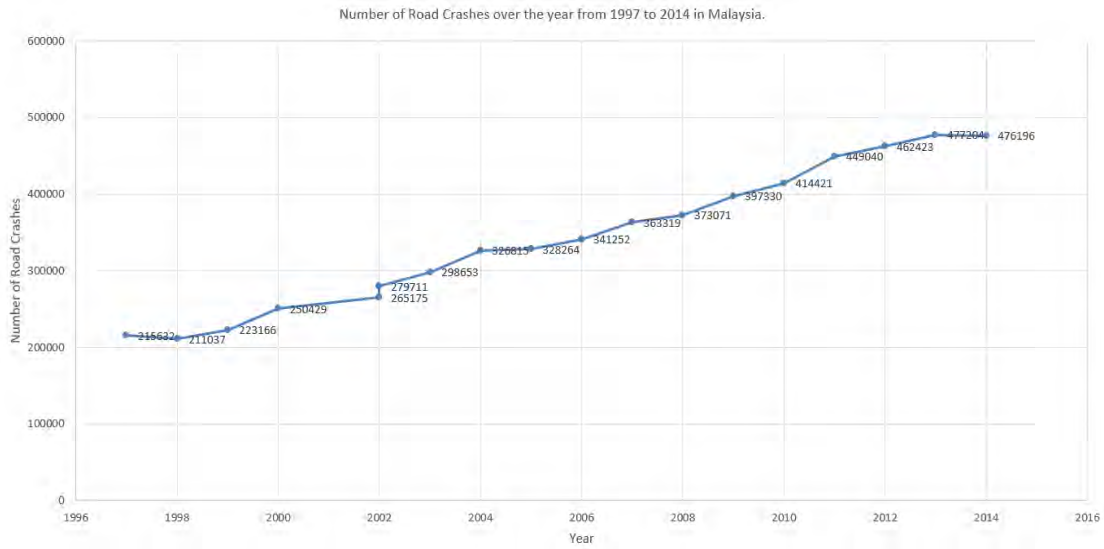


Figure 1.2: Number of road crashed from 1997 to 2014 in Malaysia.

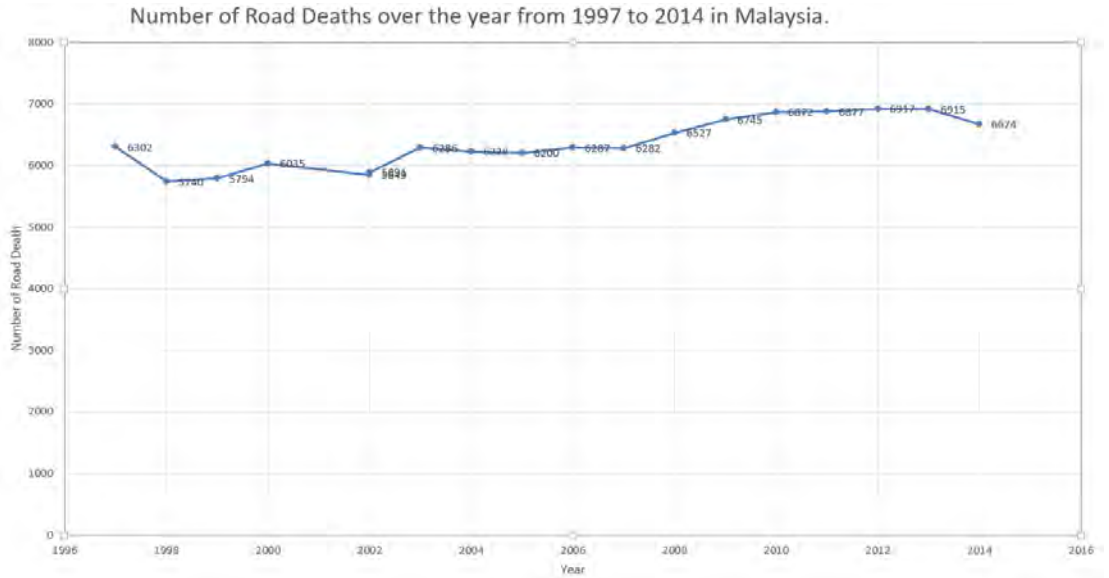


Figure 1.3: The number of road deaths from 1997 to 2014 in Malaysia.

The road accident is a major cause of death in Malaysia. People who are killed by road accident is 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 Objectives

The main objectives of this project are:

- To design an automatic accident alert respond system that can connected through IoT (Internet of Things).
- To develop an automatic accident alert respond system which can send the emergency notification more quickly to prevent the death in lack of rescue time.
- To analyze the performance of device of automation accident alert respond system.

## 1.4 Problem statement

When an accident occurred, the nearby people would give a help for the victim. However, the problem still occurs when an incident happens in isolation area. In this situation, the victim cannot request any help and delay the rescue golden hour. In fact, most of the death was due to the delayed of rescue operation time. Therefore, this system will be an important device for the victim because its can convey a message and send the rescue signal to the authority while in an isolation place.

## 1.5 Scope of work

Scope of this project is based on the three objectives which are stated in the previous section. This project is used to design an automatic accident alert respond system via Internet of Things (IoT) in order to send the emergency notification in the shortest period and prevent the road death caused by lack of respond time. The performance of the system is analyzing and evaluating by doing the experiment. The

important knowledge should know in this project is the technique on how to interface the Arduino Mega 2560, switch, vibration sensor, GSM SIM900 module, GPS, and ESP8266 Wi-Fi Module. Besides, the data such as incident location date and time will be uploaded to the cloud for future reference. This project is including 4 different stages. The first stage is concern about the concept of the whole design. The design is simulate using Proteus 8 Software. The second stage, the system is built and the connection between each components is tested. The third stage is to fabricate the components, measure the performance, functionality and capability. Finally, the prototype is coming out.

## 1.6 Thesis outline

This thesis consists of five chapters. It explains and discusses each detail description for each chapter.

I. Chapter 1- Introduction

The introduction briefly describes road crashes in Malaysia and over the world. The introduction is also including the objectives of the project, problem statement of the project and the scope of the project.

II. Chapter 2-Literature Review

In order to increase the knowledge for this research, reading on past year thesis, related journals and articles are a must in this part. Some of the useful knowledge can be taken from the related references for the improvement for automatic accident alert respond system through IoT. The comparison is completed for the different type of microcontroller, the different sensor used for these design and their function.

III. Chapter 3-Methodology

The methodology has explained the method used to complete the design system. The flow chart also considered as a method. Proteus 8 software will help to simulate the function and make people understand clearly the whole concept. Arduino IDE software is used to compile the source code and convert it to a hex file.

IV. Chapter 4-Result and Analysis

Several experiments were done for analyzing the function of the design system is reached the goal of expected outcome. The data will be collected and proved that the project is success.

V. Chapter 5-Conclusion and Recommendation

Few suggestion and future improvement will be discussed in this section. The result and analysis for the whole project were be concluded in conclusion.

## 1.7 Summary

In this chapter, the research of the total case of accidents occur in Malaysia is covered. From the total case of accidents, the people have died in the accident is increasing dramatically year by year. Therefore, a system is design for reducing the case of people death in road accident. Objective and problem statement of the design system is mentioned in chapter 1. Besides, scope of the system is also will be briefly descript in this chapter.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Overview

This chapter will present the total road accident cost and total number of people death in 2016 in Malaysia. The previous or similar project that had been done will also discuss in this chapter. Other than that, the comparison between microcontroller, Arduino Uno and Arduino Mega will be discussed. Besides, both GSM SIM300 module and GSM SIM900 is compared. The information of each component like, GPS, vibration sensor and ESP8266 Wi-Fi module is described in this chapter.

## 2.2 Background

Road accident in Malaysia is increasing tremendously year by year and the death rate is also increasing. Based on the article road accident cost Malaysia RM9.2 Bil in 2016 by Gan Pei Ling, total number of people killed in road accident are 7152 people in 2016. The death rate due to road accident is increase slightly which is 2.59 person per every 10000 registered vehicles compared to 2.55 person in 2015 [3]. Therefore, an accident alert respond system should be introduced in order to prevent the rate of increasing of people death in Malaysia.