Real Time Accident Alert System Through Internet of Thing (IoT)

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ABSTRACT: Recently, cases of road accidents and deaths are the most common news in Malaysia every day. Most of these fatal cases are due to the delay in emergency rescue assistance or improper medical treatment on the scene. Moreover, an increasing number of road accidents is also correlated with the lack of real-time accident alert notification provision- to alert the emergency response team, and the authorised person within a fast response time. Therefore, in this paper, a real-time accident alert system through the Internet of Things (IoT) prototype was designed and developed; the device performance was also presented. This prototype is built with Arduino microcontroller that has been integrated with a vibration sensor, GSM and a Wi-Fi module. Applet IFTTT application is utilised with a GSM modem to send the location, time and date of an accident to a specified email. As a result, a simple and cost-effective real-time accident response system has been built with a wide capability of storing accident details in cloud storage. The benefits are that the emergency response team and the authorised person can retrieve and manage the data that are provided in the shortest time irrespective of the location.

Keywords: *Accident alert respond; sensor; GPS; IoT microcontroller*

1. INTRODUCTION

Road accident is one of the serious issues the world over, which can happen anytime and anywhere. According to the Malaysian Institute of Road Safety (Miros) report, a road accident occurs almost every day [1]. Normally when an accident occurs, the victim will get help from the people who are near the incident. However, if the accident occurs in an isolated place, the victim may be unable to request for any help [2]. As it is unknown where and when an accident can happen, especially when the tragedy occurs at an isolated and rural place, this system is not just to acknowledge where and when the accident happens but it can help the rescue team and the authorise person to find, track the right location, and give help to the victim without delay [3,4].

This project involved various electronic component connection and was integrated with the Internet of Things (IoT) devices whereby wide details of accident data can be saved in cloud storage using GSM and WiFi module [5]. At the same time, the data will be able to capture and retrieve within a fast respond time in order to manage and to help the victim at the accident scene.

2. CONCEPT AND SYSTEM DEVELOPMENT

Figure 1, shows a block diagram to explain the concept of a real-time accident alert system development. Basically, the input system will consist of power supply, switches and a vibration sensor. Arduino UNO microcontroller is use for the interfacing between the software and hardware component. GPS will detect the vehicle location and provide information through the command in the microcontroller unit and send the location coordinate to the IoT platform or cloud storage. At the same time the message will also be sent to a mobile phone using the apple IFTT respectively. All data and information that are provided in the cloud can be retrieved at any time and from anywhere.

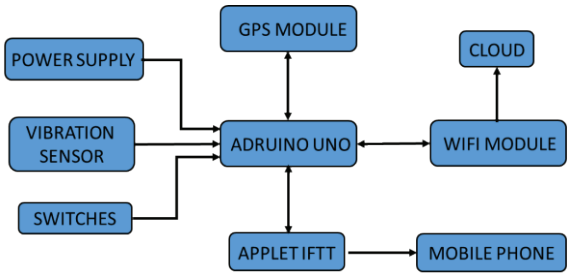

Figure 1. Block diagram for the real time accident alert system

3. RESULTS AND DISCUSSIONS

The vibration sensor that is installed in the prototype acts as an impact sensor or accelerometer in the real vehicle. Therefore, when the vibration sensor is triggered, the GPS module will track the time, date and the accident location through Adruino interfacing. With the command in this Adruino, the data are then sent to the Thingspeak web server, which is the cloud storage for this real time accident alert system. The Thingspeak web server then triggers and communicates with the Applet IFTTT and sends the location of the place of the accident to the specific email. Figure 2, illustrates the location of the accident that is stored in the Thingspeak web server once the vibration sensor is triggered. Figure 3, shows the location of the accident, sending through an email to an authorised rescue team

or a specific mobile phone. The exact accident location can also be configured by allocating the longitude and latitude coordinates in google map or the waze application. Without time delay, the shortest and fastest way can be used by the rescue team to reach the scene of the accident, and might avoid a worsening in the condition of the accident victim.

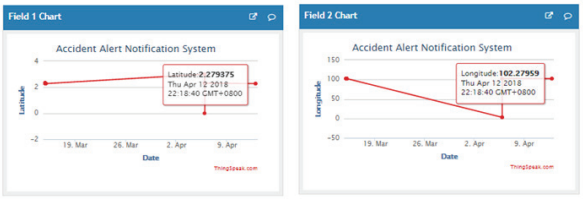

Figure 2. Location of display in Thingspeak web server using vibration sensor.

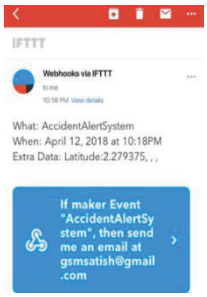

Figure 3. Notification accident sent through an email.

Figure 4, depicts the location that can be displayed in the google map when the coordinate location is configured in the application. With this guidance the rescue team will manage to reach the scene of the accident without further delay and might prevent any unforeseen incidents from happening.

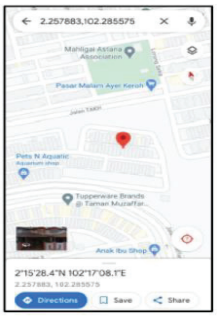

Figure 4. Location display in google map

Apart from getting the prototype development result, an experimental analysis is also carried out to determine the system performance including component and signal in sending the message through the email and IoT platform, respectively. One of the experiments that had been carried out was the experimental effect of the vibration sensor with the environmental factors. Figure 5 illustrates that the vibration sensor is not affected by any environmental conditions such as the rain, wind and external sounds such as a vehicle's horn or a noisy place. The vibration sensor will only be affected when the impact is higher than the threshold value. This threshold value is set as the beginning of the system. In a real situation the threshold of the impact sensor is based on the calculation of the impact that normally exists in a vehicle collision.

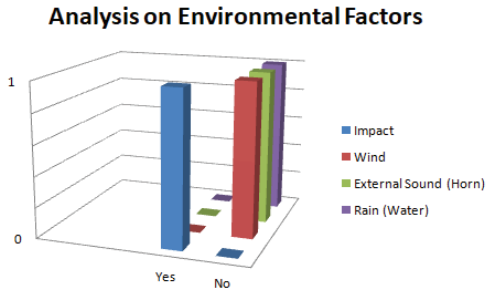

Figure 5. Different type of environmental factor effected to vibration sensor.

4. CONCLUSION

At the end of this paper, the real-time accident alert system through the Internet of Things (IoT) prototype was successfully developed and tested. If this prototype can be implemented into every vehicle, it can notify the rescue team and an authorised person without delay. Significantly, it can prevent unforeseen happen to the injured person and victim at the accident location. The experimental analysis on the devices system such as vibration sensor also result that impact signal is not affected to the environmental condition such as rain, wind, noisy condition exclude the impact factor that reach at the certain threshold value.

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