International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 07 | July 2019 www.irjet.net p-ISSN: 2395-0072

Disaster Notification System

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Abstract - This study will explore how to combine the usage of Internet and technology to provide a convenient and rapid method, in order to notify rescue unit when emergency occurs and seize the golden rescue time. By implement of automatic notifications, rescue units can be notified by the system and send out rescue team when victims are unable to move or in coma. By using the existing tools, google-api, sensors, wireless network devices (wifi, Bluetooth…etc.) and other devices, we can build an automatic notification system that can also combine drunk and drive prevention function, in order to provide a more rapid and reliable disaster protection network.

***Key Words*: Automatic notification, Manual notification, drunk and drive prevention**

1.INTRODUCTION

Cars have been one of the most assured tools since the 19th century. With the frequent use of vehicles, the frequency of traffic accidents has increased year by year. According to the statistics of the Ministry of the Interior, there have been about 160,000 car accidents in Taiwan per year, averagely[1], hundreds of accidents every day. According to the data base, these accidents are caused mainly by drunk driving. How to prevent drunk driving by using technology, and how to perform the best treatment when an accident happens has become a Very important issue. The research will use latest technology to compensate for the lack of functionality of current in-vehicle systems and to develop a software system to work with wireless networks. In a traffic accident, automatic accident analysis, immediate contact concerned department or friends/relatives can prevent subsequent irreparable disasters; and can even avoid alcohol accidents caused by drunk driving, by adding alcohol sensors to achieve the best accident prevention effect.

2. LITERATURE REVIEW

At present, there are some methods to achieve automatic notification system; including using sensors and GPS to resolve the current address, using impact sensors to generate potential difference signals when impact occurs, through which to identify the occurrence of car accidents, and using GPS with Google services to convert longitude and latitude addresses into readable Taiwan addresses are finally transmitted to disaster relief units and family members via wireless networks to achieve immediate notification. Based on this method, this study will add the function of drunk driving detection. According to Article 114 of the Road Traffic Safety Rules, alcohol concentration in exhaled breath after drinking alcohol or other analogues will be added. Those who reach 0.15 mg/l or 0.03% alcohol concentration in blood are considered drunk drivers. The principle of alcohol sensor is that when the human body exhales, the exhaled carbon dioxide and other gases, along with the increase and decrease of alcohol concentration in the air, make slight changes in the internal circuit of the sensor, such as the resistance value of the sensor increases and decreases, and make use of it. This characteristic (resistance value increases or decreases) will be able to determine the alcohol concentration, and then detect the alcohol concentration of driving. When the alcohol concentration exceeds 0.03%, drivers will not be able to start or turn off the engine of the vehicle, and by adding a fingerprint identification system to prevent cheating such as driving by inviting people to do the testing. By combining the notification system, inform relatives, friends and taxi drivers to assist in transportation transfer.

3. CONCEPTUAI FRAMEWORK

3.1 Vehicle system

The main body of the system displays the disaster information on the map and provides the detailed disaster information to the drivers (ex. traffic accident, flood, fire, etc.). It also connects with the microcontroller and receives the information transmitted by the microcontroller for processing. Disaster notification can be switch between automatic and manual function. When disaster occurs, disaster relief units can be notified actively. The automatic function is that when self-driving traffic accident occurs, disaster relief units can be notified automatically through the detection of sensors and trigger the notification function.

3.2 Microcontroller

Processing the information transmitted by the sensor, and transmitting the information analysis to the vehicle system with the customized communication protocol, the system will then process the transmitted information accordingly. Connected sensors are: 1. Alcohol sensor 2. Impact sensor 3. GPS.

The alcohol sensor will be use when the driver's alcohol concentration is higher than 0.05%, it will be impossible to start a vehicle (Note 1: Article 185.3 of the

Criminal Law stipulates that driving a power vehicle in one of the following circumstances shall be sentenced to fixed-term imprisonment of not more than two years and a fine of not more than NTD.200,000: the alcohol concentration in exhalation reaches 0.25 mg/l. Or the concentration of alcohol in blood is above 0.05%.)[2]

A car accident occurs, there will be a strong impact. The function of the impact sensor is to measure the impact force. When the impact force is greater than 55km/h, it will cause fatal damage (Note 2: 56km/h standard formulated by EU)[3]. When the impact is greater than this value, the automatic notification function will be triggered. This function will automatically turn GPS' longitude and latitude to an actual address, and send messages to disaster relief units ex 119, 110 and so on. This information will also be transmitted to the driver's family member in order to grasp the rescue time and improve the survival rate of the injured.

The system gathers the current latitude and longitude, it will analyze the data through the microcontroller and send it to the system in the vehicle. The vehicle system will then connect to the Internet and Google's latitude and longitude address conversion service, and convert the data to a more readable address.

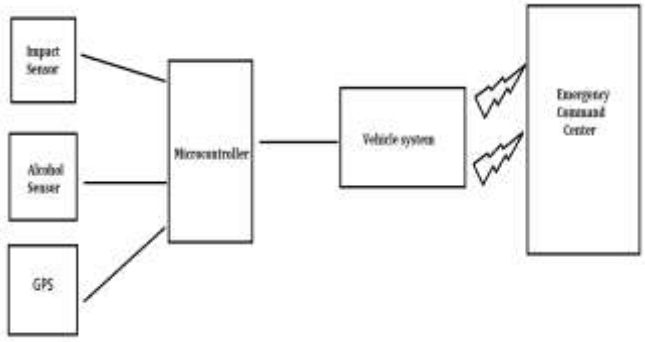

Fig -1: Architecture.

4 Methodology

4.1 Vehicle system

Based on the framework of Microsoft. net framework, this paper develops a map interface using GMAP. net to facilitate users to know the current on-road situation.

GMAP. net is a powerful cross-platform open source network component with road navigation, geocoding, and it supports various types of maps such as yahoo, Google…etc.

4.2 Latitude and longitude decoding

The longitude and latitude are converted to address by the API service provided by Google, and the longitude and latitude are transmitted to the Google service through HTTP protocol[5]. Google parses the data in XML and JSON format[6] and passes it back to the user as follows:

4.3 Detect alcohol

The material used in MQ-3 alcohol sensor is tin dioxide (SnO_2) with low conductivity in clean air. When there is alcohol concentration in the environment, the electrical conductivity of the sensor increases with the increase of alcohol concentration in the air. Through this characteristic, we can know whether the driver is drunk or not.

4.3 Detect accident

The impact sensor will alter the conductivity according to the magnitude of the pressure. The higher the pressure is, the higher the conductivity will be. Through this characteristic, we can know whether the impact force endangers the safety of driver's life.

5. EXPERIMENTAL RESULT

When user is driving, the system will show the current location, vehicle condition information, including traffic accidents, fires, and floods and so on. See Fig-2

When disaster occurs, manual notification can be made through the notification button.

The system will automatically convert the longitude and latitude read by GPS into the current address through google-API when entering the notification screen to fill in the type of disaster. See Fig-3

When the information of the accident is detected, it will be transmitted to the disaster relief unit. It will also send the accident information channel system to user's mobile terminal. See Fig-4

And when the driver is in excessive alcohol concentration, it will not be able to start the engine of the vehicle, and the system will also notify the driver to avoid the occurrence of drunk driving.

Hardware simulation of alcohol detection, when the alcohol concentration exceeds 0.05%, the LED light will turn on

Fig -2: Information of map

Fig -3: Notify disaster

Fig -4: Information of the accident

6. CONCLUSION

This system can improve the current traffic safety problems and prevent the occurrence of drunk driving. Drivers can know the traffic conditions better through the disaster notification system to avoid the occurrence of continuous traffic accidents due to road conditions. Finally, the automatic notification system is added in order to help the victims when no one is around.

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