PAPER • **OPEN ACCESS**

Internet of Things Based Drivers Safety Management

To cite this article: Tahseen Alawi Ahmad 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* **928** 032074

IOP Conf. Series: Materials Science and Engineering **928** (2020) 032074 doi:10.1088/1757-899X/928/3/032074

Internet of Things Based Drivers Safety Management

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Abstract

The vast majority of crashes are caused by the driver's negligence about wearing seatbelts while using electronic devices while on the road where the health about drivers rests in the driver's hands on the road. The aim of this article is to reduce the use of mobile devices while driving. This project was designed to ensure that the driver ties his seatbelts and also the mobile device is brought in silent mode before everything is determined for the drive. This can be done utilizing the Arduino controller which has been connected to the ESP8266 WiFi module, to detect the seat belt and the mobile Android service running in the back of the driver's mobile device. Mobile mode is switched from active mode to silent mode once Wi-Fi is turned off.

Keywords: ESP8266, PIC Microcontroller; Arduino Board, GSM Module, , Android Service; Seatbelt Checker.

1. Introduction

According to World Health Organization (WHO) road safety reports, safety belts are a necessary means to protect passengers from injuries and accidents, . Safety belts while driving represents the life and death gap. People don't wear seatbelts because of discomfort, weight gain or occasionally forgets to wear them in a hurry. Based on Sussex university reports in Britain, they stressed that the drivers 'use of the mobile phone and the failure of the seat belt while driving drove drivers' attention and thus leads to accidents and deaths. According to World Health Organization (WHO) road safety reports, safety belts are a necessary means to protect passengers from injuries and accidents, . Safety belts while driving represents the life and death gap. People don't wear seatbelts because of discomfort, weight gain or occasionally forgets to wear them in a hurry. Based on Sussex university reports in Britain, they stressed that the drivers 'use of the mobile phone and the failure of the seat belt while driving drove drivers' attention and thus leads to accidents and deaths.

Experts stressed that the excessive speed of up to 300 km / h accompanied by the failure to fasten the seat belt resulted in an increase in traffic accidents and, consequently, deaths. According to the United Nations, traffic accidents have killed more than 1.25 million people worldwide and infected as many as 50 million annually. The international organization has urged nations to do more to enforce policies on road safety and vehicle health and has set a target of halving global road traffic deaths by 2020 [1][12].

The use of mobile devices while driving increases the incidence of accidents worldwide. The use of mobile devices to talk, correspond or visit accounts on social media sites increases the risk ratio by up to four times, and the use of smart devices while driving, whether on highways or in the middle of cities, especially busy areas and intersections, the driver loses the level of concentration required by driving, which causes him to cause traffic accidents.

Multi-tasked people as well as others are willing to risk their personal safety, because they can not resist utilizing mobile devices while driving [2].

The proposed model can be used in cars through the integration of the ignition control system in the vehicle. This gives an opportunity guaranteed for the driver to carry out two things: ensure safety belt and ensure that the mobile device is in silent mode.

The vast majority of injuries are caused by the driver's confusion about using seat belts and mobile devices while on the move.

The core purpose of this research manuscript is to guarantee that the driver to fasten his seat belt and also put the device in silent mode before car engine turns on. This work can be done through the use of the Arduino controller which has been connected to the ESP8266 WiFi module, to detect the seat belt as a mobile service operating as a background for the device and driver[3][17].

2. Related Works

Recently, there are more interests in driver safety monitoring and management. The following is a sample of many articles on this subject:

In 2015[1], Abdulbaqi, Azmi Shawkat., Khadim, Sameer, presented a method about Real-Time Safety Automobile Driver System to monitor and analyze the driver's fatigue level online.

In 2016[2], Sneha.H. Dhoria, B.Sandeep, G.Narendra Santosh Kumar, and M.Srivatsava presented an article to design a back stopper technique to conquer barriers to vehicle rolling back on inclined roads without the use of any special driving skills.

In 2018[3], Prithviraj Digole, Ravi Lipne, and Sahil Soygaonkar, introduced an article about Driver Safety Management System utilizing IoT. The authors used RFID sensor, Alcohol sensor, Ultrasonic sensor to detect the driver case.

3. Methodology

The aim of the system is to assist the driver to focus on the way while driving especially in crowd places. The system will turn off the mobile device while driving and give the driver an alert that the seat belt is open and not in safety mode, otherwise the driver cannot operate the engine of the car.

4. Method and Materials

There are several requirements must be met to complete system implementation in order system more efficient,:

- An infrared sensor (IR),
- GSM module any version,
- PIC Microcontroller,
- Wi-Fi Module type ESP8266,
- L293D engine driver unit, and
- LCD screen for output.

5. Mobile Based System

There are several applications at present which are designed to make the mobile device in silent mode detect motion through GPS and use accelerometer sensors. It is necessary to login the internet in order to utilize GPS service, this service is not available

overall mobile devices, and the failure to get the mobile location to turn it to the silent mode[4].

There are many applications used to consider the speed and enable the mobile device to get silent mode. Also, this application gives the user the ability to execute up to 6 applications. These application are available in iOS systems, enabling the user to use the same mechanism and provide the possibility to make the mobile in the silent mode automatically or manually[4][15].

6. Auxiliary app features

Support systems offer many additional services that add comfort and safety to drivers:

- Automation Map: The application will automatically detect the starting time of the vehicle, as this feature is set in the application automatically.
- Mobile Calls Block the and texts.
- Auto reply to Texts and Calling.
- Mobile secure key off.
- Auto Wi-Fi off.
- Auto Bluetooth off.
- Mobile Battery Optimization[5][14].

7. Proposed System Background

The proposed system utilize Arduino controller unit that connect directly with ESP8266 module. This includes receiving signals from an infrared sensor (IR), and Job Scheduler () for android service. The IR infrared wait positive signal comming from seatbelt detector to ensures that the seatbelt is secured, and at the same time the mobile device is brought to silent mode utilizing Job Scheduler() generated utilizing the Android studio package. This SW take advantage of the Audio Manager() function to take mobile device into silent mode, , and also enabled the call forward mode when no calls are answered. All of these SW and HW are directly connected to the Arduino board via a dedicated port.

For silent mode, if the driver receives a calling from others for more than two times during silent mode, the caller ID will be displayed later on a small LCD screen connected to the car and controlled by a PIC Microcontroller. This procedure is useful for drivers as it restricts the useing of mobile devices behind the steering wheel

7.1 Arduino Board

The board is utilized in the proposed system consists of a board type Arduino UNO type MEGA with microcontroller type ATmega328 that connect directly with the motherboard by 6 analog input pins and 14 digital in/out pins. The oscillator used with this board type crystal oscillator and have 16MHz size. All these accessories are directly connected by the personal computer (PC) to start operation by utilizing USB cable port[6][18].

Fig 1 Arduino Board

7.2 ESP8266 Wi-Fi Module

A small chip ESP8266 based on IEEE 802.11 b/g/n Wi-Fi has distinguished with a low cost and can be connected with the stack TCP/IP for purposes of communicating with other devices through a particular digital signal where a ESP8266 Wi-Fi Module will host the service of Job Scheduler () at the mobile devices.

Fig 2 ESP8266 Wi-Fi Module

ESP8266 WiFi module is the most popular module for IoT applications. This ESP 8266 module can be communicating Via Arduino UNO according the following figure:

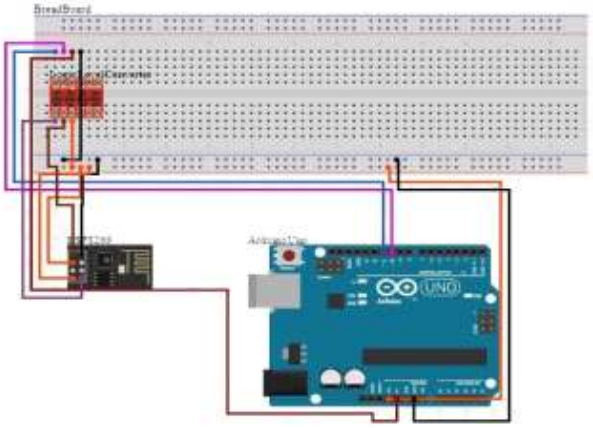

Fig 3 communicating ESP 8266 Via Arduino UNO

There are several applications can be used to connect ESP8266 WiFi module with other devices such as Circuito.io application[7].

Fig 4 Adding Connectivity

7.3 SIM 900 Module (SIMCom wireless modules (SimCWM))

A GSM Module can be used separately as a device for calling, and sending /receiving texts where its compatible with any of the controllers. This module operates at Quadband 1900 MHz. It has a slot called SIM Slot which inserts a network operator SIM. This unit can communicate with a controller through AT commands[8].

Fig 3 SIM 900 GSM/GPRS Module

The applications of SimCWM wireless modules have been applied in various fields:

- Automobile-meter reading
- Management Healthcare
- Telematics
- Automobile
- Implement the Industrial automation
- e-Payment
- Security
- Tracking and tracing Devices.

7.4 PIC Microcontroller

The PIC Microcontroller consists of 40 pins. The input/output set has been allocated to 33 pins. The applications in which this Microcontroller is used are various, due to it have very popular and useful in security devices as well as safety. For purposes of measuring system quality efficiency and monitoring the results, Microcontroller is connected to the LCD module as well as GSM with it[9][13].

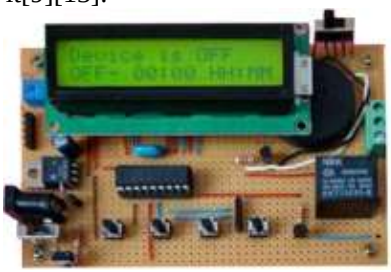

Fig 4 PIC16F877A

7.5 The Engine Operating Unit (EOU)

In order to turn on the car engine, utilizing a DC motor that is controlled by the Arduino Umo. The behavior of driver's engine unit is as a connection between the DC motor and the processor unit. The behavior of driver's engine unit is as a connection between the DC motor and the processor unit[11].

Fig 5 L293D Engine Driver Unit

7.6 Seatbelt Checker

Security on the driver is one of the most critical safety conditions. Seatbelt checker is used to ensure the driver is wearing the seatbelt or not. It's made with IR sensor. It has two IR Tranmitter and IR Receiver sections. The IR emitter contains of IR led and a series of resistors that emit infrarot light and are positioned at the belt end. Checker is used to checking if the driver put the seatbelt or not by utilizing IR sensor that consists of IR Tranmitter (consists of IR led emits infrared light and series resistance is fastened to the belt end), and IR receptor (placed at the other made of a photodiode).

At this point, after fastening the seatbelt and setting the mobile to the silent mode utilizing Wi-Fi, the photodiode receives the infrarot light and the processor receives a positive signal to turn the motor on. [10].

8. The Operating Scenario and System Implementation

The module of Wi-Fi is turned on that will run Android service in the mobile device and then turn a mobile device silent mode. The GSM module receives the calls. The Arduino UNO controller module receives the incoming signal from the seatbelt checker. The Arduino Uno received an incoming signal via pins, and it is sent a positive signal from the processor to pin L239D to in order to enable car engine turned on.

During driving, when receiving a call, an automatic reply a text message is sent via the GSM module accepting the AT command to tell the caller that the driver in driving mode.

The LCD screen displays the number that dials several times connected to a small alert device for driver alert. This feature is useful in case of emergency.

When the driver turns off the car, then the Wi-Fi network connection is cut-off. Then, the application suspends working when the mobile device switches from the silent mode to the normal mode.

The Handler() instruction use to detect the incoming call number in the LCD screen and send SMS to the caller [16]. The block diagram of infrastructure proposed system is shown below:

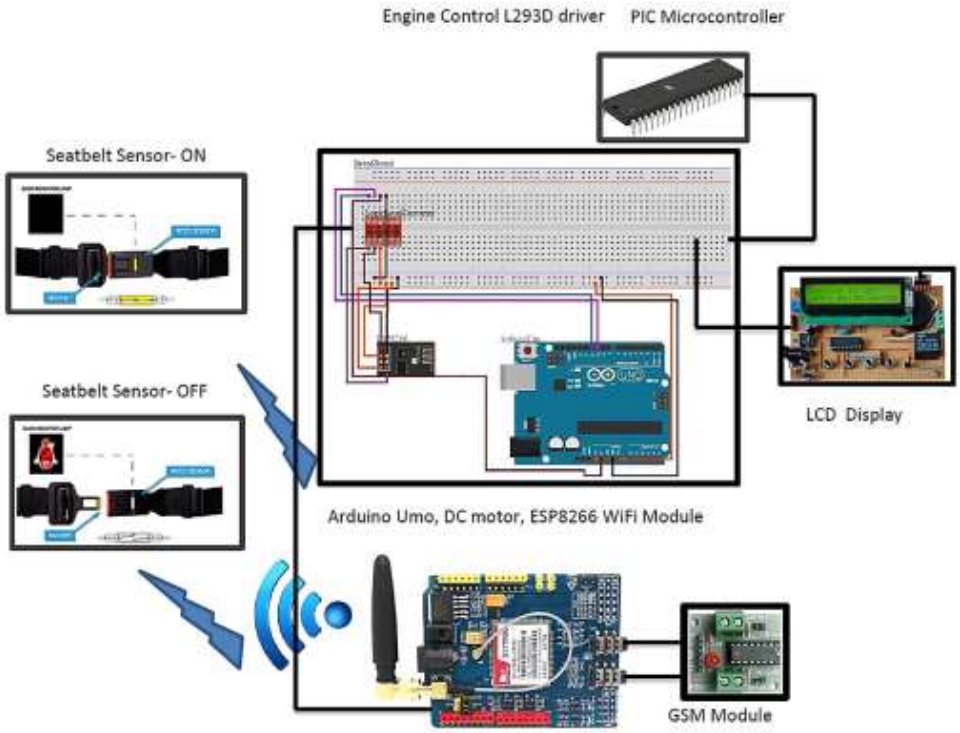

Fig. 6 Block Diagram of Infrastructure of the Proposed System

9. Conclusion

The aim of the suggested system is a guarantee that the driver reaches his destination safely without problems. This system targeted the driver and the car as well as the road to secure the safety of the car and as a driver. The system based on utilizing of sensors that sense the motion to put the mobile in silent mode. As well as, control the Wi-Fi in the surrounding areas, which is not available at times. With this suggested system, the mobile device is switched from normal to silent mode automatically before starting the engine car is guaranteed. The system controls the position of the seatbelt, so the driver must install the seatbelt before running the engine. This system based on IoT technology as a proactive step to connect cars with each other in the future. Technically, this system is applicable for in aircraft, trains and ships.

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