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Smart Ignition Control by Seat Belt Detection and Wi-Fi Connectivity in Android Phones

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Abstract: ***The purpose of this paper is to ensure that people behind the wheels reach their destination with utmost safety. The safety of co-passengers, pedestrians as well as co-vehicles lies in the hands of every driver on the road. Most accidents are caused because of the driver's negligence towards seatbelts and usage of mobile phones while on the road. Our project aims at making certain that the driver fastens his seatbelt and also the phone is brought under silent mode. This could be done using a Raspberry Pi controller which has inbuilt Wi-Fi, a seatbelt detector and a mobile application in the driver's phone. The mobile is brought out of silent mode once the Wi-Fi is turned off.***

Keywords: Raspberry Pi (wireless fidelity, Wi-Fi), Seat Belt Checker, Android Application.

I. INTRODUCTION

According to WHO Global status report on road safety, Seatbelts protect passengers from injuries and fatalities. Seatbelts mean the difference between life and death while driving. People fail to wear seatbelts owing to discomfort or sometimes forget to wear them in a hurry. A study at University of Sussex said "Hands-free phone uses by the drivers 'equally distracting' as that of handheld devices".

In India, during 2016, the number of accidents due to the usage of mobile phones by the driver was found to be 4976. Also, 2138 people have died and 4746 people have been injured. This proves to show that mobile phones have become an integral part of every individual. People are unaware of the ill consequences of their usage in inappropriate places. As a society, people have become multitaskers that they're willing to risk their personal safety as well as that of the others because they can't resist themselves from using mobile phones.

Our proposed model could be used in cars and is integrated with the ignition control system of the car. This ensures that the driver fastens his seatbelt and his mobile is in silent mode as these two requirements have to be met for the ignition of the car to be enabled.

A. Existing System

There are presently many applications to which aim to bring the mobile phone into the silent mode detecting its motion through the global positioning system and using accelerometer sensor. For using GPS, Internet access is necessary which is not always available in all mobile phones thereby failing to get the mobile under silent mode. One such application is Dash Droid which uses GPS to analyze speed and gets the mobile phone under silent mode. Also, this app allows one to use up to 6 applications which is a major cause of distraction to the driver.

Even in the iOS system the same mechanism is used and the user is provided with an option to choose whether to enable the silent mode either automatically or manually. People tend to stick to the manual mode as they do not want to miss out on any calls which may lead to unfortunate events.

B. Proposed System

In our proposed system we use Raspberry Pi 3 which has an inbuilt Wi-Fi that incorporates the signals from the IR Sensor and mobile application. A positive signal from the seatbelt detector is awaited which ensures that the seatbelt is fastened. Simultaneously the mobile phone is brought under the silent mode by using an Android app developed using ADT bundle. This program uses the function Audio Manager() to get the phone under silent mode. To detect the incoming call another function called LISTEN_CALL_STATE is being used. The hardware and software are interfaced using a port in the Raspberry Pi. During the silent mode if a call is received for more than 3 times from a certain caller the number is displayed in the LCD of the car automatically. This restricts the driver from using the mobile behind the wheels.

II. PRACTICAL IMPLEMENTATION

This mechanism requires Raspberry Pi Model 3,Engine Driver Unit L293D,LCD screen, IR sensor. Principle of this method is very simple.

A. Rspberry Pi

The third generation Raspberry Pi is Raspberry model 3 B. This is the board which we are making use of since it has a port for wireless LAN connectivity. It broadcasts the signals which are received by the driver's phone. Additionally, it also has Bluetooth and GSM connectivity. It runs on a 64-bit Quad core Broadcom 2837 processor and has an operating frequency of 1.2GHz. It is ten times faster than first generation Raspberry Pi models. It supports various functionalities using its 40-general purpose input and output pins. It is through these pins the signal from IR sensor and signal to the engine driver unit are sent. It is programmed using python IDLE. The board is powered by AC-to-DC adapter or battery to get started.

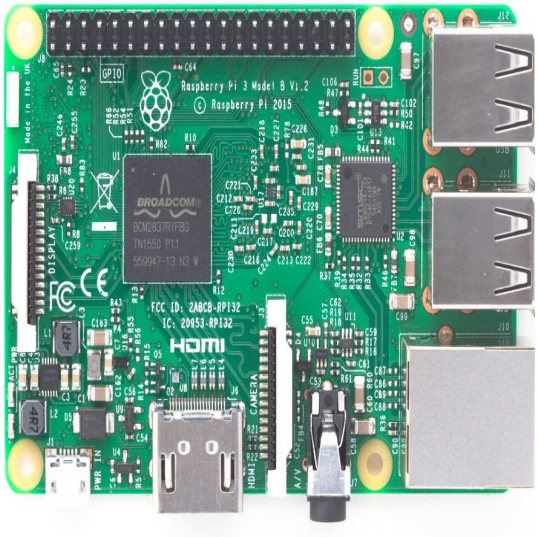


Fig1: Raspberry Pi Board

B. Engine Driver Unit

To depict the ignition of car we use a DC motor which is controlled by the Raspberry Pi. The Engine driver unit act as bridge between the processor and the DC motor. It is an H-Bridge motor control circuit which is formed using LM293D.The LM293D is a 16 pin IC. Each motor requires two wires from LM293D.

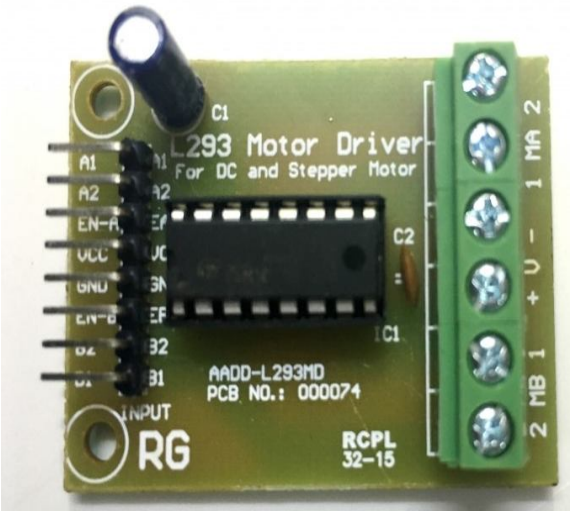


Fig2: L293D Engine Driver unit

C. Seat Belt Checker

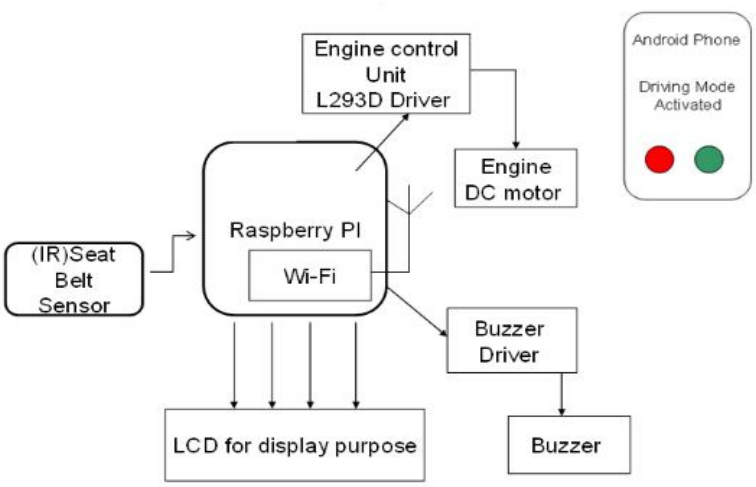
To ensure whether the seatbelt is worn by the driver or not seatbelt checker is used. It is made using IR sensor. It has two parts IRemitter and IR receptor. IR emitter consists of IR led and a series resistance which emits infrared light and is fixed to the end of the belt. The infrared receptor is placed at the other end that is where the belt is inserted and locked. The IR receiver is made of a photodiode. When the seatbelt is fastened photodiode will receive the infrared light and sends a positive signal to the processor. Only after the seat belt is fastened and mobile is brought into the silent mode using Wi-Fi connectivity, the ignition is enabled.

D. Working

The raspberry kit is employed in a car. When the central locking button is pressed, the car gets unlocked and supply of 3.3V is applied to the raspberry kit. The Wi-Fi module gets switched on and is capable of sending data up to 19.07 Mbits/s over a range of 2m. The Android service in driver's phone identifies the Wi-Fi networks and runs in background. The phone is brought into silent mode. Now, Pi waits for the signal from the seatbelt checker. When fastened, a wired signal is sent to Pi's GPIO pin. A positive signal is sent by the processor to L239D pin enabling the ignition of the car. While driving when a call is received, an auto-reply message is sent through the GSM of Pi using AT commands for telling that the caller that driver is driving. In case of emergency, if a call is received from the same number for more than three times, the number is displayed on LCD screen with a buzzer. Once the driver switches off the car, the phone is disconnected from Wi-Fi network. The application stops working when the phone switches to normal mode from silent mode.

III. DIAGRAMS

A. Block Diagram



IV. RELATED WORKS

A. Automatic disabling of cell Phones at Prohibited Areas

Handoff mechanism is used in this paper. Here we should add external hardware circuit inside the mobile phone which is stimulated using MATLAB Simulink Toolbox. Use of hardware circuit inside mobile phone is practically difficult.

B. Automatic Enabling and Disabling of Mobile Phones in Restricted Areas

This paper focuses on disabling the mobile phones only in restricted areas. This brings all the phones connected to the Wi-Fi under aeroplane mode. This is proposed in public places like temples, petrol bunks.

C. Authenticated Access Control For Vehicle Ignition System By Smartcard And Finger Print Technology

In this paper they have used magnetic sensors as seatbelt detectors. When they come in contact with loud speakers and microphones they cause bends in magnetic lines which creates a problem of sensor being switching on .Thus sending incorrect signals.

D. Disabling Of Mobile Phones In Restricted Areas Using 8051 Microcontrollers

External circuits are to be added in the mobile phones. This system does not provide facility of emergency calls and efficiency of the hardware is less.

E. Seat Belt Safety Features Using Sensors to Protect Occupant

The principle used in this paper is microcontroller which is placed under every seat. The controller gets information from various sensors like load sensor, touch sensor and reluctance sensor. This information is passed to wheel sensor and then locking mechanism is enabled. The main disadvantage is placing microcontroller under every seat is quite costly.

V. CONCLUSION

A destination is a reward for safe driving, through our proposed system we ensure that driver reaches his destination with utmost safety. This system focuses not only on the safety of the moving vehicle but also those on the road. In present day applications choice to set the mobile to silent mode lies in the hands of a driver. The motion sensors are used in mobile to get the phone to silent mode. They even come into action while the person is travelling in a train or engaged in some other activity like running. This is a disadvantage as mobile is brought into the silent mode at wrong times. Sometimes it also detects the motion using rate of change of WIFI connectivity in the surroundings which may always not be available. So, through our proposed model we ensure that mobile is brought into the silent mode automatically well before the ignition of the car. Our system also requires that the driver fastens his seatbelt before he hits the road. According to recent IOT study, by 2025 cars will be connected to each other using Wi-Fi. So, we have incorporated the concept of Wi-Fi. Thereby, our proposed system ensures the driver's his own and everyone's safety on road.

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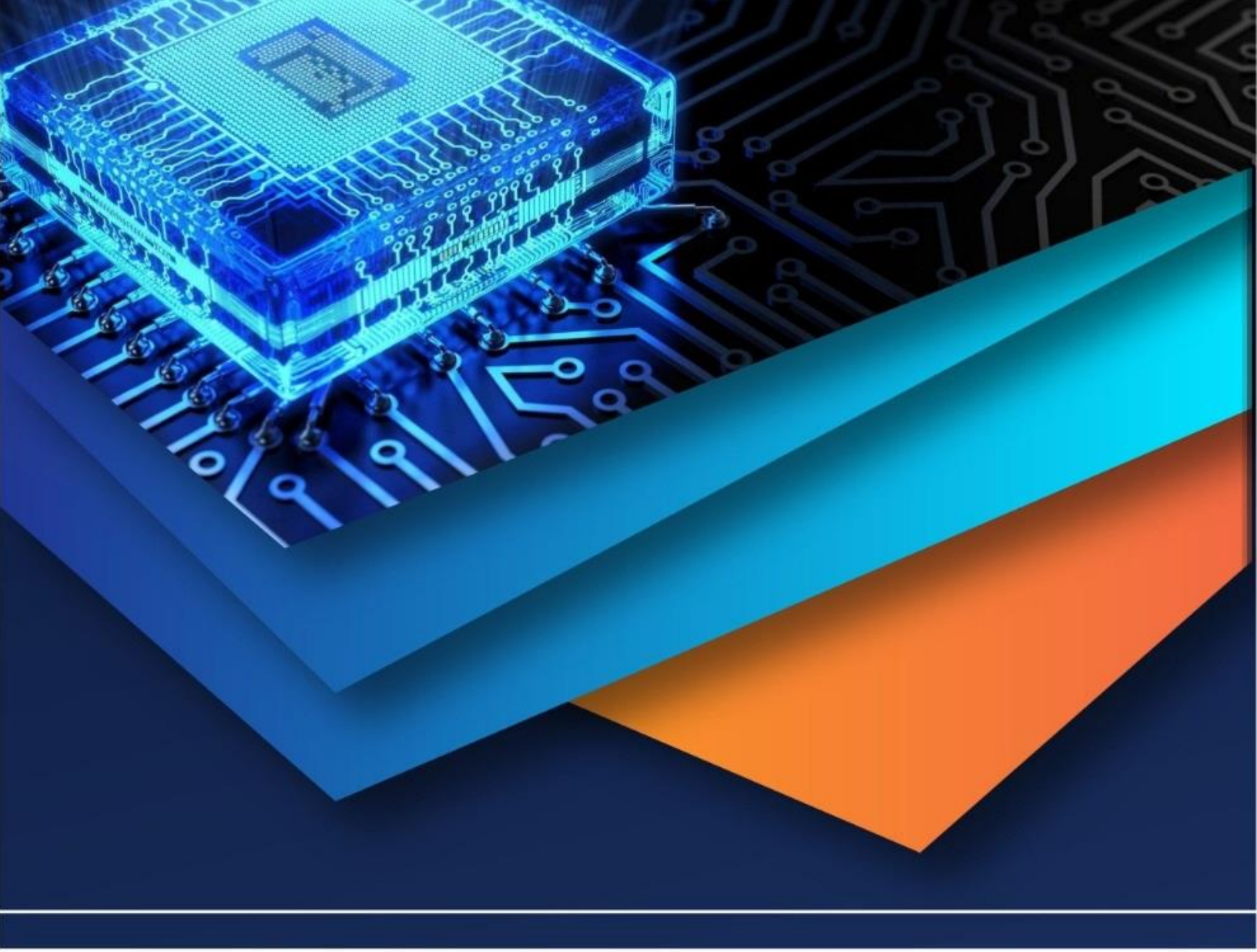

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