"SMART AND MULTI-TASKING HELMET"

Submitted in partial fulfilment of the requirements for the Award of the degree of

ECS-using Raspberry Pi

MTSE

By

P.NIKHIL SAI	20MIS7015
E.NAVEEN	20MIS7018
P. VENKATA GANESH	20MIS7081

Under the guidance of

Dr. Khadeer Pasha

VIT-AP UNIVERSITY

DEPARTMENT OF SCOPE

"VIT-AP"

Dr.Hari Kishan Kondaveeti
Deputy Director,
Engineering clinics

Dr.Khadeer Pasha
Assistant Professor
Sr Grade 1

ABSTRACT

When a motorcyclist gets involved in a high-speed accident without a helmet, the consequences can be severe. An NHAI report states that 1,50,000 persons die in accidents in India every year, which total roughly 4,50,00 accidents. According to the research, India has the most number of road accident fatalities. In the nation, there are 53 traffic accidents per hour, resulting in one fatality every four minutes. The "Smart and Multitasking Helmet" may be the best answer to this terrible issue and could help save a lot of lives.

The usage of a smart helmet, a sort of protective headgear, increases the rider's level of safety when operating a motorcycle. This helmet's primary function is to keep the rider safe. Advanced features like fall detection, accident recognition, position monitoring, and alcohol detection can be used to accomplish this. As a result, it doubles as a smart bike feature in addition to being a smart helmet. The ignition switch cannot turn ON without the helmet being worn, hence it is required.

With an RF Module, a wireless connection between the transmitter and receiver can be established. When a rider is intoxicated, the ignition locks on its own and sends a message to the registered phone number containing his location. Hence, these sensors detect when the cyclist crashes and the helmet touches the ground and transmit the information to the microcontroller board. The controller then extracts the GPS data using the interfaced GPS module. When the data exceeds the minimal stress limit, the GSM module immediately sends the notification to the ambulance or the family.

LIST OF COMPONENTS & THEIR ABBREVATIONS:

- Alcohol Sensor
- Vibration Sensor
- RF Module-Radio Frequency Module
- GPS Module- Global Positioning System
- GSM Module-Global System for Mobile Communication
- 16x2 LCD Display-Liquid Crystal Display
- ATMEGA328P- AT=Atmel, mega= mega AVR,16=16kb flash memory

How to Use ATMEGA328P:

ATMEGA328 is used similar to any other controller. All there to do is programming. Controller simply executes the program provided by us at any instant. Without programming controller simply stays put without doing anything. Fig 5.5 is about the pin specifications of the ATMEGA328P.

First the controller needs to be programmed and this programming is done by writing the appropriate program file in the ATMEGA328P FLASH memory. After dumping this program code, the controller executes this code and provides appropriate response. Fig shows about the 28 pin IC.

Entire process of using an ATMEGA328P goes like this:

- ✓ List the functions to be executed by controller.
- ✓ .Write the functions in programming language in IDE programs.
- ✓ .ATMEGA328P programming can also be done in ARDUINO IDE.
- ✓ .After writing the program, compile it to eliminate errors.
- ✓ .Make the IDE generate HEX file for the written program after compiling.
- ✓ .This HEX file contains the machine code which should be written in controller flash memory.
- ✓ .Choose the programming device (usually SPI programmer made for AVR controllers) which establishes communication between PC and ATMEGA328P. You can also program ATMEGA328P using ARDUINO UNO board.
- ✓ .Run the programmer software and choose the appropriate hex file.
- ✓ .Burn the HEX file of written program in ATMEGA328P flash memory using this program.
- ✓ .Disconnect the programmer, connect the appropriate peripherals for thecontroller and get the system started.

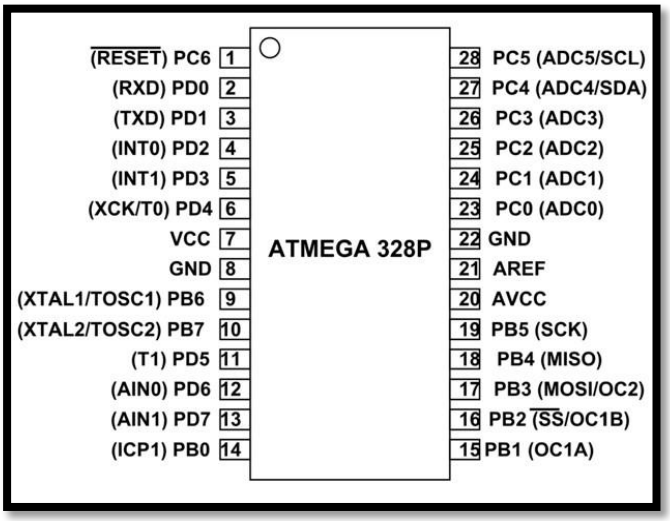
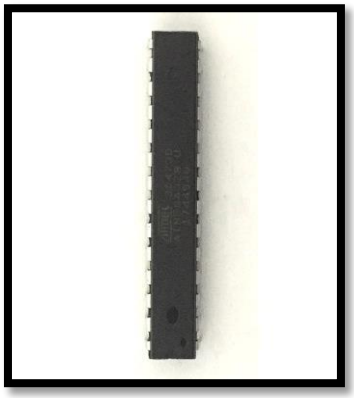


Fig 5 Pin Diagram of ATMEGA328P



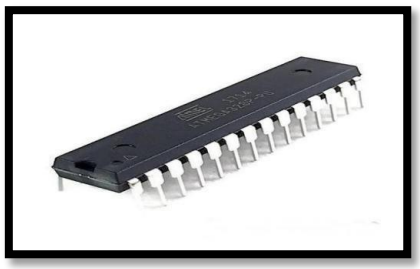
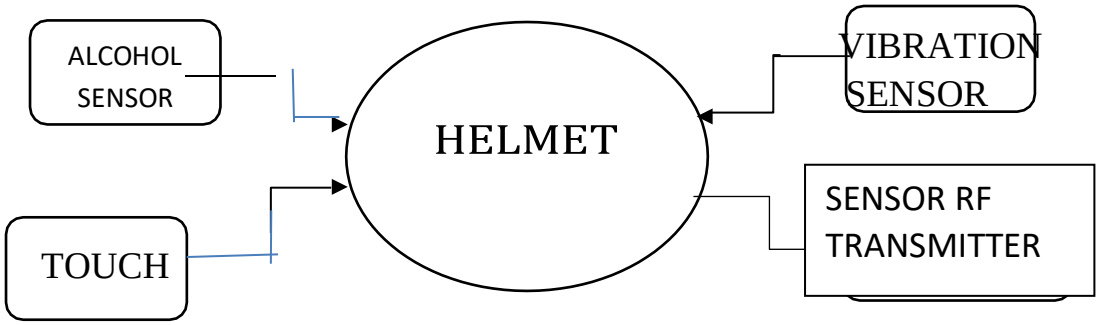


Fig ATMEGA328P IC

BLOCK DIAGRAM OF SMARTAND MULTI-TASKING HELMET

HELMET UNIT:



Block diagram of helmet unit

BIKE UNIT:

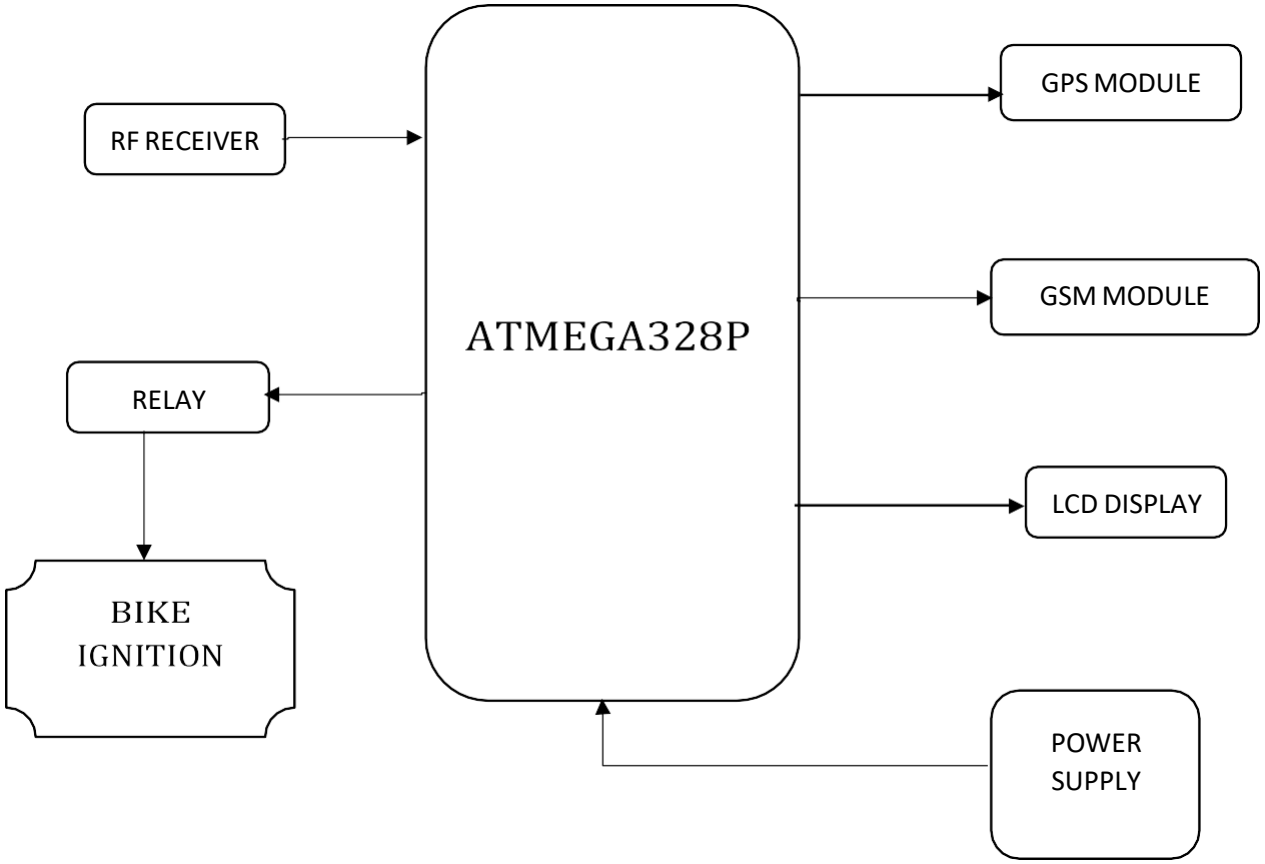


Fig. Block diagram of bike unit

Contents

1. INTRODUCTION

Now a days most of the countries are enforcing their citizens to wear helmet while riding bike and not to ride a bike when the person is under the influence of alcohol, butstill rules are being violated. The motivation of this project comes from the real-world challenges that we face daily on the roads. Road accidents are on the rise day by day and in countries like India where bikes are more prevalent many people die to carelessness carried in wearing helmets. In present day scenario we encounter numerous cases of death due to two-wheeler road accidents. Despite of the fact that helmets are available everywhere, people are not wearing them. In the event of road accidents, the message is sent to the emergency contact through GSM.

Fig.1 Survey
picture 1

1.1. Motivation

Road accidents have been a major cause for concern across the Indian subcontinent. In 2020 alone, the country reported nearly 132 thousand fatalities due to road accidents. Each year, about three to five percent of the

country’s GDP was invested in road accidents. Notably, while India has about one percent of the world’s vehicle population,it also accounted for about six percent of the global road traffic incidents. Almost 70 percent of the accidents involved young Indians

2.BACKGROUND

Over the world, motorbike accidents have been a major cause of injuries and fatalities. According to statistics, motorbike accidents cause a sizable portion of fatalities on the road, and many of these fatalities could have been avoided with the use of the right safety equipment, such helmets. Conventional helmets have been effective in lessening the severity of head injuries, but there is always room for development to give riders further advantages.

In order to solve some of the drawbacks of conventional helmets, smart helmets have emerged as a possible option. Sensors and technical features found in these helmets, such Bluetooth connectivity, GPS navigation, and rear-view cameras, can give riders access to real-time environmental data.

Using a smart helmet might also encourage safer riding practises. For instance, some intelligent helmets have a function that warns users when they go above the speed limit or veer off the road. These features can lower the risk of accidents and assist the riders in maintaining thierlimit.

3.PROBLEM DESCRIPTION

As the bikers in our country are increasing, the road mishaps are also

increasing day by day, due to which many deaths occur, most of them are caused due to most commonnegligence of not wearing helmets, also many deaths occur due to lack of prompt medical attention needed by the injured person.

The project aims at the security and safety of the bikers against road accidents. The objectives of this project are to design the circuit that can improve safety of motorcyclists, to develop a smart safety helmet for complete rider.

3.1 SOLUTIONS

The first method is ABS Technology. Anti-lock braking system technology is a facility that provides maximum braking effect in the vehicles by preventing locking of the wheels in all-weather situations.

Simplified...when brakes are applied, the wheels will not get locked up, therefore two-wheeler skids and falls and/or crashes are reduced significantly. There are some studies that report a decreasing trend of head-on, rear-end and pedestrian crashes in those vehicles fitted with ABS technology as compared to vehicles minus the ABS technology. Furthermore, through ABS technology there will be increased control of the bike and it would give increased on-road stability; whether on race tracks or on the highways. It has become an established fact that anti-lock braking system serves two-fold purposes. One on application of brakes, the technology allows the driver to maintain the steering control and second to shorten the breaking distance so that the driver is not afraid of skidding on application of brakes in any emergent situation.

The second method is enforcement of strict laws on wearing Protective headgear. The Motor Vehicles Act of 1988 was established

to maintain the legal safety of the motorbike community. Section129 of this principal Act mandates every individual aged above 4 years to "wear protective headgear" when riding a motorcycle in a public area. As already mentioned, these helmet laws for motorcycles include both the driver and pillion rider. Section 129(b) mentions that the helmet must be fastened to the driver's head or rider with firm fasteners, like straps attached with it. This ensures that this protective headgear does not fall off the wearer's head in case of an accident. Non-compliance with the laws m can subject motorcycle riders to a fine for not wearing a helmet worth Rs.1000 under Section 194D of this Act (5). Besides, this traffic offense can also cause you to get your driving license suspended for 3 months.

The third method is the "Smart and Multitasking Helmet". It is compulsory to wear the helmet, without which the ignition switch cannot turn ON. An RF Module can be used as a wireless link for communication between transmitter and receiver. If the rider is drunk the ignition gets automatically locked and sends a message to the registered number with his current location. So when the rider crashes and the helmet hit the ground, these sensors sense and give it to the microcontroller board, then the controller extracts GPS data using the GPS module that is interfaced to it and sends the data to family members

4.OBJECTIVES

A smart helmet is a type of protective headgear used by the rider which makes bike driving safer than before. The main purpose of this helmet is to provide safety forthe rider. This can be implemented by using advanced features like alcohol detection, accident identification, location tracking, use as a hands-free device, and fall detection.This makes it not only a smart

helmet but also a feature of a smart bike. It is compulsoryto wear the helmet, without which the ignition switch cannot turn ON. An RF Module can be used as a wireless link for communication between transmitter and receiver.

The helmet checks if the rider is drunk and driving. If the rider is drunk then the ignition of the bike is avoided and the hence not letting the rider to ride the bike. In thissystem we use an Arduino microcontroller interfaced with alcohol sensor and it is usedto monitor user's breath and constantly sends signals to microcontroller. The microcontroller on encountering alcohol signal from sensor and send the data to bike unit using RF transmitter and a RF receiver is connected to the microcontroller in the bike unit which stops the engine. The system need push button to start the engine. If thealcohol is detected the system locks the engine. The system also sends a message stating

"Accident occurred" including the latitude and longitude location of the incident using GSM and GPS. It uses a vibration sensor to detect an accident.

- **Instructions for use**

- In GSM module appropriate SIM card must be placed in order to send SMS.
- The SIM card placed in the GSM Module must be recharged in order to send theSMS.
- Phone numbers must be written in code in order to send SMS.

5.METHODOLOGY/PROCEDURE

The Smart Helmet using Raspberry Pi was created by integrating a Raspberry Pi microcontroller with various sensors and components such as an accelerometer, gyroscope, and GPS module. The microcontroller was programmed using

Python programming language to collect data from the sensors and perform various functions such as monitoring speed, detecting accidents, and providing real-time updates to the rider.

The main purpose of this helmet is to provide safety for the rider. This can be implemented by using advanced features like alcohol detection, accident identification, location tracking, use as a hands-free device, and fall detection. This makes it not onlya smart helmet but also a feature of a smart bike. It is compulsory to wear the helmet, without which the ignition switch cannot turn ON. An RF Module can be used as a wireless link for communication between transmitter and receiver. If the rider is drunkthe ignition gets automatically locked and sends a message to the registered number with his current location. So when the rider crashes and the helmet hit the ground, thesesensors sense and give it to the microcontroller board, then the controller extracts GPS data using the GPS module that is interfaced to it and sends the data to family membersif there is an accident.

5.1Working of Components

5.1.1 Alcohol Sensor

Fig 5.2 shows the hardware of Alcohol Sensor. MQ-3 gas sensor is used for identifyingthe alcohol content from breath. It can be positioned just in front of the mouth. The sensor responds to various molecules in alcohol and determines if the rider is drunk.

Fig 5.2 Alcohol Sensor

4.1.1 Touch Sensor

Fig 5.3 shows the hardware of Touch Sensor. Touch sensor is placed inside the helmet,where the actual human touch is sensed. It is determined by the helmet unit whether it is worn or not before starting the bike. If this condition is satisfied, then it sends the signal through RF transmitter to bike unit to start.

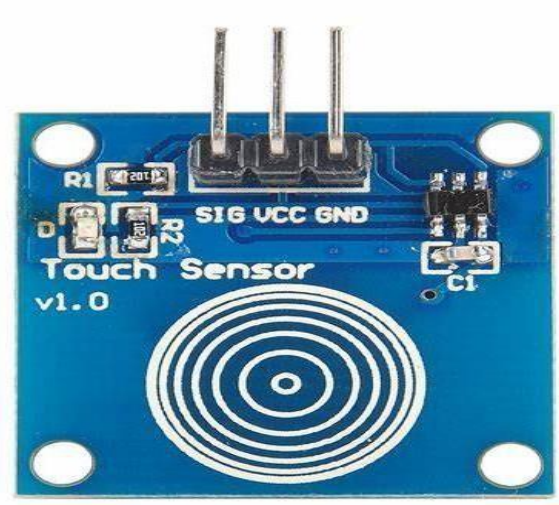


Fig 5.3 Touch Sensor

5.1.2 Vibration Sensor

Fig 5.5 shows the hardware of Vibration Sensor. It measures the amount

and frequency of vibration in a given system, machine, or piece of equipment. Those measurements can be used to detect imbalances. It is used to sense if there is an accident.

Fig 5.1.2 Vibration Sensor

5.1.3 RF Module

Fig 5.5 shows the hardware of RF Module. An RF transmitter module is a small PCB subassembly capable of transmitting radio waves and modulating radio wave to carry data. Transmitter modules are usually implemented alongside a microcontroller which will provide data to the module that can be transmitted[1].

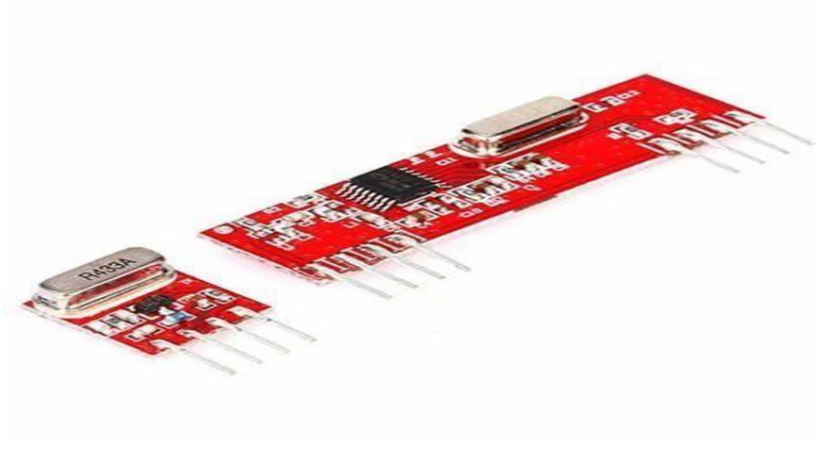


Fig 5.1.3 RF Module

5.1.4 Working of GPS Module

Fig 5.6 shows the hardware of GPS. GPS stands for Global Positioning System and is used to detect the latitude and longitude of any location on the earth, with the exact UTC time. GPS module is used to track the location of the accident. The device receives the coordinates from the satellite for each and every second, with time and date.

Fig 5.1.4 GPS Module

5.1.5 Working of GSM Module

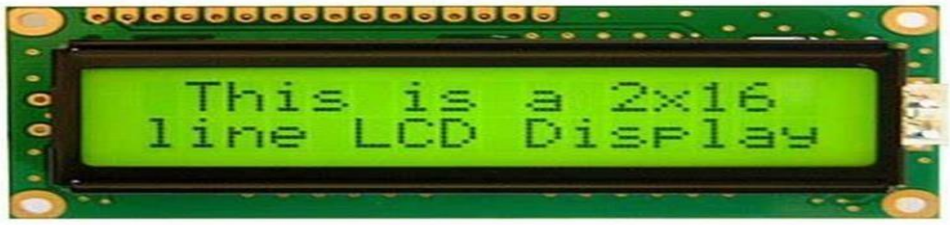
Fig 5.7 shows the hardware of GSM. GSM module is used to establish communication between a computer and a GSM-GPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries.

GSM Module is used to send the information to family members, ambulance and police in case of an accident.

Fig 5.1.5 GSM Module

5.1.6 Working of 16x2 LCD Display

Fig 5.1.6 shows the hardware of LCD. LCD stands for liquid crystal display Since their interface serial/parallel pins are defined so it's easy to interface them with microcontrollers. The LCD Display is used to show the status of the alcohol and whether the helmet is worn or not.



5.1.6 Working of ATMEGA328P Microcontroller

ATMEGA328P is high performance, low power controller from Microchip. ATMEGA328P is an 8-bit MC based on AVR RISC architecture. It is the most popularof all AVR controllers as it is used in ARDUINO boards.

- **Where to Use ATMEGA328P:**

Although there are many controllers, ATMEGA328P is most popular of all because ofits features and cost. ARDUINO boards are also developed on this controller because of its features.

- With program memory of 32 Kbytes ATMEGA328P applications are many.
- With various POWER SAVING modes, it can work on MOBILE EMBEDDEDSYSTEMS.
- With Watchdog timer to reset under error it can be used on systems with minimalhuman interference.
- With advanced RISC architecture, the controller executes programs quickly.
- Also, with in chip temperature sensor the controller can be used at extremetemperatures.

6.RESULTS & DISCUSSIONS

Results:

The results of the tests showed that the Smart Helmet using Raspberry Pi was successful in providing additional safety features to motorcycle riders. The helmet accurately detected the speed of the motorcycle, and alerts were provided to the rider when they exceeded the speed limit. The helmet also detected accidents and sent an alert to the rider's phone and emergency contacts.

The GPS module in the helmet was able to provide real-time updates to the rider about their location and directions. This feature was found to be particularly useful for riders who were unfamiliar with the route or riding in new areas. The rearview camera on the helmet was also effective in providing a view of the rider's surroundings and reducing blind spots.

Discussions:

The Smart Helmet using Raspberry Pi provides riders with an innovative solution to improve safety while riding motorcycles. The integration of various sensors and components enables the helmet to provide real-time updates and alerts to the rider, improving their situational awareness and reducing the risk of accidents.

The helmet's ability to detect accidents and send alerts to emergency contacts can significantly reduce response time in case of an emergency, increasing the chances of survival for the rider. The helmet's real-time GPS and rear-view camera features also improve rider safety by providing real-time updates about the rider's surroundings, reducing the risk of accidents caused by blind spots or unfamiliar routes.

7.CONCLUSION & FUTURE SCOPE

The developed project efficiently ensures:

- Rider is wearing helmet throughout the ride.
- Rider should not be under the influence of alcohol.
- The system also helps in efficient handling of the aftermath of accidents by sendinga SMS with the location of the biker to the police station.

By implementing this project, a safe two-wheeler journey is possible which would decrease the head injuries during accidents and also reduce the accident rate due to driving bike after consuming alcohol. The helmet may not be a 100% foolproof but is definitely the first line of defense for the rider in case of an accident to prevent

fatal injuries.

8. REFERENCES

[1] Sayeed and A. Perrig, “Secure Wireless Communications: Secret Keys throughMultipath,” Proc. IEEE Int Conf. Acoustics, Speech Signal Processing, pp. 3013-3016, Apr.2008

[2] Road accident statistics in India, Jan 2018, [online] Available: http://sites.ndtv.com/roadsafety/important-feature-to-you-in-your-car-5

[3] Bruno Fernandes, Muhammad Alam, Vitor Gomes, Joaquim Ferreira and Arnaldo Oliveira, "Automatic accident detection with multi-modal alert system implementation for ITS", Elsevier Vehicular Communications, vol. 3, pp. 1-11, January 2016

[4] Article from The Hindu [online] 2011 Feb. 10 Available from : URL: https://www.hindu.com/2011/02/10/stories/2011021063740500.html

[5] C.Prabha, R.Sunitha, R.Anitha, “Automatic Vehicle Accident Detection and Messaging System Using GSM and GPS Modem”, International Journal of Advanced Research in Electrical and Electronic and Instrumentation Engineering (An ISO 3297:2007 Certified organization) Vol.3, Issue 7, July 2014.

[6] S.Gopalkrishnan, "A Public Health Perspective of Road Traffic Accidents", Journal of family medicine and primary care, vol. 1, no. 2, pp. 144-150,.