

Hi-Tech Vehicle with Smart-Tec Helmet for both Rider and Pillion using IoT Enhancing User Situational Awareness and Accident Reporting System

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ABSTRACT: A Hi-Tech Vehicle with Smart-Tec Helmet is a first step towards new innovation using embedded system which makes the motorcycle driving safer than before. It makes the rider to compulsory wear the helmet in order to start the bike. The module also checks whether the rider has consumed the alcohol or not, if yes the bike will not start and the message is delivered to “u drink we drive” services or NGO to take care of the rider. It also detects the presence of pillion and ensures that whether the pillion is wearing the helmet or not. Bike will not start until pillion wears the helmet. This research also includes user situational awareness which provides the details regarding the obstacles and temperature of engine through the speakers placed inside the helmet and also takes the necessary steps in controlling the speed during the critical conditions. In spite of above precautions, if there is an occurrence of the accident then GSM sends the current location of the accident by using GPS to the ambulance and concerned family members. It deals with the vehicle tracking, controlling and monitoring system using IoT which updates the current location of vehicle in real time system in Google Map along with other relevant information faced by user such as consumption of alcohol, temperature of engine, occurrence of accident etc. and authorized user can also control the vehicle for anti-theft purpose by turning ignition ON or OFF remotely during unpredictable situations.

KEYWORDS: Rider and Pillion Helmet detection; Alcohol detection; Obstacle Detection; Temperature detection; Accident detection; IoT; Vehicle Tracking, Monitoring and Controlling.

I. INTRODUCTION

According to the U.S. Department of Transportation’s National Highway Traffic Safety Administration motorcyclists are 35 times more likely to experience a deadly accident on the road than those in passenger cars as shown in fig 1. When motorcycles crash, their riders lack the protection of an enclosed vehicle, so they are more likely to be injured or killed. Thus this research mainly concentrates on the safety for two wheeler vehicles.

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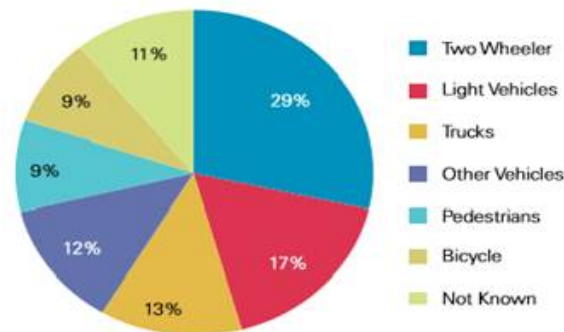


Fig. 1 Percent fatalities 2013

According to the Governor's Highway Safety Administration (GHSA) [5], wearing helmets is the single best way to prevent motorcycle accident fatalities. Wearing a motorcycle helmet can reduce the risk of death by almost 40% and the risk of severe injury by approximately 70%. In 2013 motorcycle helmets saved 1,630 lives. NHTSA says that if all motorcyclists had worn helmets, 715 more lives would have been saved. Thus this research involves the helmet detection module which determines whether the rider has worn helmet or not. If not, ignition of vehicle will not turn ON until rider wears the helmet.

Drunken driving is one of the major causes of road accidents. Globally, some 480,000 deaths and 20 million of people get injured by drunken driving every year. Studies shows that in low- and middle-income countries like India between 33% to 69% of fatally injured drivers and between 8% to 29% of nonfatal injured drivers had consumed alcohol before their crash [6]. So step should be taken to avoid drunken driving cases. Thus this research involves alcohol detection module which determines whether the rider has consumed alcohol or not. If rider has consumed alcohol then ignition of vehicle will not turn ON and message consisting of rider's location is delivered to the concerned person or cab services such as "U DRINK WE DRIVE" to take care of the rider who has consumed the alcohol.

Road safety experts have noted that the pillion is at greater risk of suffering serious head injuries in case of an accident. A general analysis of accident profiles of two-wheelers reveals that maximum hits on the bikes by heavy vehicles like trucks and buses (where risk of fatalities are higher) occur either from the side or behind, thus making the pillion more vulnerable to fall and prone to serious injuries. In study that was carried out in India on average 245 cases of motorcycle accidents in the year 2013, in which 23.67 % of the bodies that were autopsied were of the pillion. According to NHTSA helmets are estimated to be 37 percent effective in preventing fatal injuries for motorcycle riders (operators) and 41 percent effective for motorcycle passengers. Thus it is very essential for pillion to wear helmet. This module is designed in such a way that pillion also has to compulsorily wear the helmet in order to turn ON the ignition.

The National Highway Traffic Safety Administration [7] estimates that drowsy driving was responsible for 72,000 crashes, 44,000 injuries, and 800 deaths in 2013. Drowsiness—

- Makes rider to pay less attention to the road.
- Slows reaction time, if rider have to brake or steer suddenly.
- Affects a driver's ability to make good decisions.

It is very necessary to prevent accidents due to drowsiness, thus we have introduced the obstacle detection module which detects, intimates and takes the necessary action during the critical situation. It also helps in maintaining the safe distance between vehicles generally referred as 2 second rule as shown in fig 2. It is also seen that overheating of the engine due the continuous driving reduces the life cycle of the engine and also it is one of the major cause for the accident. Thus we have introduced the temperature detection module which detects and takes the necessary action whenever there is a rise in temperature of the engine. In-spite of taking all the above mentioned precautions if there is an occurrence of the accident then the accident detection module is introduced in this research which helps in

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intimating the location of the accident to the concerned family person and the ambulance. This research introduces the antitheft protection for two wheeler vehicles and also provides vehicle tracking and monitoring using IoT technology.

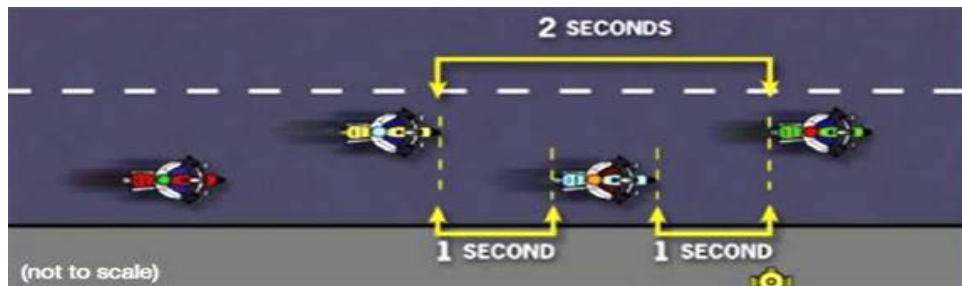


Fig. 2 Two-second Rule

II. LITERATURE REVIEW

According to the Kajal Thakre [1] et al. in their research entitled as “Smart Helmet”, have placed the vibration sensors in different places of helmet where the probability of hitting is more which are connected to Microcontroller. So when the rider crashes and the helmet hits the ground, the sensors senses and the Microcontroller extract data using the GSM module that is interfaced with Microcontroller. When the data exceeds minimum stress limit then GSM module automatically sends message to ambulance or police or family members.

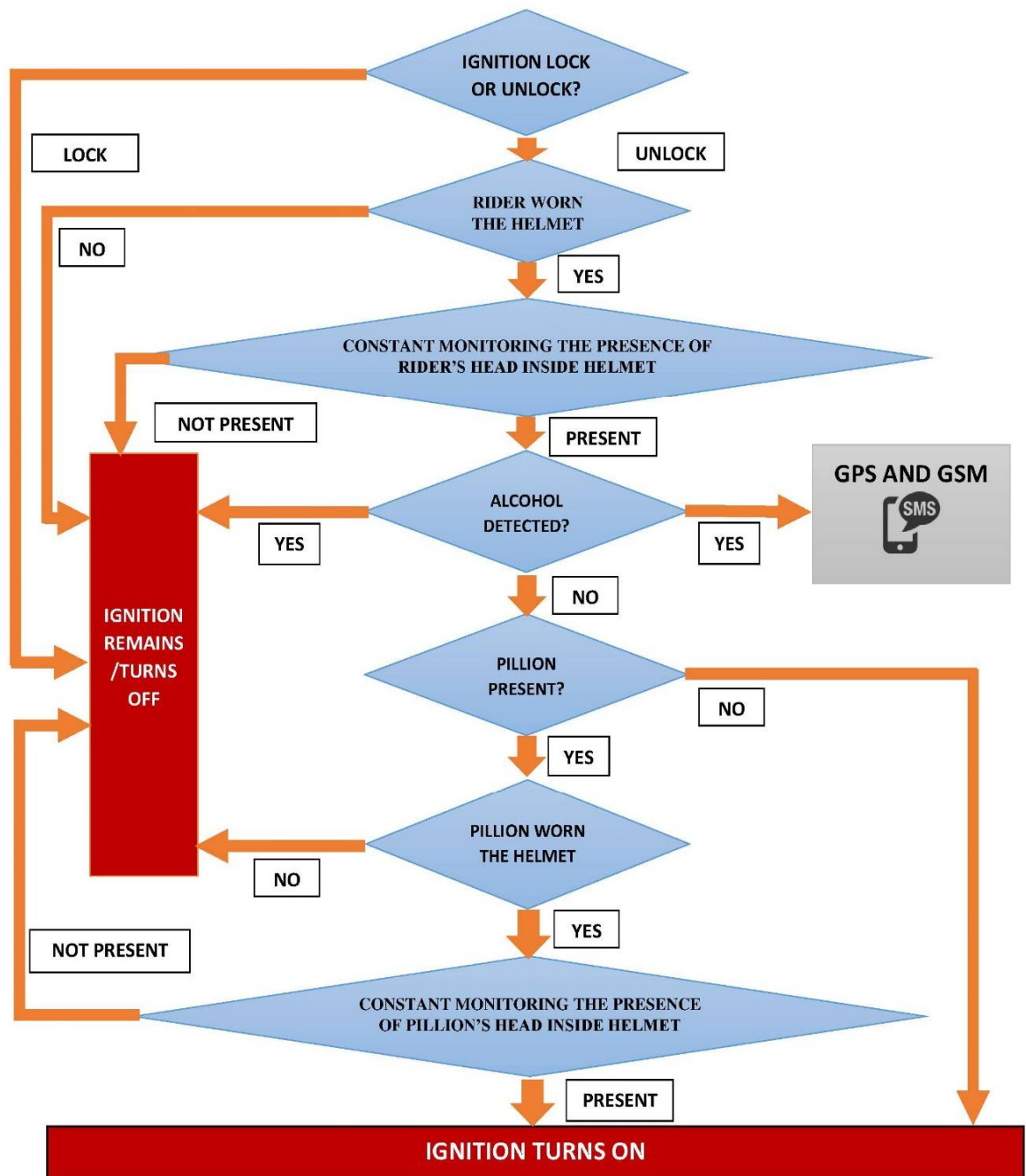
According to the Manasi Penta [2] et al. in their research entitled as “Bike Rider’s Safety Using Helmet”, system will ensure that the motorbike will not start unless the rider is wearing a helmet and has not consumed alcohol. Thus alcohol detection is also an important part in their project. Alcohol detection is done by MQ-3 sensor and helmet detection is done by IR and PIR sensors. The system will also alert the bike rider if any obstacle comes too close while riding the bike. This is found to be useful at night or when the rider is drowsy or tired. By this accidents can be prevented. Also GSM technology is used to inform the family members in case of an accident. Accident detection is done using accelerometer. Wireless communication through ASK module is done between the helmet and motorbike.

According to the Anshu Singh Gautam [3] et al. in their research entitled as “Smart-Helmet System”, introduced an intelligent system, which checks whether the person is wearing the helmet and has a non- alcoholic breath before driving. If any of these conditions are not met, the bike does not start and a message is sent to the concerned person. A transmitter on Smart-Helmet generates a signal on the basis of two mentioned conditions with the help of a switch and an alcohol sensor and then sends it to the receiver on the bike through the RF transmitter. Now, the receiver decodes the signal and the microcontroller, according to decoded signal, takes the required action. In case alcohol is detected the GSM module attached to the receiving unit sends message to a registered mobile number.

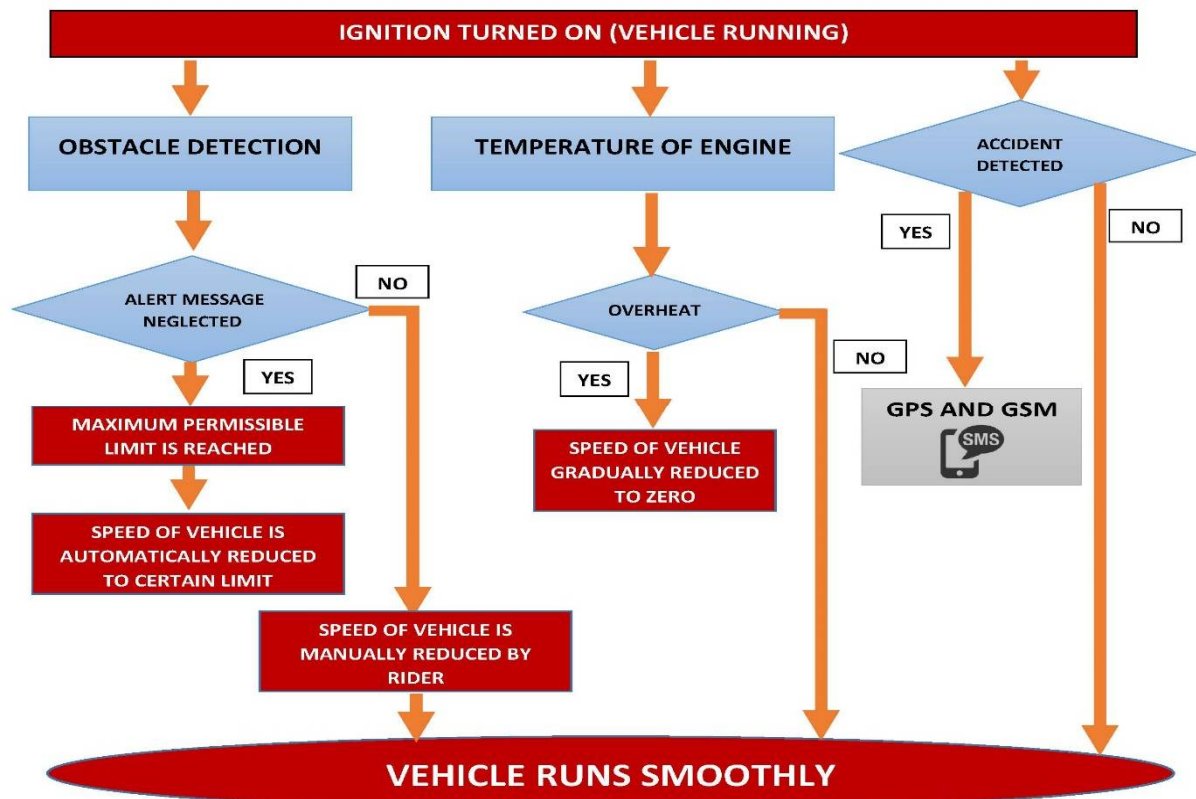
According to the Sudharsana Vijayan [4] et al. in their research entitled as “Alcohol Detection Using Smart Helmet System”, introduced an intelligent system, Smart Helmet, which automatically checks whether the person is wearing the helmet and has non- alcoholic breath while driving. Here they have a transmitter at the helmet and the receiver at the bike. There is a switch used to make sure the wearing of helmet on the head. The ON condition of the switch ensures the placing of the helmet in proper manner. An alcohol sensor is placed near to the mouth of the driver in the helmet to detect the presence of alcohol. The data to be transferred is coded with RF encoder and transmitted through radio frequency transmitter. The receiver at the bike receives the data and decodes it through RF decoder. The engine should not ON if any of the two conditions is violated. MCU controls the function of relay and thus the ignition, it controls the engine through a relay and a relay interfacing circuit.

III. FLOW CHART

1) Flowchart to turn ON the ignition of vehicle.



2) Flowchart when vehicle has turned ON



IV. WORKING PRINCIPLE

In this research few conditions need to be satisfied in order to turn ON the bike.

The first condition it checks whether the authorized user has remotely locked or unlocked the engine. If the engine is unlocked by the user it checks the next condition that rider has worn the helmet or not. The ignition of bike will remain OFF until rider wears the helmet. What if the rider wears the helmet in order to start the bike and removes it after the ignition of the bike has turned ON? So in the next condition, module continuously monitors the presence of human head inside the helmet. If the rider removes the helmet in mid of the journey, the vehicle stops at that moment. Hence the rider has to continuously wear the helmet till the destination.

The module then checks whether the rider has consumed the alcohol or not. If the rider has consumed the alcohol then the module won't allow the ignition of bike to turn ON and at the same time with the help of GPS the current location of the rider is determined and then by using GSM the message containing the current location is delivered to concerned family person or friends or "U DRINK WE DRIVE" services.

The next condition it checks whether the pillion is present on vehicle or not. If the pillion is not present and all the above mentioned conditions are satisfied then it finally allows the ignition of bike to turn ON. If the pillion is present then it will check the next condition that whether the pillion is wearing the helmet or not. Until the pillion wears the helmet the module won't allow the ignition of bike to turn ON. Hence pillion also has to compulsory wear the helmet and it will constantly monitor the presence of pillion head inside the helmet hence pillion also has to compulsory wear the helmet till rider is driving the vehicle.

Once the vehicle turns on successfully the vehicle continuously monitors the three criteria's:

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First the bike continuously monitors the obstacles while driving the vehicle. This also helps in maintaining the safe distance between the vehicles. There will be two permissible limits. When the rider crosses the 1st permissible limit then the message is sent to the rider through the speakers placed inside the helmet to reduce the speed as the vehicle is approaching near to obstacle. If the rider is alert, then rider will reduce the vehicle speed to maintain the safe distance. But if the rider neglects the message and approaches very near to the obstacle i.e. maximum permissible limit then the speed of the bike is automatically reduced to certain limit thereby helping to maintain the safe distance between the vehicles.

The second criteria is the temperature of engine. As there is no indication in two wheelers regarding the overheating of engine, this module helps in determining the temperature of engine which helps in avoiding the explosion of engine in worst cases and also helps in increasing the longevity of the engine. If the engine is overheated the speed of bike automatically reduces gradually to zero and stops. The ignition of vehicle can only be turned ON again if the temperature of engine turns to normal.

The third criteria is even after taking all the above mentioned precautions if the vehicle meets with an accident due to other causes then the accident detection modules helps in determining the occurrence of accident and at the same time the message containing the current location of the vehicle is delivered to the concerned family person and ambulance.

Vehicle tracking, monitoring and controlling the system using IoT technology

- The current location of the vehicle is tracked on Google Map.
- Whether the rider has consumed the alcohol or not
- Whether the engine is normal or overheated
- Whether the vehicle has met with an accident or not

Along with all these parameters there is one more important parameter included in this research which serves as anti-theft protection for two wheelers. The ignition of vehicle can be locked and unlocked remotely. If the vehicle is accessed by the unauthorized user then the authorized person can remotely turn OFF the ignition of vehicle. This module also helps when the authorized user is not using the vehicle and by locking the ignition of vehicle remotely no other person can turn ON the vehicle even after inserting the appropriate key to turn ON the vehicle. This ensures the high end protection to the owner of the vehicle.

All these parameters as shown in fig 2 are provided in particular user account in website and android app is also provided to the user which makes the user convenient to monitor and control the vehicle.

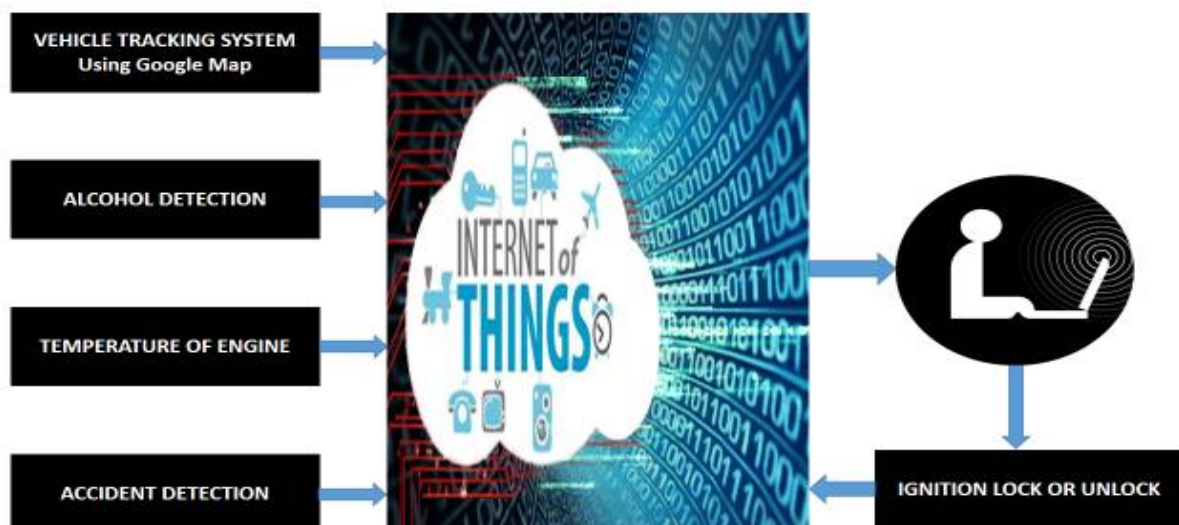
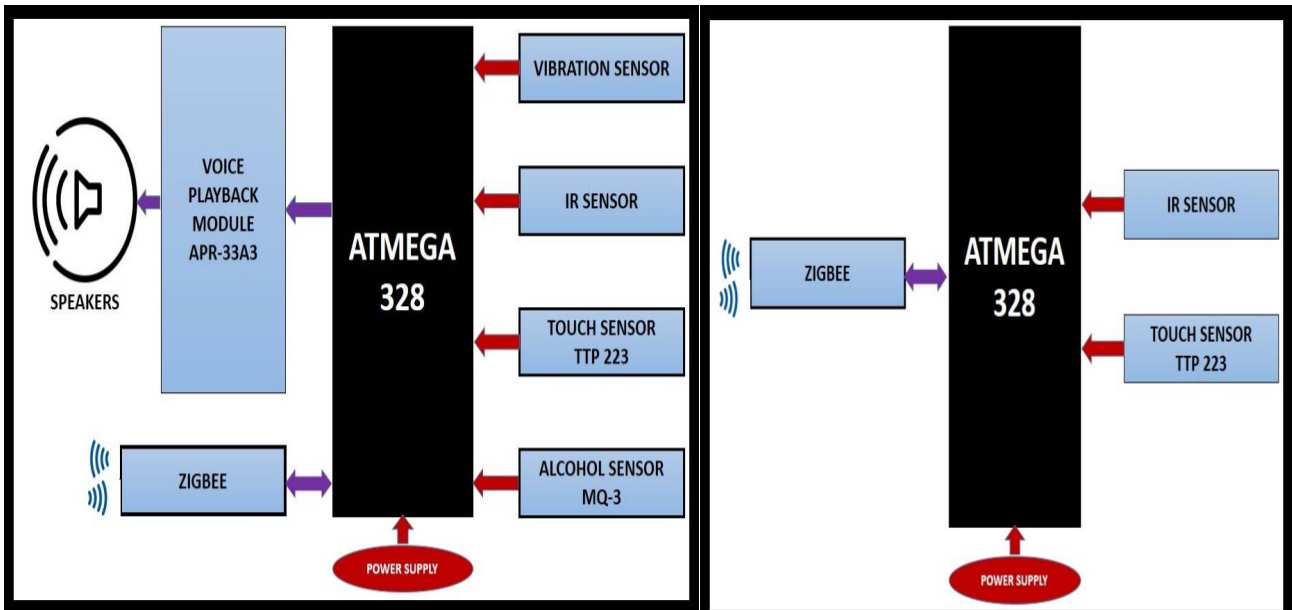


Fig 3. Vehicle tracking, monitoring and controlling the system using IoT technology.

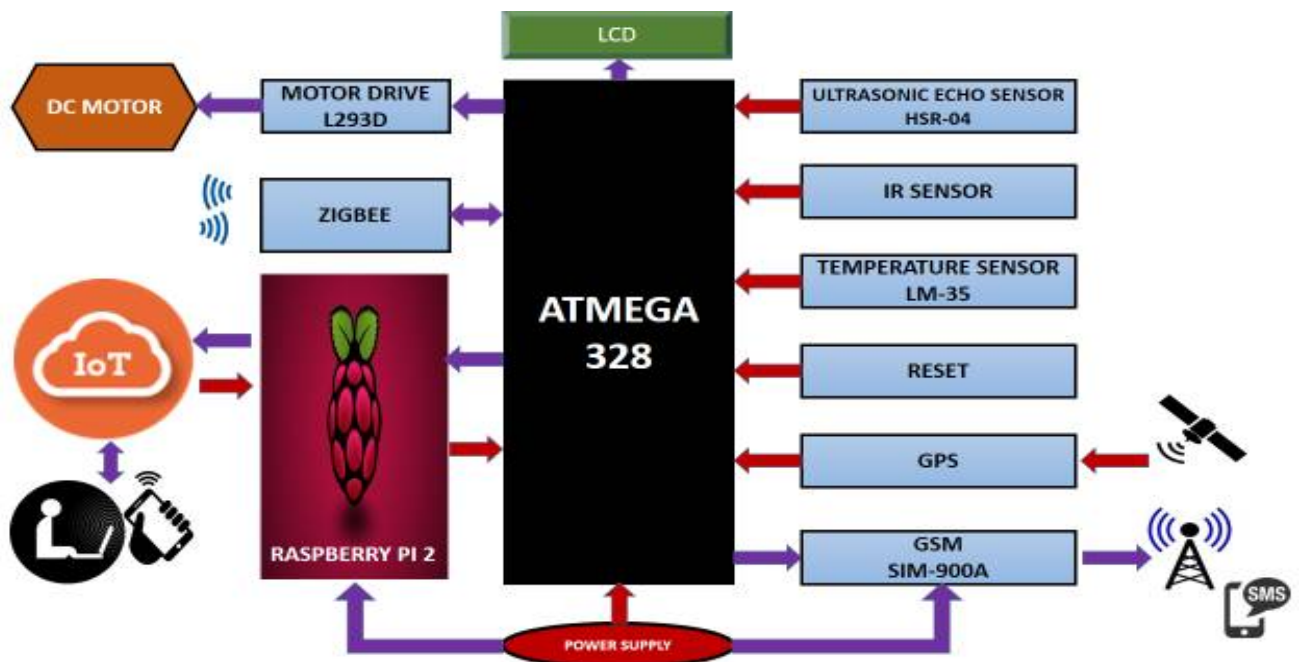
V. BLOCK DIAGRAM

1) Rider helmet

2) Pillion helmet



3) Bike module



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VI. WORKING MECHANISM

1) Ignition lock or unlock through IoT:

Initially the bike module checks whether the authorized user has locked or unlocked the ignition of vehicle. When the authorized user has locked the ignition the Raspberry-pi extracts the data from the web server and passes over to the MC-1(Microcontroller at the bike module). The MC-1 then turns OFF the ignition of the vehicle and at the same time it sends the data packet to the MC-2 (Microcontroller at the rider's helmet) through zigbee the MC-2 then activates corresponding channel of voice play back module and the rider will get the intimation "Warning message to rider- Vehicle is accessed by unauthorized user" through the speaker placed inside the rider's helmet.

2) Rider helmet detection:

When the authorized user has unlocked the ignition of vehicle then the bike module checks the next condition that the rider is wearing the helmet or not. When the rider wears the helmet, the skin of the riders face touches the touch sensor and the output of the touch sensor will go high. The MC-2 then reads the output of the touch sensor and it passes the data packet to the MC-1 through zigbee then MC-1 makes the LCD to display "Please wear the rider helmet". Next it checks whether rider is constantly wearing the helmet or not. When the rider is wearing the helmet, the output of the IR sensor will be high and it is read by MC-2

3) Alcohol detection:

The bike module next checks whether the rider has consumed the alcohol or not. If the rider has not consumed the alcohol, then the output of alcohol sensor which will be low is read by MC-2. The MC-2 then sends the packet of data to MC-1 through Zigbee.

If the rider has consumed the alcohol, the output of alcohol sensor will be high which is read by MC-2. It then sends the data packet to the MC-1 through zigbee and the MC-1 turns OFF the ignition of the vehicle and makes the LCD to display "Alcohol detected Engine turned off". The MC-1 then sends the packet of data to MC-2 through zigbee. MC-2 then activates the corresponding channel of the voice playback module and intimates the rider "Engine turned off due to consumption of alcohol by rider".

The MC-1 activates the GPS module to detect the current location and send the message to the concerned family person or NGO or "U DRINK WE DRIVE" Services by using GSM with the help of AT commands. The MC-1 then writes the data to the Raspberry pi to update the information on the server.

4) Pillion helmet detection:

Next the module checks whether the pillion is present or not. The presence of pillion is determined by using the IR sensor at the footrest. The MC-1 reads the output of the IR sensor, if the pillion is not present, the output of IR sensor will be low. Hence MC-1 turns ON the ignition of the vehicle and makes the LCD to display "No pillion present Engine turned ON" and at the same time MC-1 sends the data packet to the MC-2 through zigbee which in turn activates the corresponding channel of the voice play back module and intimates the rider that "Pillion is not present engine turned on successfully".

If the pillion is present the output of IR sensor placed at the footrest will go high and it is read by MC-1. If the pillion does not wear the helmet the MC-1 makes the ignition of the vehicle to remain off and makes the LCD to display "Kindly wear the pillion helmet", and it sends the data packet to MC-2 through zigbee and it activates the corresponding channel of voice playback module and intimates the rider "Kindly wear the pillion helmet". When the pillion wears the helmet the skin of the pillion's face touches the touch sensor and output of the touch sensor goes high indicating pillion has worn helmet. Next the MC-3 (microcontroller placed at

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pillion's helmet) checks whether the pillion is continuously wearing the helmet or not with the help of IR sensor. When the output of IR sensor goes high, it is read by MC-3 and it sends the data packet to the MC-1 through zigbee. The MC-1 then turns on the ignition of the vehicle successfully and makes the LCD to display "Pillion present-Engine turned on".

5) Obstacle detection:

The vehicle continuously monitors the obstacle with the help of ultrasonic echo sensor while the rider is driving the vehicle. There will be 2 permissible limits (distance). when the rider approaches the 1st permissible limit the MC-1 makes the LCD to display "Obstacle warning" and at the same time the MC-1 sends the data packet to MC-2 through Zigbee and MC-2 then activates the corresponding channel of voice playback module to intimate the rider that " Kindly reduce the speed as vehicle crossed 1st permissible limit". If the rider is alert, rider will reduce the vehicle speed to maintain the safe distance. But if the rider neglects the message and approaches very near to the obstacle i.e., maximum permissible limit, then the MC-1 reduces the speed of the vehicle to the certain limit by using PWM concept and at the same time it make the LCD to display "Obstacle detected". The MC-1 then sends the data packet to MC-2 through zigbee and intimates the rider "Vehicle speed automatically reduced as vehicle approached very near to the obstacle".

6) Temperature detection:

The module then checks the temperature of the engine by using LM-35 temperature sensor. If the temperature of the engine exceeds the threshold, the voltage of temperature sensor goes high and it is read by MC-1, then MC-1 reduces the speed of the vehicle gradually to zero and it makes the LCD to display "Engine overheat speed Dec to zero" and at the same time it sends the data packet to MC-2 through zigbee and MC-2 then activates the corresponding voice channel of the voice playback module and intimates the rider "Speed of vehicle gradually reducing to zero as engine is overheated". The MC-1 then writes the data to the Raspberry pi which updates the information on the server.

7) Accident detection:

Inspite of taking all the above mentioned precautions, if the rider meets with an accident the rider helmet hits the ground and vibration sensor will go high. The MC-2 reads the output of the vibration sensor and sends the data to the MC-1 through zigbee. The MC-1 makes the LCD to display – "Accident Detected". The MC-1 then makes the GPS module to detect the current location and sends the message to the concerned family person or Ambulance by using GSM with the help of AT commands. The MC-1 then writes the data to the Raspberry pi to update the information on the server.

VII. HARDWARE DESCRIPTION

1) Atmega 328:

The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter, programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per Mhz.

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2) Ultrasonic Sensor:

Ultrasonic ranging module HC - SR04 provides 2cm - 40cm and the ranging accuracy can reach up to 3mm. The module includes ultrasonic transmitter, receiver and control circuit. The basic principle of work: Using IO trigger for at least 10us high level signal. The module automatically sends eight 40 kHz and detect whether there is a pulse signal back. Test distance = (high level time × velocity of sound (340M/S) / 2.

3) Vibration Sensor:

This sensor buffers a piezoelectric transducer. As the transducer is displaced from the mechanical neutral axis, bending creates strain within the piezoelectric element and generates voltages.

4) Touch Sensor:

The TTP223 is a touch pad detector IC which offers 1 touch key. Low power consumption and wide operating voltage are the contact key features for DC or AC application. It operates at voltage 2.0V~5.5V. The response time is max about 60mS at fast mode, 220mS at low power mode @VDD=3V. Sensitivity can be adjusted by the capacitance (0~50pF) outside. Stable touching detection of human body replaces the traditional direct switch key. It has the maximum ON time 100sec by pad option (MOTB pin). Auto calibration for life and the re-calibration period is about 4.0sec, when key is not been touched.

5) Zigbee:

CC2500 is a proprietary RF IC compliant with zigbee platform which provides easy to use RF communication at 2.4 GHz. It can be used to transmit and receive data at 9600 baud rates from any standard CMOS/TTL source. This module is a direct line in replacement for the serial communication and it requires no extra hardware and no extra coding. It works in Half Duplex mode i.e. it provides communication in both directions, but only one direction at same time.

6) Motor Drive:

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

7) GSM:

GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/ 1800 MHz. The modem comes with RS232 interface, which allows to connect PC as well as microcontroller with RS232 Chip MAX232. The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack which helps to connect with internet via GPRS. Using this modem, one can make audio calls, SMS, Read SMS, attend the incoming calls and internet etc. through simple AT commands.

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VIII. SOFTWARE AND LANGUAGES DESCRIPTION

- 1) Arduino Software (IDE):
The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them. The open source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS, and Linux.
- 2) PHP:
PHP is a server-side scripting language designed for web development but also used as a general-purpose programming language. PHP code may be embedded into HTML code, or it can be used in combination with various web template systems, web content management system and web frameworks. PHP code is usually processed by a PHP interpreter implemented as a module in the web server or as a Common Gateway Interface (CGI) executable. The web server combines the results of the interpreted and executed PHP code, which may be any type of data, including images, with the generated web page.
- 3) HTML:
Hypertext Markup Language, commonly abbreviated as HTML, is standard markup language used to create web pages. Along with CSS, and JavaScript, HTML is a cornerstone technology used to create web pages, as well as to create user interfaces for mobile and web applications. Web browsers can read HTML files and render them into visible or audible web pages.
- 4) Python:
Python is widely used high level, general purpose, interpreted, dynamic programming language. Its design philosophy emphasizes code readability, and its syntax allows programmers to express concepts in fewer lines of code than in languages such as C++ or Java. The language provides constructs intended to enable clear programs on both a small and large scale. It features a dynamic type system and automatic memory management and has a large and comprehensive standard library.
- 5) Embedded C:
The C Standards Committee extended the C language by providing a common standard for all implementations. It includes a number of features not available in normal C, such as, fixed-point arithmetic, named address spaces, and basic I/O hardware addressing. It is small and simpler to learn, understand, program and debug. It supports access to I/O and provides ease of management of large embedded projects. In Embedded one needs to read/write data on given address, so in C it's easy to access and modify, because of its pointer concept.
- 6) NetBeans IDE:
NetBeans is a software development platform written in Java. The NetBeans Platform allows applications to be developed from a set of modular software components called modules. Applications based on the NetBeans Platform, including the NetBeans integrated development environment (IDE), can be extended by third party developers. The NetBeans IDE is primarily intended for development in Java, but also supports other languages, in particular PHP, C/C++ and HTML5.

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IX. EXPERIMENTAL RESULTS

The proposed model of the research is shown in fig 4. The proposed module consist of rider helmet, pillion helmet and bike module. The information which is updated to the server using IoT technology can be verified as shown in fig 5.

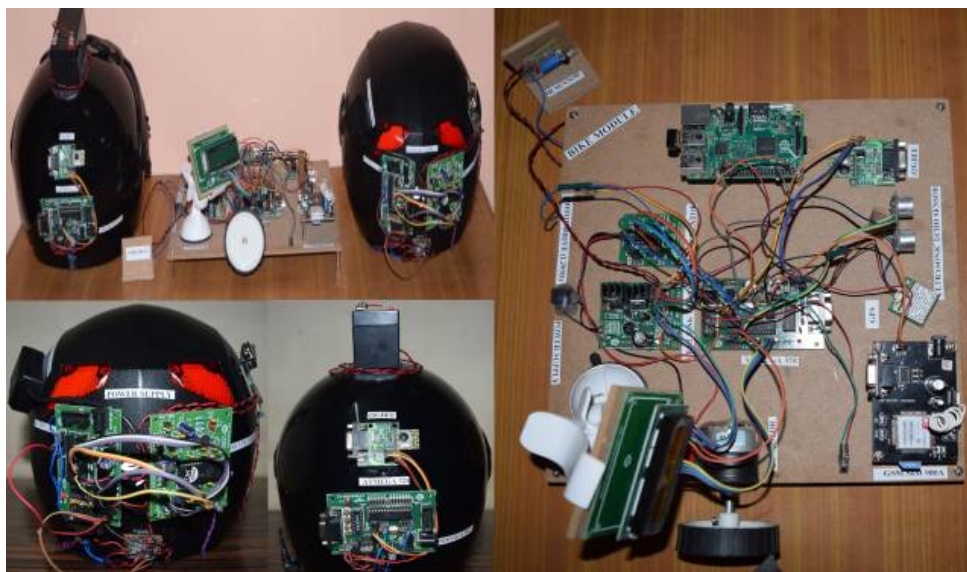


Fig.4 The proposed model

```
pi@raspberrypi: ~  
File Edit Tabs Help  
pi@raspberrypi ~$ sudo python main.py  
main.py:12: Funtimewarning: A physical pull up resistor is fitted on this channel  
GPIO.setup(3,GPIO.OUT)  
ON  
code=  
b  
accident detected  
accident updation  
success  
data Updation successful  
{u'status': u'success', u'message': u'data Updation successful'}  
ON  
code=  
c  
engine over heated  
temperature updation  
success  
data Updation successful  
ON  
code=  
a  
alcohol detected  
alcohol updation
```

Fig. 5Update verification

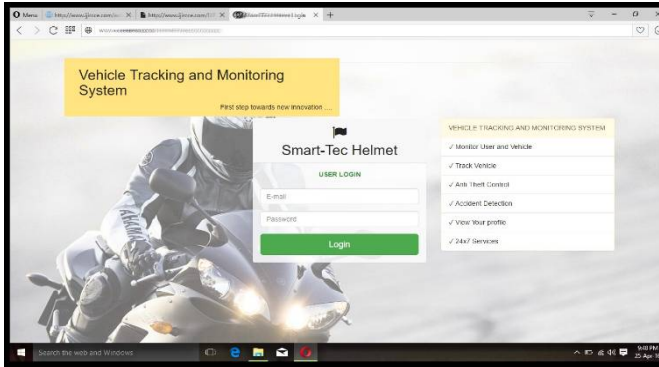


Fig. 6.1

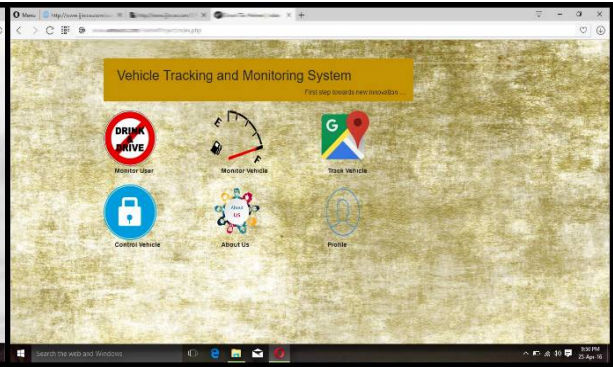


Fig. 6.2



Fig. 6.3

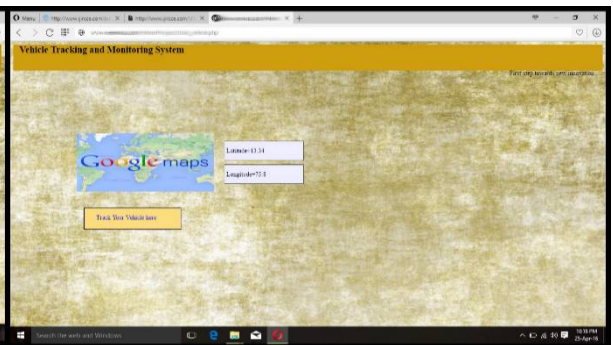


Fig. 6.4

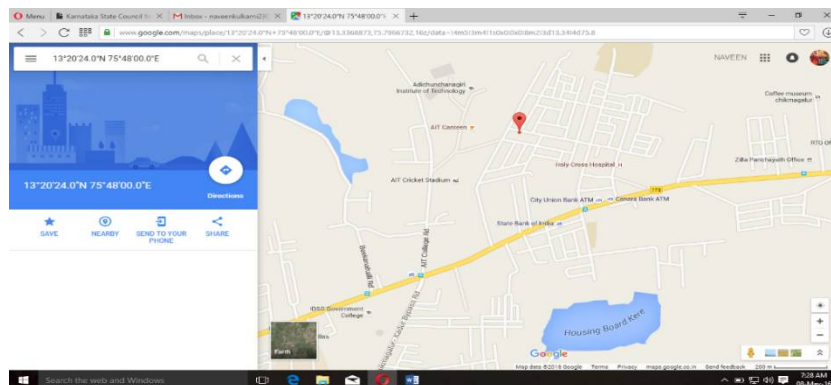


Fig. 6.5

Fig. 6 Vehicle monitoring, controlling and tracking (6.1) Login page (6.2) Home page (6.3) Vehicle controlling (6.4) Vehicle tracking details (latitude and longitude) (6.5) Real time positioning using Google Map.

Each authorized user who is the owner of the vehicle can login to the particular account as shown in fig 6.1 for vehicle monitoring, controlling and tracking as shown in fig 6.2. The authorized user can lock or unlock the vehicle remotely as shown in fig 6.3 with the help of IoT technology which serves as anti theft protection to the owner of vehicle. The user can also track the vehicle in real time using Google map as shown in fig 6.4 and fig 6.5.

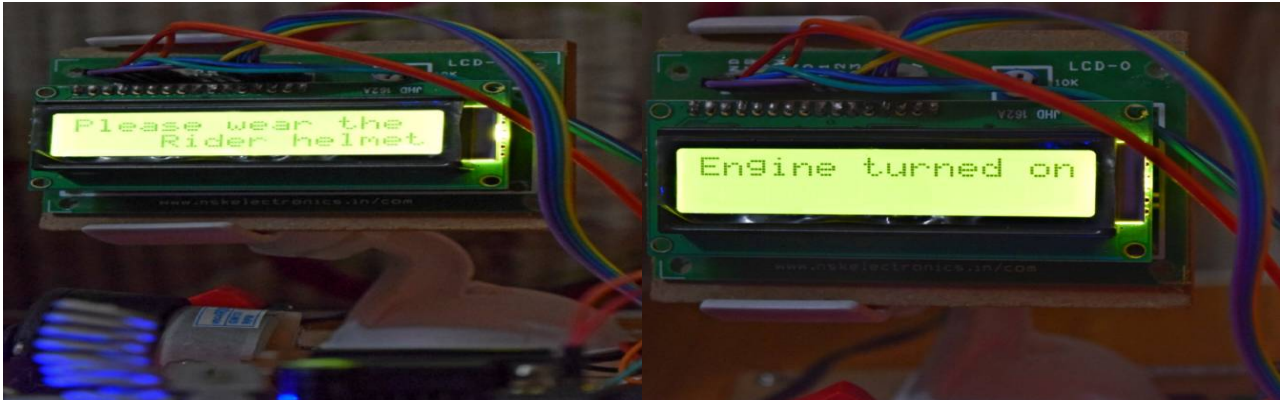


Fig. 7.1 Fig. 7.2

Fig. 7 Rider helmet detection (7.1) When the rider has not worn the helmet. (7.2) When the rider has worn the helmet.

When the rider switches the module ON, the message is displayed on LCD as shown in fig 7.1 until the rider wears the helmet. When the rider who has not consumed the alcohol wears the helmet and if pillion is not present then ignition of vehicle turns ON and message is displayed on LCD as shown in fig 7.2.

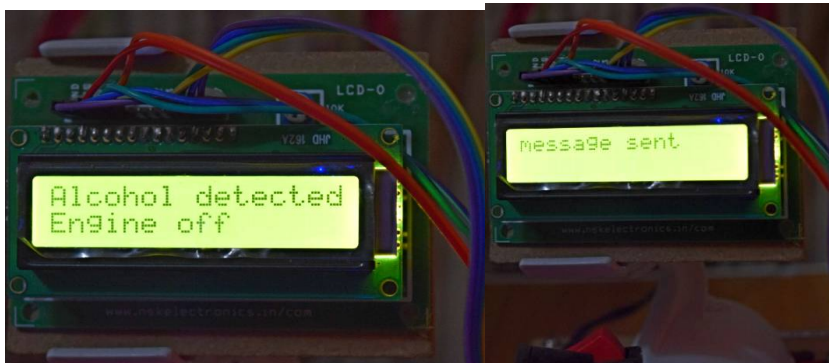


Fig. 8.1

Fig. 8.2 Fig. 8.3

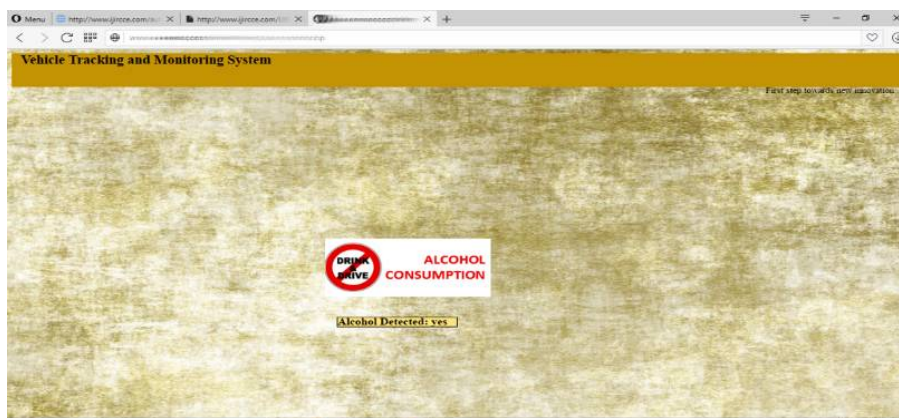
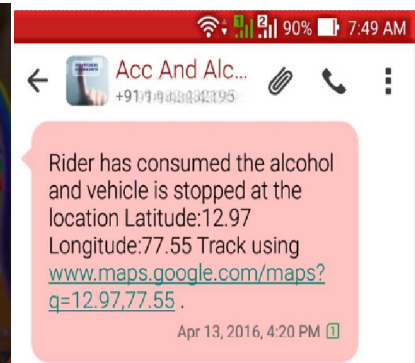


Fig. 8.4

Fig. 8 Alcohol detection (8.1) When rider has consumed alcohol (8.2) Text message sent to predefined number (8.3) Message received by the concerned person (8.4) Data updated on the server.

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When the rider has consumed the alcohol the ignition turns OFF and displays the message on LCD as shown in fig 8.1. With the help of GPS and GSM the text message is sent to the predefined number as shown in fig 8.2 and 8.3. This information is also updated to the server with the help of IoT technology as shown in fig 8.4.



Fig. 9.1



Fig. 9.2

Fig. 9 Pillion helmet detection (9.1) When pillion is not wearing the helmet. (9.2) When pillion is wearing the helmet.

The bike module checks whether the pillion is present or not. If the pillion is present and not wearing the helmet then ignition will not turn ON and rider will get the intimation through speakers and the message is displayed on the LCD as shown in fig 9.1. When the pillion wears the helmet, the ignitions turns ON and displays the message on LCD as shown in fig. 9.2.



Fig. 10.1



Fig. 10.2

Fig. 10 Obstacle detection (10.1)When rider approaches 1st permissible limit. (10.2) When rider reaches maximum permissible limit.

When the rider approaches 1st permissible limit, the warning message is displayed on the LCD as shown in fig 10.1 and rider gets the intimation through speakers to reduce the speed. If the rider neglects the warning message and approaches very close to the obstacle i.e. maximum permissible limit then speed is automatically reduced to certain limit and displays the message on the LCD as shown in fig 10.2.

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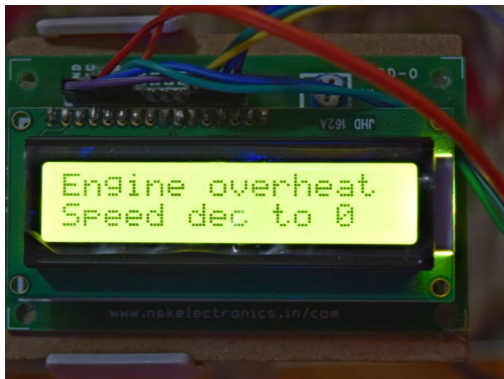


Fig. 11.1

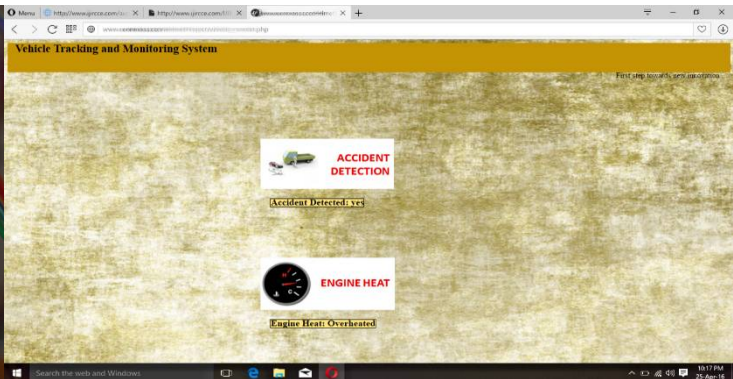


Fig. 11.2

Fig. 11 Temperature detection (11.1) When engine is overheated (11.2) Data updated on the server.

When temperature of engine gets overheated then speed is gradually reduced to zero and displays the message on the LCD as shown in the fig 11.1. This information is also updated to the server with the help of IoT technology as shown in fig 11.2.

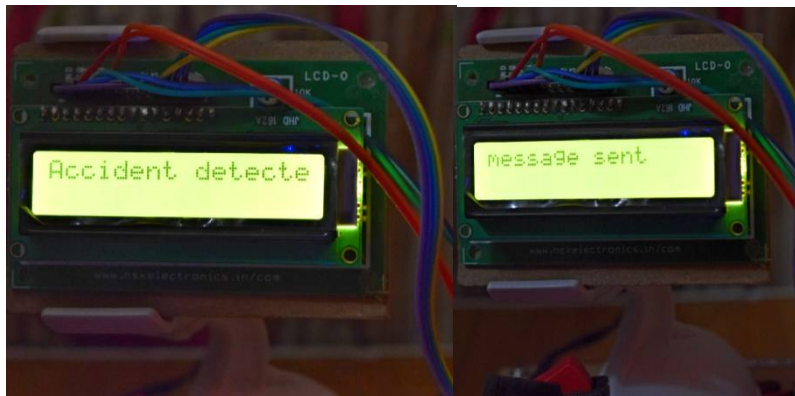


Fig. 12.1 Fig. 12.2 Fig. 12.3

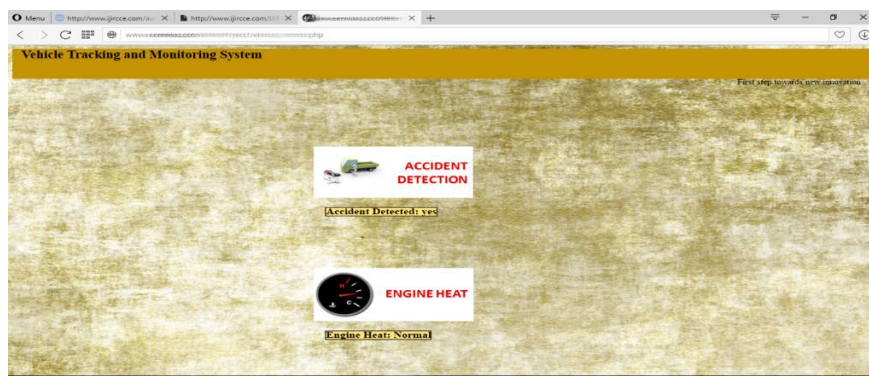
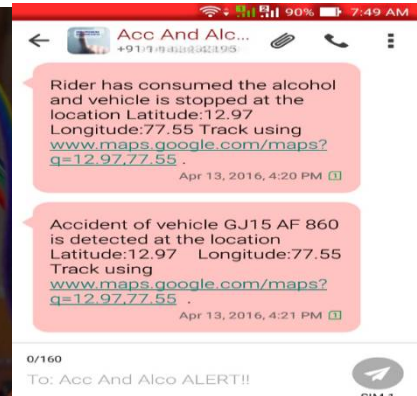


Fig. 12.4

Fig. 12 Accident detection (12.1) When accident is detected (12.2) Text message sent to predefined number (12.3) Message received by concerned person (12.4) Data updated on server.

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When the helmet hits the ground, the output of vibration sensor goes high. Thus the occurrence of the accident is detected, which is displayed on the LCD as shown in fig 12.1. With the help of GPS and GSM the text message is sent to the predefined number (ambulance) as shown in fig 12.2 and 12.3. This information is also updated to the server with the help of IoT technology as shown in fig 12.4.

X. CONCLUSION

As per the notification issued by the Transport Department of Karnataka, "Every person while driving or riding (both for rider and pillion rider) a motorcycle of any type to motorcycles, scooters and mopeds irrespective of Brake Horsepower of the vehicle within the limit of Karnataka state shall wear protective headgear". Hence this research helps to abide the rule issued by government to make the rider and pillion to compulsory wear the helmet and helps in avoiding the violation of the traffic rules, this in turn reduces the work of traffic police. The module also helps in providing the constant situational awareness to the rider and provides all the safety measurement to the individual during the adverse conditions to save his/her life using the helmet with simple but highly advanced technology which not only make the user the efficient rider and reduces the accidents but also saves the life during critical and unpredictable situations.

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