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Design of Intelligent Bike Helmet to Avoid Road Accidents

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ABSTRACT: A new intelligent helmet that ensures that a rider cannot start the bike without wearing it. So the bike will start only with both the key and the helmet. The working of the model is demonstrated by using switching ON and OFF the LED. A smart helmet is a special idea which makes motor cycle driving safer than before. GSM and GPS technology is used to implementing this work. The working of the smart helmet is very simple, vibration sensors are placed in the helmet where hitting probability is more and connected to microcontroller. So when the rider crashes and the helmet hit the ground, these sensors sense and send to microcontroller, then by using GPS module GPS data can be extracted. When the data exceeds minimum stress limit then GSM module automatically send message to ambulance or family. This system also checks the approaching vehicle's speed on either side of the road and generates vibrations in the bike's handlebar.

KEYWORDS: Intelligent helmet motor cycle, GSM, GPS, and microcontroller.

I. INTRODUCTION

An Embedded system is a special-purpose computer system design to perform a dedicated function. Since the system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product. Embedded system comprises of both hardware and software. Embedded system is fast growing technology in various fields like industrial automation, home appliances, automobiles, aeronautics etc. Embedded technology uses PC or a controller to do the specified task and the programming is done using assembly language programming or embedded C. An embedded system is a computer system designed to perform one or a few dedicated functions often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. By contrast, a general-purpose computer, such as a personal computer (PC), is designed to be flexible and to meet a wide range of end-user needs. Embedded systems control many devices in common use today. Embedded systems are controlled by one or more main processing cores that are typically either microcontrollers or digital signal processor (DSP). The key characteristic is being dedicated to handle a particular task, which may require very powerful processors.

Embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure. In general, "embedded system" is not a strictly definable term, as most systems have some element of extensibility or programmability. The handheld computers share some elements with embedded systems such as the operating systems and microprocessors which power them, but it allow different applications to be loaded

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and peripherals to be connected. Embedded systems are controllers with on chip control. They consist of microcontrollers, input and output devices, memories etc., on chip and they can be used for a specific application.

II. RELATED WORK

The existing works related to accident detection and alcohol detection is examined in detail manner. Accident detection and information passing by using vibration sensor with GSM and GPS technology works and Alcohol detection using MQ3 gas sensors and other alcohol detection module is explained in this section. Various works examined to detect the accident and send the information about the location of the bike when it met accident using GPS module. GPS module to extract the location of the accident, the GPS data will contain the latitude and longitude values using which find the accident place can be found accurately. The switching on and off of a led indicator will be used to demonstrate the working of the model. The Basic principle used is a remotely switched relay. The trigger is on the helmet itself, and is activated only when the rider wears it, which in turn switches the relay in the bike's ignition circuit, thereby making it mandatory for the rider to wear it in order to start the bike. Advantage of this work is wearing helmet is made compulsory to start the bike. And particular helmet is used to start particular bike. Disadvantage of this work is rider cannot assure for wearing the helmet when the back seater is wearing the helmet the bike can start.

According to the survey India 698 accidents occur per year, nearly half the injured people die due to lack of treatment in proper time. The many reasons for this such as late arrival of ambulance no persons at place where the accident occur to give information to the ambulance or parents. The idea of this work is to give information about the rider wearing the helmet or not, whether the rider drunken or not and also, he met with an accident it gives an information about location where he is met with an accident through GSM module to mobile numbers family members, so this work has chosen GSM technology to give the information by sending SMS, using GSM module which has SIM card slot to place the SIM and send SMS. Sending SMS alone can't help the driver, if it sends and an SMS saying that accident had occurred where the ambulance will come without knowing the location of the accident. So to trace out the location where exactly accident occur using GPS module, and gives to microcontroller, then it sends the SMS which contains the latitude and longitude of an area to family members mobile numbers for this purpose GPS module is used to extract the location of the accident, the GPS data will contain the latitude and longitude values used to find the accurate position of the accident place. Advantage of this work is easy tracking the accidents of bikes and avoiding accident in absence of helmet.

This system is aimed at making vehicle driving safer than before .The main purpose behind this project is "Drunken driving detection". Now days, many accidents are happening because of the alcohol consumption of the driver or the person who is driving the vehicle. Thus drunk driving is a major reason of accidents in almost all countries all over the world. It is used to sense the alcohol. The analog output of which is applied to the comparator. The analog gas sensor-MQ3 is suitable for detecting; this sensor can be used in a breathalyser. It has a high sensitivity to alcohol and low sensitivity to benzene. The sensitivity can be adjusted by the potentiometer. Sensitive material of MQ-3 gas sensor is SnO₂, which with lower conductivity in clear air. In this work detection of alcohol using alcohol detector connected to printed circuit board such that when the level of alcohol crosses a permissible limit, the vehicle ignition system will turn off. Alcohol detector in car project is designed for the safety of the people seating inside the car. Alcohol breath analyser module should be fitted or installed inside the vehicle. This module has Good sensitivity to alcohol gas, simple drive circuit, long life and cost. This sensor has high sensitivity to alcohol and small towards benzene. This system is aimed at making vehicle driving safer than before. This is implemented using Arduino. This work has derived the driver's condition in real time environment and proposes the detection of alcohol using alcohol detector connected to Arduino such that when the level of alcohol crosses a permissible limit, the vehicle ignition system will turn off and the GPS module will capture the present location of the vehicle. Also the GSM module will automatically send the distress message to police or family members.

India had earned the dubious distinction of having more GPS module GSM module, 16x2 LCD display and DC number of fatalities due to road accident in the world. Road safety is emerging as a major social concern around the

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world especially in India. Drinking and driving is already a serious public health problem, which is likely to emerge as one of the most significant problem in the near future. The system implemented by us aims at reducing the road accidents in the near future due to drunken driving. This system detects the presence of alcohol in the vehicle and immediately locks the engine of vehicle. At the same time an SMS along with the location of vehicle is send to three pre-selected contacts. Hence the system reduces the quantum of road accidents and fatalities due to drunk driving in future.

EXISTING SYSTEM

During 2008, Road Traffic Injuries (RTI) ranked fourth among the leading causes of death in the world. Nearly 1.3 million people die every year on the world's roads and 20 to 50 million people suffer non-fatal injuries, with many sustaining a disability as a result of their injury. Road traffic injuries are the leading cause of death among young people aged 15-29 years and cost countries 1-3% of the gross domestic product (GDP). India has one of the highest rates of motorcycle injuries. The victims classified as "severely injured", nearly 76 per cent sustain head injuries, a figure 25 times higher than that in developed countries. A Traumatic Brain Injury (TBI) can lead to a range of problems-from mild concussion to paralysis, from personality changes to even coma. Because the brain cannot heal itself the way other organs do, an injury is often a lifelong problem. About 40% of those killed and injured on Indian roads are motorcyclists. According to the TDGI (Transportation Department of the Government of India), there is an increase in the number of road accidents from 5.11 lakh to 5.7 lakh within the year 2011 to 2014 and more disturbingly, the large number of deaths from road accidents are borne by "vulnerable road users" such as pedestrians, cyclists and motorcyclists. So if it can be made mandatory to make the people wear the helmet when the rider ride the bike then the rates of accidents can be expected to fall. Many laws and regulations have been proposed to prevent these major percentages of accidents but unfortunately despite the laws these cases are still on a rise because of the lack of proper implementation. Now the time has come to use technologies to prevent this type of alarming accidents. The helmet designed here, is aimed at ensuring that the rider can't avoid wearing the helmet while ride, as it will be needed to start the proper implementation. The existing system is a simple telemetry system, which is activated by means of a pressure that is applied to the helmet's interior when the rider wears it. The technology used is ROHS compliant and is absolutely safe and feasible for long term usage. Once activated the transmitter sends a control signal to the receiver circuit and activates the relay which is connected to the bike's ignition circuit's power supply. The prototype used here consists of a DPDT electromechanical relay and has some time lag while wearing the helmet and switching on of the circuit (average experimental time= 4.57 seconds). In large scale production, solid state relays can be used which have much smaller response time.

III. PROPOSED SYSTEM

This project describes how to prevent the accident. Vehicle accidents are most common if the driving is inadequate. These happen on most factors if the driver is alcoholic or if not wearing the helmet. In this one case the person is under less conscious. If the rider is not wearing the helmet it can easily detected and the bike will not get start without the signal that the rider is wearing the helmet. Driver consuming alcohol resulting in reduced vehicle control is one of the major causes of road accidents. This project will help to prevent road accidents due to this kind of situation. Besides, lot of situations is there. If accident occurs the person needs help. So the location of accident is traced by GPS module and emergency message is automatically send to the emergency station or the family members by means of GSM module. The Internet of Things (IoT) can be defined as an infrastructure which combines intelligent services with situational awareness, and allows mutual communication between people and intelligent things over a network. In this study, we design and implement an IoT-based helmet automatic lock to reduce the impact of accidents.

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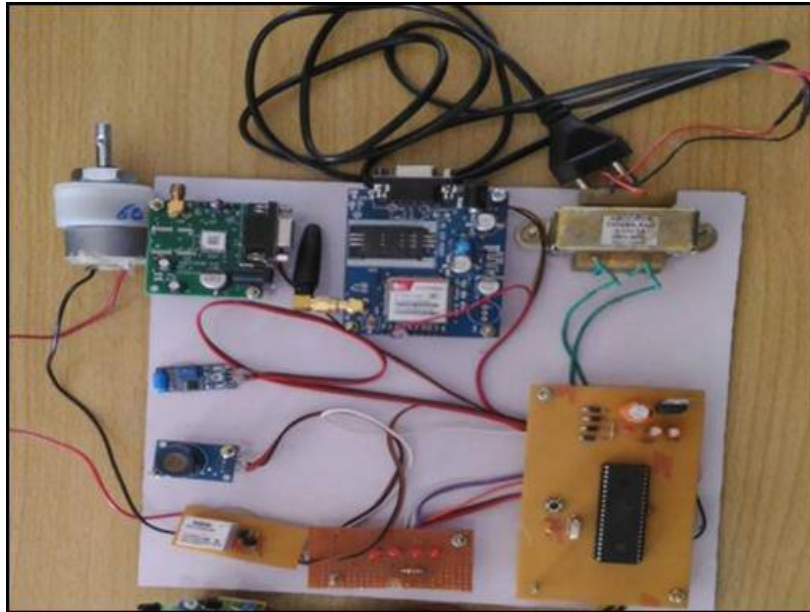


Fig 1: Proposed system layout

This project describes how to prevent the accident. Vehicle accidents are most common if the driving is inadequate. These happen on most factors if the driver is alcoholic or if not wearing the helmet. In this one case the person is under less conscious. Driver consuming alcohol resulting in reduced vehicle control is one of the major causes of road accidents. This project will help to prevent road accidents due to this kind of situation. Besides, lot of situations is there. If accident occurs the person needs help. So the location of accident is traced by GPS module and emergency message is automatically send to the emergency station or the family members by means of GSM module. The sensor used for detecting alcohol is MQ3 sensor. Initially this sensor sense whether the person who drives a car is consuming alcohol or not. If yes, then the motor of the vehicle cannot be turn on. Thus it is very useful to prevent accident due to drink and driving.

The IR module is placed near the petrol tank to ensure whether the rider is there to start the bike and second IR module is placed near the handle bar at back side to ensure whether back seater is there or not. 3rd and 4th IR module is used in the helmet to ensure that the rider has wearing the helmet or not. If all the modules send the information in the form of pulses and given to the Microcontroller this operation is enabled by means of the driver circuit connected to the vehicle motor. The vibration sensor is used to detect the accident. At the time of accident there is major vibration in the vehicle. Immediately the GPS associated with the vibration sensor starts tracking the location. GSM module automatically send distress message to emergency service station and family members. This message contains the longitude and latitude values, by using these values it is easily track the place.

Alcohol Detection

Drinking and driving is a serious public health problem, which is likely to emerge as one of the most significant problem. The system implemented by us aims at reducing the road accidents in the near future due to drunken driving. The system detects the presence of alcohol in the vehicle and immediately locks the engine of the vehicle. Hence the system reduces the quantum of road accidents and fatalities due to drunk driving in future.

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IR Sensor

Infrared radiation (IR) is electromagnetic radiation with a wavelength between 0.7 and 300 micrometers, which equates to a frequency range between approximately 1 and 430 THz. Its wavelength is longer (and the frequency lower) than that of visible light, but the wavelength is shorter (and the frequency higher) than that of terahertz radiation microwaves. Bright sunlight provides an irradiance of about 1 kilowatt per square meter at sea level. Of this energy, 527 watts is infrared light, 445 watts is visible light, and 32 watts is ultraviolet light. Infrared imaging is used extensively for military and civilian purposes. Military applications include target acquisition, surveillance, and night vision, homing and tracking. Non-military uses include thermal efficiency analysis, remote temperature sensing, short-ranged wireless communication, spectroscopy, and weather forecasting. Infrared astronomy uses sensor-equipped telescopes to penetrate dusty regions of space, such as molecular clouds; detect cool objects such as planets, and to view highly red-shifted objects from the early days of the universe.

Tracking

If accident occurs there is major vibration in vehicle. At that time GPS associated with vibration sensor will start tracking the current location of the vehicle. Every location on earth has a global address. It is described by two numbers-its latitude and its longitude. Because the address is in numbers, people can communicate about location. A global address is given as two numbers called coordinates. The two numbers are a location's latitude and number and its longitude numbers. Latitude and longitude are imaginary lines drawn on maps to easily locate places on the earth.

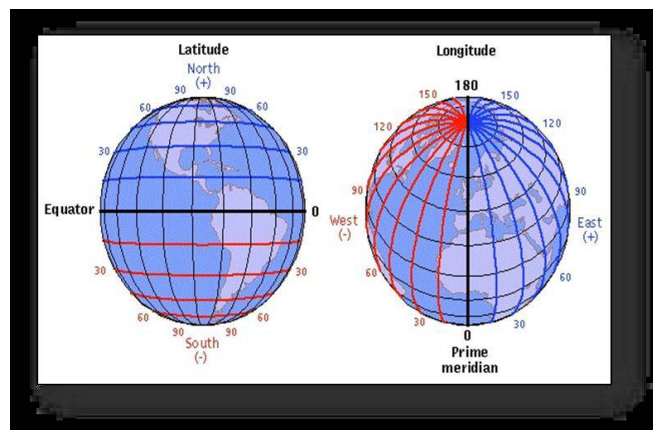


Fig 2. Latitude and Longitude

In fig 3 Block diagram contains four IR module, with GSM and GPS module. This is used to send information and locate the accident of the vehicle during accident. Vibration sensor is used to detect accident. Alcohol sensor is used to detect whether the rider is drunken or not. Relay is used to connect to the motor by using signals from the micro

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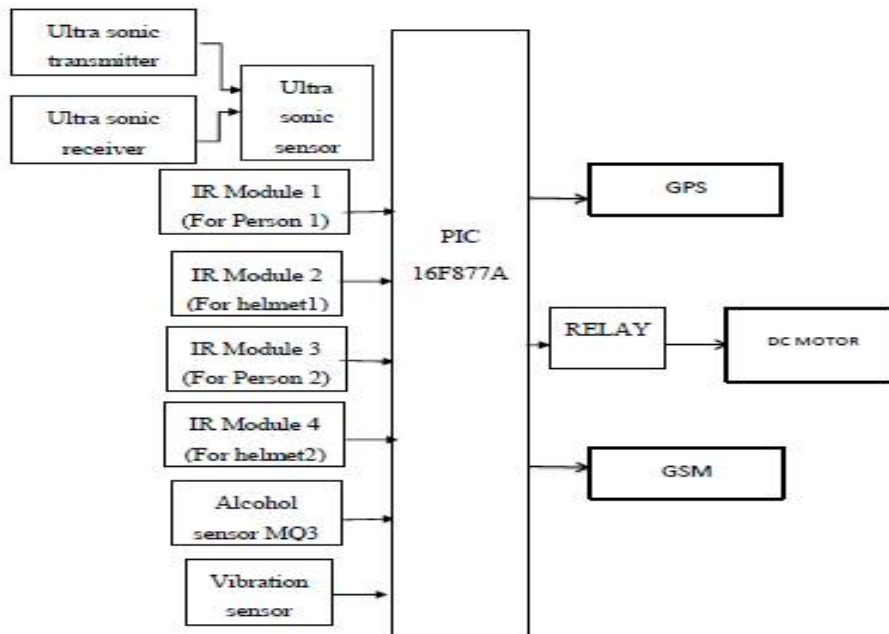


Fig 3. Block diagram of proposed system

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays". Magnetic latching relays require one pulse of coil power to move their contacts in one direction, and another, redirected pulse to move them back. Repeated pulses from the same input have no effect. Magnetic latching relays are useful in applications where interrupted power should not be able to transition the contacts. Magnetic latching relays can have either single or dual coils. On a single coil device, the relay will operate in one direction when power is applied with one polarity, and will reset when the polarity is reversed. On a dual coil device, when polarized voltage is applied to the reset coil the contacts will transition. AC controlled magnetic latch relays have single coils that employ steering diodes to differentiate between operate and reset commands.

IV. RESULTS AND DISCUSSION

This work describes about the importance of wearing helmet during driving the bike riding. GSM is used in this work to send the information when the bike met an accident. GPS is used to track the location of the bike during accident. When the bike met an accident signal is send to microcontroller to track the location by using GPS. The result is shown in the figure 6.1 which gives the information about the latitude and longitude of the place by using GPS.

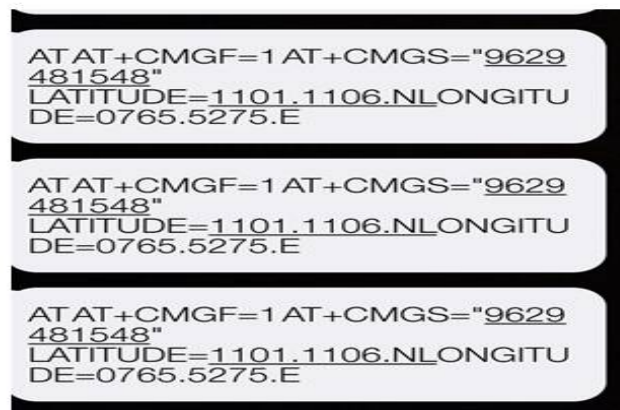
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AT+CMGF=1 is the GSM format to send the message .when the value is equal to 1 message send and when the value is 0 message cannot be send from the GSM.AT+CMGS is the format used to send the SMS from the GSM in the module to the given mobile number about the location details about the bike.



```
AT+CMGF=1 AT+CMGS="9629
481548"
LATITUDE=1101.1106.N LONGITU
DE=0765.5275.E

AT+CMGF=1 AT+CMGS="9629
481548"
LATITUDE=1101.1106.N LONGITU
DE=0765.5275.E

AT+CMGF=1 AT+CMGS="9629
481548"
LATITUDE=1101.1106.N LONGITU
DE=0765.5275.E
```

Fig 4: Simulation Result of an output Circuit.

V. CONCLUSION

An effective solution is provided to develop the intelligent system for bike which can monitor various parameters of vehicle in-between constant time period and can send this data to the base unit as explained, by using hardware platform PIC16F877A, Alcohol sensor MQ3, IR module, Vibration sensor, DC Motor, GPS & GSM module. The designed system would finish the function of communicating with the base station via GPS, GSM and send the information regarding the accident of bike. The whole Control system has the advantage of small volume and high reliability. This system brings innovation to the existing technology in the vehicles and also improves the safety features, hence proving to be an effective development in the automobile industries.

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