

GSM Based Smart Helmet with Sensors for Accident Prevention and Intellectual Motorbike

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Abstract:

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 for the rider. This can be implemented by using advanced features like accident identification, location tracking, use as a hands free device, fall detection. This makes it not only a 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 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. In case of an accident it will send a message through GSM along with location with the help of GPS module. The distinctive utility of project is fall detection; if the rider falls down from the bike it sends a message.

Keywords —GSM, Tracking, RF, accelerometer, Biker's safety, Accident detection, Smart helmet, Alcohol detection.

I. INTRODUCTION

In every aspect of our life safety and security are the major important areas. Now-a-days the scenario that we come across in many cases of human deaths and severe injuries to people is because of two-wheeler road accidents. And it is a crucial issue that requires everybody's attention, for every four minutes there is one death being reported in India. As per World Health Organization (WHO) we have identified that 40% of the deaths and 70% of severe injuries can be reduced if bike rider wears the helmet.

Now a day's wearing helmet is compulsory for every two wheeler riders and also it is equally important for pillion riders too to wear the helmet, but the discomfort or inconvenience caused due to wearing conventional helmet makes the rider to avoid using the helmet and finally it leads to death of the rider.

In spite of the fact that helmets are being available to everybody, people are just not wearing them and the main reason behind it is that the conventional helmets are generating unconditional temperatures inside it which makes inconvenience to the person.

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.

For the automation of coal mining industry in South Africa considering that of productivity, health and safety [1]D. Kock, et al. formulated the coal interface detection (CID). In order to do this two well-known techniques such as vibration analysis and natural gamma radiation were used. They also considered infrared, power line carrier, radio and optical fibre communication channels for transmission of data in the coal mines as communication channels. It is needed to thoroughly explore the prosperous implementation of computerized systems in underground mines. People can take the ownership of the operation.

An intelligent helmet for coal mines based on ZigBee wireless communication was proposed by Cheng Quing and et al. [2]. The main idea is to detect the level of humidity, concentration of methane and temperature in the mining area. The data sensed is transmitted to the ground station through ZigBee in wireless mode. The monitoring person who is in the ground station gives alert to the miner through voice communication when the event occurred. The drawback in this method is that it is impossible to aware miner through voice communication as he is be working in a raucous environment and a person needs to be selected at the monitoring room to monitor and alert the miner.

A safety helmet for miners based on ZigBee wireless technology was proposed by Shishiret al. [3]. Monitoring of gas concentration, humidity and temperature of the surrounding were measured. The data sensed is transmitted through ZigBee to control centre in wireless mode. When the sensed data is beyond the normal values the warning is sent through ZigBee by using different LED's and

driving up alarm circuit. The drawback of this system is the real-time data can be viewed but not possible to data log and not able to recognise which miner has experienced problems

Alcohol detection is mainly to detect the drunken people was proposed by AbhinavAnand [4]. MQ-3 sensors are used to detect the amount of alcohol content in the breath and if the rider is alcoholic the bike will not start. Using RF module the communication is made possible.

This system has been developed and realized using smart sensors and LPC2148 controller based mobile technology. If the accident happened then this system directly transmit the location of the accident and victim's heart beat count to the emergency care centre through SMS. [5]. The system designed in such a way that without wearing the helmet the rider cannot start two wheelers. The helmet is connected to bike's ignition systems which is electronically controlled. Smart Helmet. For Indian Bike Riders [6], affords an excellent alternative to the prevailing accidental avoidance techniques. These include modern helmet and an electronic system which can be applied in mechanical system as two wheelers to avoid accidents on roads by urge of wearing helmet

Currently in the existing system, when the person met with an accident we are not in a position to ensure the immediate first aid treatment; due to this late medication the person may die. With the help of proposed system in this paper, it triggers an automatic alert message to the concerned person or to the ambulance in case of any emergency situation like an accident. The alert message consists of the details such as location of the accident, which will help to speed up the first aid service to the casualty. The Internet of Things (IoT) can provide an infrastructure which integrates the smart services with situational responses, and also allows mutual communication between smart things or devices and people over a network. So we have come up with this idea of IoT based smart helmet which ensures the safety of the rider while riding.

The idea of proposing this system has mainly come from the social responsibility towards the society. The proposed system allows the rider to start a bike only on wearing the helmet. This system

identifies the bike accidents with accuracy and gives information to the nearby hospital and relatives of the rider who met with an accident. It also tracks the location details of the rider and will be stored in the cloud/server.

The proposed helmet has the advantages like Detection of accident in remote area can be easily detected and medical facilities provided in short time, stress-free to operate by the user, consistent system, monitors hazards and threats, sophisticated security, simple and reliable design etc

II. BLOCK DIAGRAM OF THE SYSTEM

The block diagram for the motor bike module is shown in Fig 1. PIC microcontroller is the heart of the system. It has MemS sensor, GPS module, RF receiver and GSM module. The relay and DC motor arrangement is given to to have control on ignition system

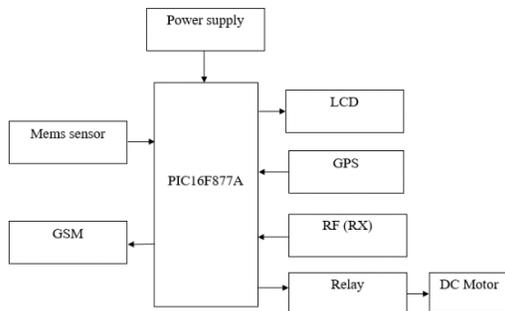


Fig 1. Motor bike module

The block diagram of the helmet module is shown in fig 2. It has an ARDUINO connected with pressure and alcohol sensor.

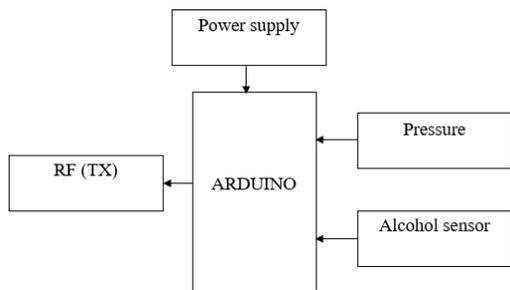


Fig 2. Helmet module

III. WORKING

The system is working on the output of two conditions before the engine is ignited. It first

checks whether the rider is wearing his helmet or not using the pressure sensor placed within the helmet. If the rider is not wearing the helmet then the engine never starts. The alcohol sensor is used to detect the alcohol content in rider’s breath. If the above said conditions were not satisfied the engine will not start. If the rider is not drunken and he is wearing the helmet then bike starts. On the occurrence of accident, the MEMS sensor detects it and a message will be sent to the predefined mobile number using GSM modem. The place of accident is sent in terms of the latitude and longitude of the place using GPS.

IV. HARDWARE MODULES

Microcontroller (ARDUINO UNO)

Arduino Uno is a microcontroller board based on ATmega328 which has 14 digital I/O pins of which 6 can be used as PWM outputs. It has 6 analog inputs, one 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains all needed to upkeep the microcontroller, simply connect it to computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

GPS Technology

Global Positioning System (GPS) is a satellite based navigation system which sends and receives radio frequency signals. A GPS receiver gets these signals and offers the user with information. With the help of GPS technology, location, velocity and time, weather conditions can be determined in any part of the world.

GSM Technology

Global System for Mobile communications (GSM) is a digital cellular technology used for transmitting mobile voice and data services. It digitizes and compresses data, then sends it down a channel as an SMS.

Serial Communication

UART which is inbuilt in the microcontroller will be enabled to start the serial communication. The main requirements for serial communication are Microcontroller, computer system, RS232, MAX 232 IC HyperTerminal

Liquid Crystal Display

LCD stands for Liquid Crystal Display which is wide spread use replacing LEDs. A model used here is low cost LCD which can display messages in two lines with 16 characters each. It can also display the alphabets, Greek letters, punctuation marks, mathematical symbols and also the user defined symbols.

DC Motor

In general motor transform electrical energy into mechanical energy. DC motors require a direct current or voltage source for its working.

Alcohol Sensor

This MQ2 module is useful for gas leakage detection in home and industry. It is appropriate for sensing H₂, LPG, CH₄, CO, Alcohol, Smoke or Propane. Because of its high sensitivity and high response time, measurement can be taken as fast as possible.

IV. CONCLUSIONS

The proposed smart helmet efficiently ensures whether the rider is wearing helmet throughout the ride. It also confirm the rider should not be under the influence of alcohol. It is capable of accident detection. Hence the human life can be saved. Using this helmet a safe two-wheeler journey is possible which would shrinkage the head injuries during accidents and also reduce the accident rate due to driving bike after consuming alcohol. The helmet may not be complete solution for saving the life but it is absolutely the first line of security for the rider in case of an accident to prevent fatal injuries.

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