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IOT Based SMART Helmet For Accident Detection

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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 smart helmet to provide safety for rider.This implement by using advance feature like alcohol detection, accident identification, location tracking, use as a hands free device, solar powered, fall detection. This makes not only smart helmet but also feature of smart bike. Its compulsory to wear helmet, without helmet ignition switch cannot ON. A RF Module as wireless link which able to communicate between transmitter and receiver. If rider getting drunk it gets automatically ignition switch is locked, and send message automatically to their register number with their current location. So when accident occurs, it will send message by GSM to register numbers with their current location by GPS module. It can use to receive call while driving. The distinctive utility of project is fall detection, if the bike rider fall from bike it will send message automatically.

Keywords
Internet of Things, Arduino, Accident detection, Sensors.

1. INTRODUCTION
In recent times helmets have been made compulsory in Maharashtra State. Traffic accidents in India have increased year by year. As per Section129 of Motor Vehicles Act, 1988 makes it required for every single riding a two-wheeler to wear protective headgear following to standards of the BIS (Bureau of Indian Standards).In India drunken drive case is a criminal offence of The Motor Vehicle act 1939. Which states that the bike rider will get punish. In existence bike rider easily get escaped from law. These are the three main issues which motivates us for developing this project. In today's era, especially in the young generation, the craze of motorbikes is really remarkable. The middle class families prefer to buy motorbikes over 4-wheelers, because of their low prices, various varieties available in the market, due to cut-throat competitions between 2-wheeler companies and durability. 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 common negligence of not wearing the helmets, also many deaths occur due to lack of prompt medical attention needed by the injured person. This motivates us to think about making a system which ensures the safety of biker, by making it necessary to wear helmet, as per government guidelines, also to get proper and prompt medical attention, after meeting with an accident. The circuit is so designed that the bike wont' start without wearing helmet. It introduced a security system on the rider with the perfect helmet usage before riding. In this system no advanced concepts of Microcontroller 8051 based circuitry is used based on RF link simple working and operation. By using RF transmitter and RF receiver, the motorcycle can be move it receive signal from the helmet .Here our main object is to design the circuit that can improve the safety of motorcyclists.

The project aims at the security and safety of the bikers against road accidents. The first step is to identify the helmet is wear or not. If helmet is wear then ignition will start otherwise it will remains off till helmet is not wear. For these we use FSR sensor. When the condition is satisfied then ignition will start. The third main issue is accident and late medical help. If the rider met accident with him he cannot receive medical help instantly, its big reason for deaths. Around every second people die due to late medical help or the accident place is unmanned. In fall detection, we place accelerometer at the bike unit. Due to these mechanism we detect the accident occurs or not. The aim of this project is to make a protection system in a helmet for a good safety of bike rider. The smart helmet that we made is fixed with sensors which act as to detect wear helmet or not. There are two different microcontroller is used in this project. Signal transmission between the helmet unit and bike unit is using a RF concept.

1.1 Problem statement
Now-a-days, it became very difficult to know that an accident has occurred and to locate the position where it has happened, also many deaths occur due to lack of prompt medical attention needed by the injured person, if person met with an accident, no one is there to help him, Simply leaving or ignoring the person he may die, In such situation, informing to family members through mobile to rescue him for an extent. The project aims at the security and safety of the bikers against road accidents, also to get proper and prompt medical attention, after meeting with an accident.
In India more than 37 million people are using two wheelers .Since usage is high, accident percentage of two wheelers are also high compared to four wheelers. Motorcycles have high rate of fatal accidents than cars or trucks and buses.

2. SYSTEM DEVELOPMENT

Bellow diagram represents the architecture of the proposed system "Smart Helmet". The system is divided into two separate units. One is for helmet and second one is for ignition system of the bike or two wheeler vehicles.

The helmet unit consists of a microcontroller Atmega88p as shown in the above diagram. This microcontroller is used to control the complete circuit of the system. The helmet unit and the ignition unit are connected wirelessly through RF technology. These two units communicate through RF transmitter and receiver pair. For the communication purpose the helmet unit contains a RF transmitter with a HT12E encoder IC. This transmitter will send signal to the receiver unit for the communication and to activate ignition system of the bike.The helmet unit of the system consists of start switch as shown in the architecture of the system. As soon as the bike rider wears the helmet, the switch gets pressed due to the pressure. As the switch gets pressed it sends a signal to the microcontroller and sends the signal to the receiver unit i.e. ignition unit of the bike. This switch is used to activate ignition of the bike. The helmet unit consists of an accelerometer interfaced with the micro controller and it is used to monitor the X and Y position of the driver. This X and Y position values shows whether the helmet is tilted i.e. the driver has fallen or met to an accident. An accelerometer is applied for awareness and fall detection indicating an accident. Accelerometer is a device which can detect a tilt or a sudden jerk in any of the 3 axis(x, y and z).The helmet unit consists of a GPS modem as shown in the architecture of the system. This GPS modem is used to continuously monitor the longitude and latitude location of the bike. This GPS modem continuously monitors the location and sends longitude and latitude values to the controller. This GPS modem is interfaced with the microcontroller with a matching device MAX 232 as shown in the diagram. The helmet unit also consists of a GSM modem as shown in the architecture of the system. This is a SIM800 GSM modem having a SIM slot to place a SIM card in it to send SMS to the family member of the bike rider. This GSM modem is interfaced with the microcontroller with the aid of a matching device MAX232. This modem will send SMS to the mobile numbers saved in it.A 16x2 LCD display is also interfaced in the system. This LCD display is used to display the longitude and latitude of the location of the bike continuously. And when SMS will send to the family members the display will show the message "Message Is Sending". The ignition unit of the system consists of a RF receiver as shown in the architecture. This RF receiver is connected with a HT12D decoder to decode the transmitted signal.

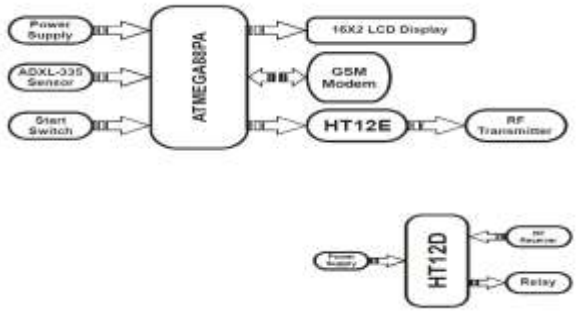

Fig 1:Block Diagram

2.1 Circuit Diagram

The circuit diagram of the system is as shown in the above diagram. The circuit diagram shows the interfacing of all the devices of the system with the microcontroller unit. The system is divided into two units a helmet unit that is a transmitter and an ignition unit that is receiver. In the helmet for the controlling ATMEGA88P microcontroller is used in this prototype. A power supply system i.e. a battery is used to provide required power to the circuit components in this unit.

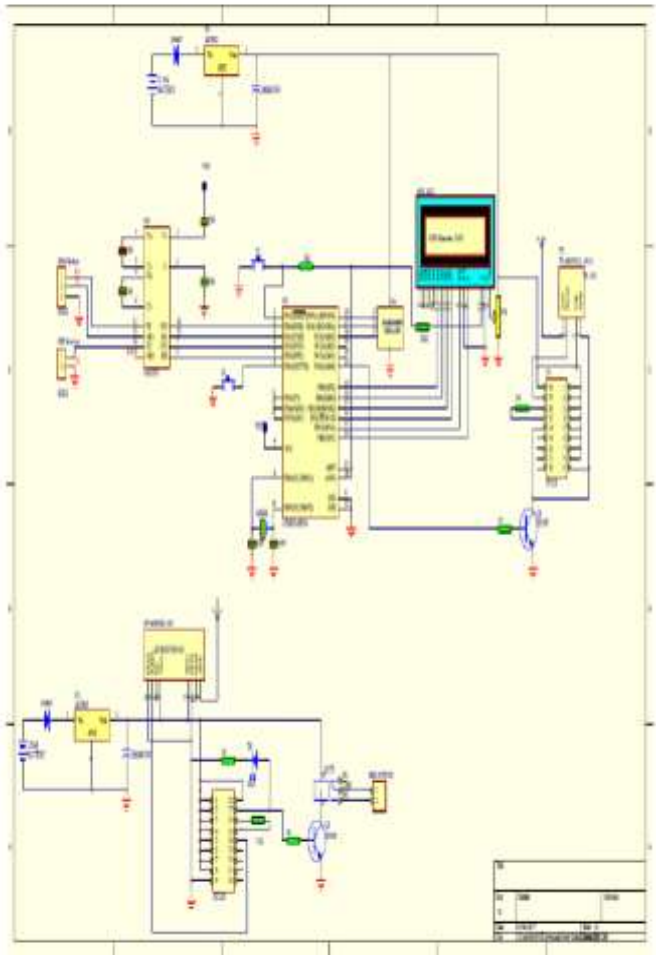

Fig.2:Circuit Diagram

Circuit implemented in the helmet consists of a microcontroller to control the complete circuit action of the unit and to collect the data from the sensor network, process the data and to transmit it to the RF receiver unit. To complete all these functions we have used an ATMEGA88PA microcontroller in this work. This microcontroller requires regulated 5V power supply for its operation. This power supply is provided by the power supply unit in the system. Generally controller works on a stable frequency to produce machine cycles to execute the firmware stored in the memory. To obtain this frequency an external oscillator is connected to the pin number 9 and 10 i.e. OSC1 and OSC2 of the controller IC as shown in the circuit diagram of the system. This is a crystal oscillator designed using a 16MHz crystal with two

parallel capacitors as shown in the circuit diagram. A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency. This frequency is commonly used to keep track of time, to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies. A reset switch is connected to the reset pin i.e. pin number 1 of the controller IC. This switch is used to reset the microcontroller during the fluctuation in the power supply or due to any malpractice during its operation. A reset input is used to reset a microcontroller. Resetting puts the microcontroller into a known state such that the program execution starts from address 0 of the program memory.

This unit consists of a start switch interfaced with the microcontroller as shown in the circuit diagram of the system. This start switch is nothing a push to on button. This in placed inside the helmet and will be pressed as the bike rider wear the helmet. This switch sends signal to the microcontroller as it will be ON due to pressed by the head of the rider. The microcontroller receives this signal, process it and send it to the ignition unit through a RF transmitter interfaced in this unit. This RF transmitter is used to communicate with the other unit wirelessly. This RF transmitter works on 433Hz frequency and consists of an encoder HT12E for encoding the signal to be sent to the receiver. The interfacing of this transmitter and encoder is as shown in the circuit diagram. Helmet unit and Bike unit are connected by wireless link of RF. RF communication circuit contains encoder and decoder circuit. Encoder is on helmet side which is using to convert parallel data into serial data. The encoder is capable of encoding massage which contains of 12N data bits and Address bits. Each address/data can stay set to with two logical states. The oscillator frequency is selected by Rosc.We choose oscillator frequency is 3 kHz, with Rosc of 1Mohms. Minimum transmission of data is 4 words. Decoder is on bike side, it used to decode serial data. It converts this serial data in to parallel. The decoders are capable to receive data that are spread by an encoder and understand it.The first bits period use as addresses and last 12N bits as our desired data, where N is stands for address number. In this decoder circuit oscillator frequency is 50 times greater than fOSCE (encoder oscillator frequency). fOSCD is 150 kHz, which is select by value of Rosc. Rosc is 1k ohms.

2.2 Working

This project is designed for the check of helmet before allowing the vehicle to start. When the rider of the 2 wheeler sits on the vehicle and turns the key on, the bike will not start unless the rider wears the helmet.

This Smart helmet has two modules of operation i.e. one receiver part and one is transmitter part. The transmitter partis embedded in the helmet itself whereas receiver part can be installed in any particular bike. Thus, wireless communication takes place between two modules.

In the transmitter module, pressure signal is sensed by a switch which is situated inside the helmet and gets pressed. A comparator converts analog signal to digital signal and feeds as logic level 1 to the input of transmitter whereas transducer gives the output. When the user takes off the helmet then the output becomes zero and the input of the transmitter will get 0 as logic level. In the receiver module, a high level digital output will obtained by the output pin till the rider wears the helmet and the ignition unit circuit of the bike will be completed when this signal actuates the digital relay. When the rider takes off the helmet the relay opens and the connections of the circuit will get terminated. Once the IR Sensor detects the presence of the rider's head it signals the microcontroller to check for the helmet. If the rider wore the helmet, the switch will get pressed and signal the microcontroller to output a high pulse to the Encoder IC HT12E. The encoded output is then sent to the transmitter for the transmission of RF signal at 433 MHz's

The microcontroller, HT12E encoder, transmitter is embedded within the helmet. Along with the above units, the helmet has a 180 degree accelerometer which is used to detect the accident condition. The tilted head of the driver after an accident will cause accelerometer to respond to the microcontroller to give a high output to the further interfaced GPS-GSM module. This GPS module will track the location of accident and the GSM module will send a text message to the family of the victim. The other half of the project is embedded within the vehicle and it includes the receiver, a decoder and a relay. The RF transmitted signal is received by the receiver working at 433MHz frequency.

GPS and GSM makes the usage for intimation regarding an accident and identification of place, if Motorcyclist met with an accident it gives an information about location where he is met with an accident through GSM module to mobile numbers of family members, so have 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 was end 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 to occur using GPS module, and gives to Atmega88p microcontroller, Then it sends the SMS which contains the latitude and longitude of an area to family members mobile numbers. For this we use GPS module to extract the location of the accident, the GPS data will contain the latitude and longitude values using which we can find the accurate position of the accident place. With this reason, this project is specially developed as to improve the safety of the motorcycle's rider.

The received signal is then decoded using a HT12D decoder IC. The output of the decoder excites the relay to switch in order to complete the connection with the engine of the vehicle. Once the relay switches to turn on the engine, the vehicle tends to start. Thus in order to complete the system, to turn the engine on; to start the vehicle is it a necessity that the rider wears a helmet.

3. ADVANTAGES & APPLICATIONS

3.1 Advantages

- Detection of accident in remote area can be easily detected and medical services provided in short time.
- Simply avoiding drunken drive by using alcohol detector. it will reduces the probability of accident.
- Operates on solar as well as battery supply.
- If helmet was stolen then we can start the bike by the password.

3.2 Application

- It can be used in real time safety system.
- We can implement the whole circuit into small module later.
- Less power consuming safety system.
- This safety system technology can further be enhanced in car and also by replacing the
- helmet with seat belt.

- Useful for school students.
- Useful for bike and scooters.
- Help to protect life in accident case.
- Number of cases of violated traffic rules can be reduced.

4. FUTURE SCOPE

Smart helmet for safe rider is designed with radio frequency link. , as user wear helmet a RF signal radiate from transmitter and these RF signal get sensed and synchronized with the help of address matching by the receiver section placed in the ignition switch of the bike and bike get started and bike stopped working as helmet keep out from head. This means bike work properly till helmet keep on head.

- We can implement various bioelectric sensors on the helmet to measure various activity.
- We can use small camera for the recording the drivers activity.
- It can be used for passing message from the one vehicle to another vehicle by using wireless transmitter.
- We have used solar panel for helmet power supply by using same power supply we can charge our mobile.

CONCLUSION

The outcomes of the system have showed that the bike ignition will start if the helmet is worn. So, it will automatically decrease the effect from accident and it can avoid bike from being stolen. Atmega88P is good in controlling all the system and the sensors. Executing the wireless system which Radio Frequency Module to send signal from helmet unit to the bike unit. Due to this wireless connection is better than wired link. This system is very effective for the safety purpose of the user. User has to wear helmet to ride two wheeler vehicle and hence traffic rules will follow with this. This system is under pocket control ie. Ride two wheeler vehicle having safety in hand and in budget also. Easy functioning too per ate this system. It provides a better security to the biker.

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