

Smart Helmet

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Abstract: Road accidents are on the rise day by day, and in countries like India where bikes are more prevalent many people die due to carelessness caused in wearing motorcycle helmets. Even though there have been continuous awareness from the government authorities regarding helmets and seat belts a majority of drivers do not follow them. So to avoid this problem We have developed the smart helmet for biker. This system provides security, safety and assistance for the bikers. The circuit is so designed that the bike won't start without wearing helmet and if the rider is drunk. In case of accident, GPS system will globally locate the biker and alert message which provide longitude and latitude points of accident location will be sent using GSM system to the registered mobile number or family members as soon as possible. Another major assistance for the driver is hands free call receiving, music and audio navigation using Bluetooth integrated headphones.

Index Terms– Arduino Uno, Vibration Sensor, Alcohol Sensor, IR sensor, RF Transmitter & Receiver, GSM and GPS Module.

I. INTRODUCTION

The number of death due to road accidents in India is indeed a cause for worry. The scenario is very dismal with more than 1,37,000 people succumbing to injuries from road accidents. Main cause of accidents and crashes are due to human errors. Some of the common behaviour of humans which results in accidents are over speeding, drunken driving, avoiding safety gears like seat belts and helmet etc. Two-wheelers account for 30% of the road accidents in India. Wearing a helmet can reduce the risk of severe injury by 72% and the risk of death by 39%, according to the World Health Organisation. Riders face many problems while driving such as unable to take calls, unable to see maps for navigation purposes etc. These are the main issues which motivates us for developing this project. The main objective of the project is to design a low-cost intelligent helmet that is capable of identifying alcohol consumption and helmet detection. This smart helmet system has two units, one on the helmet and another on the bike. These two units are communicated wirelessly using RF transmitter and receiver with encoder and decoder, ATmega328p is used as controller. Helmet unit consists of Vibration Sensor, Alcohol Sensor, IR sensor which is used to detect that the biker wear helmet or not and also detect the presence alcohol in biker breath. Bluetooth integrated headphones are use so that driver can connect them to his phone/device to provide audio navigation and hands free call receiving and music. Vibration sensor is used to detect the accident. Bike unit consists of GPS and GSM module to send the accident location to registered mobile no.

II. SYSTEM SPECIFICATIONS

- 1) Supply Power: 12v Adapter.
- 2) Communication method: Wireless communication using RF Technology.
- 3) System coverage area: 200 meters.
- 4) Operating frequency for RF: 433MHz.
- 5) Bike Ignition System: Automatic Ignition.
- 6) Bluetooth Range: 10 meters.
- 7) Features: Hands free call receiving, Music and Audio Navigation.

III. BLOCK DIAGRAM

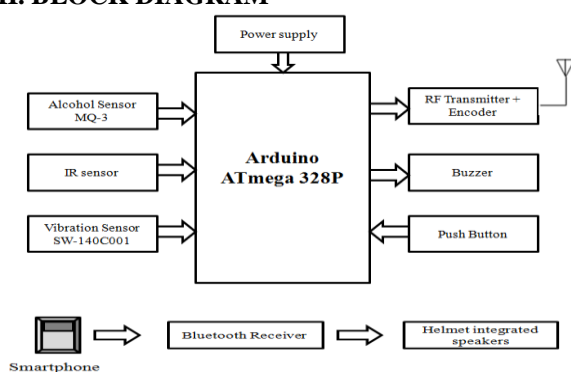


Figure 1: Helmet Unit

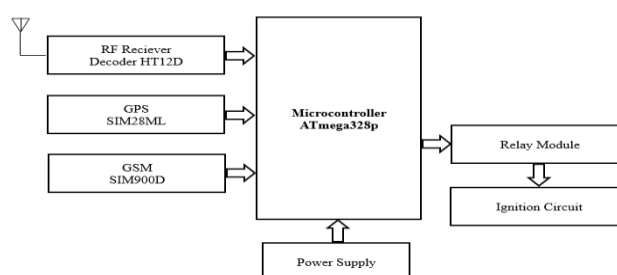


Figure 2: Bike Unit

IV. COMPONENT USED

1) Arduino Uno: The Arduino Uno is a microcontroller board based on the Atmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. All the analog outputs from all the sensors on the helmet are sent to this microcontroller as input. According to the threshold set for alcohol sensor, vibration sensor and range of IR sensor, a decision is made and sent to the module on bike wirelessly using RF Transmitter module.

2) Vibration sensors: It also known as piezoelectric sensors, are versatile tools for the measurement of various processes. These sensors use the piezoelectric effect, which measure changes in pressure, acceleration, temperature, strain or force by converting them to an electrical charge.

3) Alcohol sensor: MQ-3 gas sensor is right for identifying the alcohol content from breath. It can be positioned just front of the face. The sensor is responds to various gases. MQ-3 sensor has potentiometer to adjusting different concentration of gasses. MQ-3 has supports for both analog and digital. MQ-3 has a 4 pin namely GND, VCC, A_{out}, D_{out}. Here we use digital output of this sensor which is gives output in terms of high or low.

4) IR sensor: IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. The LOW or HIGH output of the IR sensor determines if the helmet is worn or not worn.

5) RF Transmitter & Receiver: Radio frequency (RF) is a frequency or rate of oscillation within the range of about 3 Hz to 300 GHz. This range corresponds to frequency of alternating current electrical signals used to produce and detect radio waves.

RF Advantages:

- 1) No line of sight is needed.
- 2) Not blocked by common materials: It can penetrate most solids and pass through walls.
- 3) Longer range.
- 4) It is not sensitive to the light.
- 5) It is not much sensitive to the environmental changes and weather conditions.

The data is received by the RF receiver from the antenna pin and this data is available on the data pins. Two Data pins are provided in the receiver module.

6) GPS module: The Global Positioning System (GPS) is a satellite-based navigation system that sends and receives radio signals. A GPS receiver acquires these signals and provides the user with information. Determining Position upon taking in all available satellite signals, the receiver compares the time that the satellite sent the signal to the time it was received for each of the available signals. Trilateration (similar to triangulation) then calculates the position by comparing the difference among the signals.

7) GSM module: Definition of GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services. GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1,800 MHz frequency band. It supports voice calls and data transfer speeds of up to 9.6 Kbit/s, together with the transmission of SMS (Short Message Service). Computers use AT commands to control modems.

V. METHODOLOGY

Smart helmet system provides security, safety and assistance for the bikers. This smart helmet system has two units, one on the helmet and another on the bike. The helmet unit consists of vibration sensor, IR sensor, alcohol sensor, RF encoder, transmitter and buzzer interfaced with pushbutton. If the driver is not drunk & has worn helmet then the corresponding digital output is given to RF encoder. The encoder block will check if all the conditions are satisfied & after that it will encode the active inputs to a coded binary output. The RF transmitter will transmit this coded binary output from RF encoder block. The system uses the ASK Modulation technique. Bluetooth integrated headphones are use so that driver can connect them to his phone/device to provide audio navigation and hands free call receiving and music. The bike unit consists of the RF Receiver, RF Decoder, MCU & relay circuit. The receiver is the next block of transmitter, it receives the coded binary data which is transmitted by the RF transmitter and all data is given to the RF decoder. The RF transmitter gives the input to RF decoder which decodes this input and gives the four bit digital data to the MCU (Micro Controller Unit) only if the address bit of RF encoder & RF decoder matches. The MCU block receives the digital data from RF transmitter block. After that it operates the engine of the vehicle through a relay circuit. If accident occurs then buzzer beeps continuously and will wait for 1 min. If the driver does not push the button within 1 min on helmet then GPS tracks the location of the accidental area and sends it to the registered number through GSM technology. Message alerts including the co-ordinates of the accidental location. And if driver pushes the button before 1 min i.e. in case of minor accident then no SMS will be sent.

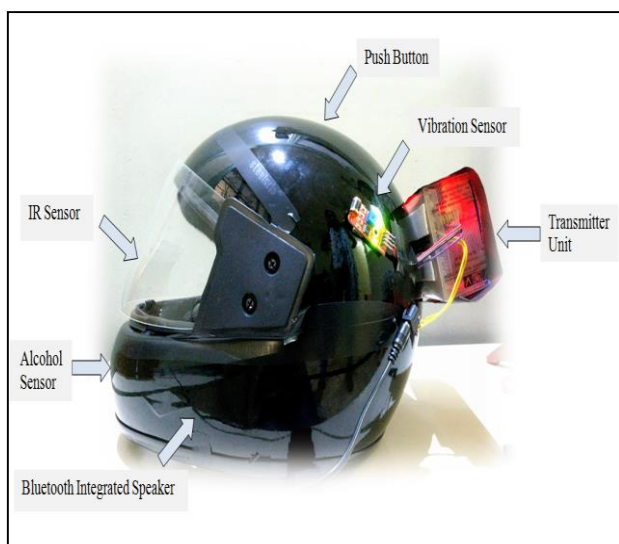
VI. RESULTS:

Figure 3: Helmet unit

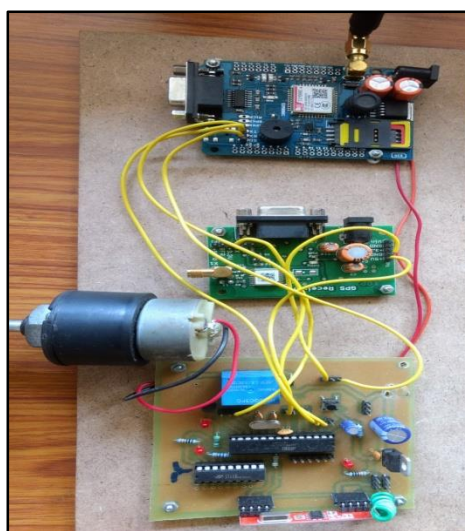


Figure 4: Bike Unit



Figure 5: Alert msg

VII. ADVANTAGES

- 1) Easy to use.
- 2) Quick and accurate results.
- 3) Easy and efficient to test the alcohol content in the body.
- 4) Helpful for police or ambulance to easily track the accident location.

VIII. FUTURE SCOPE

- 1) This safety system technology can further be enhanced in car and also by replacing the helmet with seat belt.
- 2) Hands free navigation can also be used for alerting about no entry/no parking areas.

IX. CONCLUSION

Smart helmet is an effective solution to many problems. Wearing the helmet and being sober are necessary conditions for the bike to start. Reducing the possibilities of accidents due to drink and drive. Medical assistance is possible due to smart helmet. Smart helmet can improve bike rider safety. Smart helmet can provide hands free call receiving, music & live map navigation.

X. REFERENCES

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