# Smart Helmet

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Abstract—The impact when a motorcyclist involves in a high-speed accident without wearing a helmet is very dangerous and can cause fatality. Wearing a helmet can reduce shock from the impact and may save a life. There are many countries enforcing a regulation that requires the motorcycle's rider to wear a helmet when riding on their motorcycle, Malaysia is an example. A smart helmet is a special idea which makes motorcycle driving safer than before. This is implemented using GSM and GPS technology. The working of this smart helmet is very simple, vibration sensors are placed in different places of helmet where the probability of hitting is more which are connected to microcontroller board. So when the rider crashes and the helmet hit the ground, these sensors sense and gives to the microcontroller board, then controller extract GPS data using the GPS module that is interfaced to it. When the data exceeds minimum stress limit then GSM module automatically sends message to ambulance or family members. It also has an alcohol detector sensor which detects whether the person is drunk and switches off the engine if the sensor output is high

*Index Terms*—Smart Helmet for Socity Safety Purpose and Helpfull for Biker

## I. INTRODUCTION

### Overview of Smart Helmet

A traffic accident is defined as any vehicle accident occurring on public highway roads. The thought of developing this project comes to do some good things towards the society. Two-wheeler accidents are increasing day by day and lead to loss of many lives. The main aim of our project is to build a safety system which is integrated with the smart helmet and intelligent bike to reduce the probability of twowheeler accidents. If any accident occurs no persons at place where to give information to the ambulance or parents. This is a situation we observe our day-today life, a thought of finding some solution to resolve this problem come up with this idea of giving the information about accident as soon as possible and in time. Smart helmet focusing on three major applications which are helpful in our day-to-day life. At first and most one is the ignition of the bike will not on if we are not wearing the helmet. Secondly alcoholic driving is not possible by using this smart helmet. If the rider is alcoholic, the bike will not start. Third application is accident detection. If person met with an accident, no one is there to help him and simply leaving or ignoring the person, in such situation informing to ambulance or family members through mobile to rescue him for an extent.

A smart helmet is a special idea which makes motorcycle driving safer than before. This is implemented using GSM and GPS technology. Sensors are placed in different places of helmet where the probability of hitting is more which are connected to Arduino. So when the rider crashes and the helmet hit the ground, these sensors sense and gives to the Arduino board, then controller extract GPS data using the GPS module that is interfaced to it. When the data exceeds minimum stress limit then GSM module automatically sends message to ambulance or family members. This project presents the smart helmet that ensures that the rider cannot start the bike without wearing it. This helmet uses simple cable replacement for wirelessly switching on a bike, so that the bike would not start without both the key and the helmet. Also, whenever the driver starts ignition, the alcohol sensor measures the content of the alcohol in his breath and automatically switches off the bike if he is drunk.

## 2. Objective:

In today's era, the craze of motor bikes is really remarkable. As the bikers in our country are increasing the road accident are also increasing, due to which many deaths occur, most of them are caused by not wearing helmet and due to alcohol consumption. It is difficult to check each and every rider on the road. The order to overcome the abovementioned problem our objective is to design an intelligent system that will be able to notify the accident to predefined number using GPS and GSM. To design the circuit that can improve the safety of motorcyclists. To develop a smart safety helmet with multi features like Accident alert, Alcohol detection.

## **II. LITREATURE REVIEW**

## 1. Safety for Bikers.

This paper aims at design and development of Smart Helmet which provides and ensures safety to the biker. The system proposed here helps the rider to follow all the safety regulations while driving and in case of emergency sends the signals to the concern authority. This system is specifically mechatronic system which consist of conventional helmet embedded with multiple sensors. The Sensors incorporated in the helmet are Capacitive Sensor, Strap Switch and Alcohol sensor. The capacitive sensor has the ability to sense the contact pressure and ensures that biker wears the headgear. Strap switch ensures fastening of strap belt and alcohol detection sensor prevents the rider to drive when he consumes alcoholic drinks. These three sensors have been designed to work in sync with two modules fitted on the bike viz GPS/GSM module, accelerometer. The system has been designed and tested keeping in view the Indian road conditions and economic feasibility. This System provides the future solution to tackle the global menace of road accidents at economic cost.

In this paper author said that it will not only ensure the safety of the rider but also provide him the features of accident detection, alcohol detection. In the Smart Helmet, the technology used is GPS and GSM, Microcontroller AT89S52 and RF technology.

The prime objective of this paper is to force the rider to wear the helmet throughout. Considering the increasing number of motor cycle riders in our country and the number of accidents happening each year, it is evident that in most cases the rider suffers injuries to the head and it leads to fatal causalities. This has thrown light on the importance of forcing the rider to wear helmet to reduce the extent of impact. The paper focuses on the methods that can be implemented to reduce the impact of road accidents. In this paper, we propose building a system that can be implemented by installing it on a bike which works with the helmet that is being worn to make the rider to wear the helmet before riding the bike.

2. Smart helmet for reducing two-wheeler Accident.

The main objective of this paper is to build a safety system which is integrated with the smart helmet and intelligent bike to reduce the probability of twowheeler accidents and drunk drive cases. The flex sensor checks if the person wearing the helmet or not. Alcohol sensors detect the alcoholic content in riders' breath. If the rider is not wearing the helmet or if there is any alcohol content found in rider's breath, the bike remains off. The bike will start until the rider wears the helmet and if there is no alcoholic content present. When the rider crashes, helmet hits the ground, sensors detect the motion and tilts of helmet and reports the occurrence of an accident. It sends information of the corresponding location to family members of the rider and emergency contact number. A smart helmet is a special idea which makes motorcycle driving safer than before. This is implemented using GSM and GPS technology. Vibration sensors are placed in different places of helmet where the probability of hitting is more which are connected to microcontroller board. So when the rider crashes and the helmet hit the ground, these sensors sense and gives to the microcontroller board, then controller extract GPS data using the GPS module that is interfaced to it. When the data exceeds minimum stress limit then GSM module automatically sends message to ambulance or family members. This paper presents the smart helmet that ensures that the rider cannot start the bike without wearing it. This helmet uses simple cable replacement for wirelessly switching on a bike, so that the bike would not start without both the key and the helmet. Also, whenever the driver starts ignition, the alcohol sensor measures the content of the alcohol in his breath and automatically switches off the bike if he is drunken.

In this paper author describe the system is implemented using Arduino Uno development kit which consists of RF transmitter and RF receiver system. The bike will not start without wearing a helmet by the user or rider. An alcohol sensor is placed near the mouth of the driver in the helmet to detect the presence of alcohol breath. If the breath of the driver is non-alcoholic then these two conditions are satisfied and the bike will get started. Here we have used LDR sensor which can turn the headlights of the bike ON and OFF automatically. We have also used the vibration sensors in different places of helmet so that when the rider crashes and the helmet hit the ground, the sensors sense and the Arduino extract data using the GSM module and when the data exceeds minimum stress limit then GSM module automatically send message to ambulance or police or family members. Security system applied in this paper meet the characteristics of a perfect rider and the application should be highlighted

## **III. METHODOLOGY**

## Block Diagram:



(ATmega328), GSM SIM 800L, GPS, RF Transmitter 433MHz with Encoder IC, Alcohol sensor, Switch, Solar panel (6V) and Battery 3.7V 2000mah Lithium ion. The receiver part consists of RF receiver 433Mhz with Decoder and Relay. The relay is connected in series with the ignition key switch.

First check if the rider has actually worn the helmet, in other words, the availability of the rider"s head inside the helmet. For this purpose, we are using switch as a sensor for detection. Alcohol sensor is also implanted inside the helmet. Also, we are connecting Piezo sensors as the force sensor to detect the accident. GSM and GPS use for sending SMS with the GPS coordinates to the mobile number. To run the system, we use Arduino NANO board which has ATmega328 microcontroller. The Arduino is a very user-friendly device which can be easily interfaced with any sensors or modules and is very compact in size. Now we are clear that the Arduino will send an affirmation to the bike for an ignition request. We use RF433 MHz radio transceiver module.

There are two logics one is if the helmet is weared or not and other is if the alcohol consumption detected, in both cases the signal from helmet transmitter to the bike receiver to start the ignition switch. At the receiver side the ignition key switch is connected in series with the receiver circuit relay. If the signal to start bike is came from the helmet, then only bike will start.

At the transmitter part if the helmet is worn by the alcohol is detected then bike ignition will not start. If the helmet is worn and if the force occurred on the helmet, then it will be predicted that accident occurred and GSM will send the SMS with the Longitude and Latitude GPS location to the registered mobile number. The helmet is powered by the rechargeable battery (3.7V Li Ion), which is charged by any mobile charger as well as we are using Solar Panel (6V) on the helmet to recharge the battery in day time.

## IV. HARDWARE

Resources required

- Arduino Nano
- GSM SIM 800L
- GPS
- Alcohol sensor
- Basics of LI-ION battery
- Charging LI-ION Battery
- Storage Of LI-ION batter
- Voltage Booster
- Hardwear Development
- Drawing Tools

## Arduino Nano :

Arduino Nano circuit board with Arduino IDE is capable of reading analog or digital input signals from different sensors, activating the motor, turning LED on/off and do many other such activities. All functionalities are performed by sending a set of instructions to the ATtmega328 main microcontroller, on the board via Arduino IDE. The Arduino board also includes Power USB, Power (Barrel Jack), voltage regulator, crystal oscillator, voltage pins (3.3v,5v,gnd,vin), A0 to A5 analog pins, icsp pin, power led indicator, tx and rx leds, 14 digital input/output pins, Aref, and Arduino reset The Arduino Uno is a microcontroller board , based on the ATmega328.The Uno board functioning is different from all other boards in that it does not use the FTDI USB to serial driver chip. Instead, the Atmega328 is programmed as a USB to serial converter. The ATmega328 is a low power CMOS 8 bit microcontroller based on the AVR enhanced RISC architecture structure.



## GSM SIM 800L

Mini GSM / GPRS breakout board is based on SIM800L module, supports quad-band GSM/GPRS network, available for GPRS and SMS message data remote transmission.

The board features compact size and low current consumption. With power saving technique, the current consumption is as low as 1mA in sleep mode. It communicates with microcontroller via UART port, supports command including 3GPP TS 27.007, 27.005 and SIMCOM enhanced AT Commands.



## V. FEATURES

Quad-band 850/900/1800/1900MHz Connect onto any global GSM network with any 2G SIM (in the USA, T- Mobile is suggested) Make and receive voice calls using a headset or an external 8 speaker and electret microphone Send and receive SMS messages Send and receive GPRS data (TCP/IP, HTTP, etc.) Scan and receive FM radio broadcasts Lead out buzzer and vibrational motor control port AT command interface with "auto baud" detection. GPS (Global Positioning system)

The NEO-6 module series is a family of stand-alone GPS receivers featuring the high-performance u-blox 6 positioning engines. These flexible and costeffective receivers offer numerous connectivity options in a miniature 16 x 12.2 x 2.4 mm package. Their compact architecture and power and memory options make NEO-6 modules ideal for battery operated mobile devices with very strict cost and space constraints.The 50-channel u-blox 6 positioning engine boasts а Time-To-First-Fix0(TTFF) of under 1 second. The dedicated acquisition engine, with 2 million correlators, is capable of massive parallel time/frequency space searches, enabling it to find satellites instantly. Innovative design and technology suppress jamming sources and mitigates multipath effects, giving NEO-6 GPS receivers excellent navigation performance even in the most challenging environments.

The NEO-6M GPS module is a well-performing complete GPS receiver with a built-in 25 x 25 x 4mm ceramic antenna, which provides a strong satellite search capability. With the power and signal indicators, you can monitor the status of the module. Thanks to the data backup battery, the module can save the data when the main power is shut down accidentally. Its 3mm mounting holes can ensure easy assembly on your aircraft, which thus can fly steadily at a fixed position, return to Home automatically, and automatic waypoint flying, etc. Or you can apply it on your smart robot car for automatic returning or heading to a certain destination, making it a real "smart" bot!

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## ALCOHOL SENSOR

This module is made using Alcohol Gas Sensor MQ3. It is a low-cost semiconductor sensor which can detect the presence of alcohol gases at concentrations from 0.05 mg/L to 10 mg/L. The sensitive material used for this sensor is SnO2, whose conductivity is lower in clean air. It's conductivity increases as the concentration of alcohol gases increases. It has high sensitivity to alcohol and has a good resistance to disturbances due to smoke, vapor and gasoline. This module provides both digital and analog outputs. MQ3 alcohol sensor module can be easily interfaced with Microcontrollers, Arduino Boards, Raspberry Pi etc.

This alcohol sensor is suitable for detecting alcohol concentration on your breath, just like your common breathalyzer. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration. The drive circuit is very simple, all it needs is one resistor. A simple interface could be a 0-3.3V ADC.



## VI. WORKING

First check if the rider has actually worn the helmet, in other words, the availability of the rider"s head inside the helmet. For this purpose, we are using switch as a sensor for detection. Alcohol sensor is also implanted inside the helmet. Also, we are connecting Piezo sensors as the force sensor to detect the accident. GSM and GPS use for sending SMS with the GPS coordinates to the mobile number. To run the system, we use Arduino NANO board which has ATmega328 microcontroller. The Arduino is a very user-friendly device which can be easily interfaced with any sensors or modules and is very compact in size. Now we are clear that the Arduino will send an affirmation to the bike for an ignition request. We use RF433 MHz radio transceiver module.

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Circuit Diagram of Smart Helmet

## 2) Receiver Circuit



**Transmitter Circuit** 







## VII. SOFTWARE

## The compilation process

The arduino code is actually just plain old c without all the header part (the includes and all). when you press the 'compile' button, the IDE saves the current file as arduino.c in the 'lib/build' directory then it calls a makefile contained in the 'lib' directory.

This makefile copies arduino.c as prog.c into 'lib/tmp' adding 'wiringlite.inc' as the beginning of it. this operation makes the arduino/wiring code into a proper c file (called prog.c).

After this, it copies all the files in the 'core' directory into 'lib/tmp'. these files are the implementation of the various arduino/wiring commands adding to these files adds commands to the language.

The core files are supported by pascal stang's procyon avr-lib that is contained in the 'lib/avrlib' directory

At this point the code contained in lib/tmp is ready to be compiled with the c compiler contained in 'tools'. If the make operation is succesfull then you'll have prog.hex ready to be downloaded into the processor.

NOTE:the next release will see each architecture (avr/pic/8051) to treated as a 'plug-in' to the IDE so that the user can just select from a menu the microcontroller board to use and the IDE will pick the right compilation sequence.

A program for Arduino hardware may be written in any programming language with compilers that produce binary machine code for the target processor. Atmel provides a development environment for their 8-bit AVR and 32-bit ARM Cortex-M based microcontrollers: AVR Studio (older) and Atmel Studio (newer).[53][54][55]

IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. The source code for the IDE is

released under the GNU General Public License, version 2.

The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main () into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

## Sketch

A sketch is a program written with the Arduino IDE. Sketches are saved on the development computer as text files with the file extension. ino. Arduino Software (IDE) pre-1.0 saved sketches with the extension. pde.

A minimal Arduino C/C++ program consist of only two functions:

setup (): This function is called once when a sketch starts after power-up or reset. It is used to initialize variables, input and output pin modes, and other libraries needed in the sketch.

loop (): After setup () function exits (ends), the loop () function is executed repeatedly in the main program. It controls the board until the board is powered off or is reset.

## ACTUAL IMAGE OF PROJECT





Application:

- Paramedics: Helmets with built-in communication systems can help paramedics coordinate during emergencies. Augmented reality (AR) displays can provide vital information about patients or medical procedures. Motorcycling.
- Head-Up Display (HUD): Smart helmets for motorcyclists often have a HUD that displays navigation information, speed, and other relevant data directly onto the helmet visor, reducing the need for riders to look down at instruments.
- Safety Alerts: Sensors can detect potential collisions or hazards and alert the rider through visual or haptic feedback, enhancing overall road safety.

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