

# NexG HELMET

<sup>[1]</sup> Aditya Pal Singh, <sup>[2]</sup> Seema Nayak, <sup>[3]</sup> Jatin Saini, <sup>[4]</sup> Komal Singh

<sup>[1][3][4]</sup> U.G. Student, Department of Electronics and Communication, IIMT College of Engineering, Knowledge Park 3, Greater Noida, UP India

<sup>[2]</sup> Professor, Department of Electronics and Communication, IIMT College of Engineering, Knowledge Park 3, Greater Noida, UP India

---

**Abstract**— A NexG helmet is a type of protective headgear used by the rider which makes two wheelers driving safer than now. The main objective of this helmet is to provide safety to the rider. This can be implemented by using advanced features like sleep detection, alcohol detection, accident alert system, charging system and with some other smart features which will make riding safer and enjoyable. If accident is the one reason, then lack of treatment in appropriate time is another reason for death. The helmet will sense an accident and if there's an accident, we have chosen GSM/GPS technology which will give information to emergency helpline number, nearby police station and to the family by sending the precise location of the accident area. Other reasons like sleep, we have used sleep detection system which will alert the rider if they are feeling sleepy or if the driver has consumed alcohol and riding two-wheeler then the data will go to the police and family members. So, by using this NexG helmet we can decrease the two-wheeler road accidents and will save many lives.

**Index Terms**— NexG Helmet, sleep detection, alcohol detection, accident alert, GSM/GPS technology, Audio system

---

## I. INTRODUCTION

An accident is a distinct, unexpected, uncommon, and unanticipated external action that occurs at a given time and place, with no obvious or deliberate cause but a significant effect. As we can see many accidents occur around us and many of them became so fatal for life. Road accidents have been a major cause of concern in every country especially in countries like India with its huge population. Around 1214 road accidents occur every day in India. Two-wheelers account for 25% of total road accident deaths. As the two wheelers in our country is increasing, the road mishaps are also increasing day by day, due to which many accidents or even deaths occur, most of them are caused due to rider's fault as

the rider is drunk, feeling unconscious, talking on phone while driving, high speed of the bike. Apart from these reasons, many deaths occur due to lack of on time medical attention needed by the injured person because many people lost their lives due to late medical help, only some lucky ones survived. The project aims at the safety and security of the riders against road accidents. So, a thought of taking responsibility of society we came with our project "NexG HELMET". NexG Helmet basically stands for Next Generation Helmet as we are going to add some features in a basic helmet like sleep detection system, accident alert system, alcohol detection system, navigation system, audio system which make helmet smart and provide more safety to rider. We are developing a helmet which can detect the

person's sleep action while driving and give a warning to rider. It can sense an accident, if the person got into an accident, then by using GSM/GPS technology, helmet can send message with proper location to the nearest hospital, his relatives and police by which person can get early medical help. It can also detect alcohol consumption of the rider, if rider is drunk then it will send message to police and his relatives that 'He is Drunk'. If rider get exhausted during his journey, then rider can play songs. So, by using the NexG Helmet we can decrease the two-wheeler road accidents and will save many lives.

## II. LITERATURE REVIEW

A helmet is a protective headgear that is worn on the head. A helmet, in particular, works in conjunction with the skull to protect the human brain. Since the 1990s, the majority of helmets have been composed of resin or plastic, which may be reinforced with aramid fibers. Plastics are used to make modern helmets. Fiberglass reinforced with Kevlar or carbon fiber are used in high-end helmets. They are generally having fabric and foam interiors for both comfort and protection.

According to reference [6], helmets incorporate the integration Communication System (ICS) that allows nearly all functions and applications to be controlled via voice order. This ensures that if someone connects a phone to a helmet device, they will be able to conduct various hands-free operations such as getting directions, making calls, and

more just by talking to the operator over the helmet microphone.

According to the Research paper in 2016 titled ‘2 Helmet using GSM and GPS technology for accident detection and reporting system’ in reference [8]. This project was created by the author specifically to increase the safety of bikers. The goal of this project is to learn about and comprehend the notion of an RF receiver circuit. The project makes use of an ARM7 processor, as well as a GSM and GPS module. The project also employs the use of a buzzer as a signaling device. Whenever an accident occurs, the location of the accident will be recorded, and information will be sent to the registered mobile phone number. The major disadvantage of this project is they are not using display device for showing the current status. Also, the cost of helmet is still high since helmet is designed for only one purpose.

According to research paper in 2018 titled ‘Smart Helmet with Message Alert System’ in reference[11]. In this paper, author design a smart helmet through belt-tie sensor that detects whether the rider is wearing the helmet or not and it also check the alcohol consumption. If accident happen it will send message by the GSM to the registered number with the current location using GPS module. Author used RF module for communication purpose.

According to research paper in 2018 titled ‘Design of Smart Helmet and Bike Management System’. In this paper, author design a smart helmet which having some features like accident detection, alcohol detection, GSM/GPS technology. This helmet also detects whether rider is wearing helmet or not. This paper describes a smart helmet that prevents the rider from starting the bike without it.

According to research paper in 2019 titled ‘Smart Helmet for safe driving’ in reference[10]. In this paper, author design a smart helmet by implementing some features like alcohol detection, accident identification, location tracking, fall detection. Here author used force sensing resistor, MQ-3 alcohol sensor, accelerometer ADXL345, RF communication circuit, vibration sensor and Arduino. The project's standout feature is fall detection, which sends a notification whenever the rider falls off the bike.

According to recent Research paper in 2020 titled ‘Design And Implementation of smart helmet Using IOT in reference[9]. In this paper, author design this smart helmet to detect whether rider is wearing helmet or not and to check rider is alcoholic or not. Author used Arduino ATmega328P, GPS, GSM, WIFI, IOT. The data of users can be sent to the cloud via IOT for monitoring activities such as helmet use, alcoholic consumption, and accident conditions.

So, according to above survey, we come to a result that this world has smart helmet but they are not smart enough as

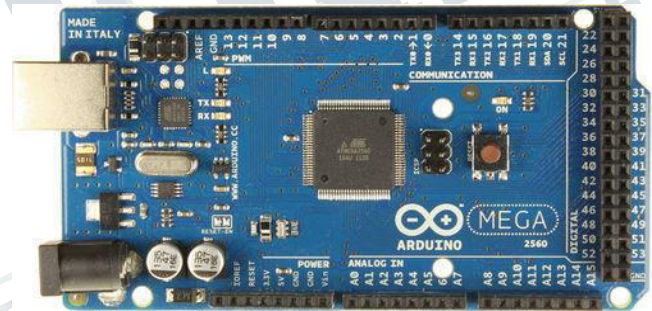
they are lacking in providing safety measures. Our NexG helmet has many advanced features like Accident alert system, Alcohol detection system, Sleep Detection system and for entertainment purpose as it has audio system as rider can have enjoyable journey. So, NexG helmet makes rider’s journey safer and enjoyable.

**III. TECHNICAL FIELD**

NexG Helmet is a helmet which is embedded with so many electronics devices and it is handled with a software. So, used hardware modules and software module is given below.

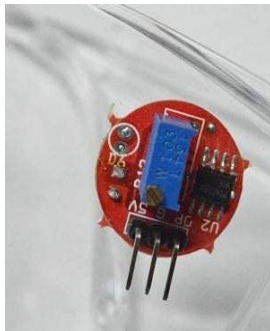
**A. Hardware Modules**

1) *Arduino Mega2560*: Arduino Mega2560 is 8-bit microcontroller (MCU) is shown in Fig1. Arduino Mega2560 features 54 digital input/output pins (15 of which can be used as PWM outputs) and 16 analog inputs. A 16 MHz crystal oscillator, a USB connector, a power jack, an In-Circuit Serial Programming (ICSP) header, and a reset button are all included on this MCU board.



**Fig. 1 Arduino Mega2560**

2) *Eye Blink Sensor*: According to reference[4], Eye Blink Sensor is an IR (infrared) based device is shown in Fig.2. This device has the diode which will check the person’s eye is closed or not. It is used to detect sleep or unconscious of a person. The emission is high while the eye is closed. The emission is modest when the eye is open. Accidents due to drowsiness can be controlled and prevented with the help of eye blink sensor.



**Fig. 2 Eye Blink Sensor**

3) *MQ-3 Sensor:* According to reference[2], MQ-3 is an alcohol sensor. It's a low-cost semiconductor sensor that can detect alcohol gas concentrations ranging from 0.05 mg/L to 10 mg/L. The sensitive material used for this sensor is SnO<sub>2</sub> whose conductivity is lower in clean air. As the concentration of alcohol gases rises, so does its conductivity. It has 4 pins (VCC, GND, DO, AO) shown in Fig.3.



**Fig. 3 MQ-3 Alcohol Sensor**

4) *Piezoelectric Sensor:* According to reference[7], Piezoelectric Sensor is a device that uses the piezoelectric effect to measure changes in pressure, acceleration, temperature, strain or force by converting them to an electrical charge is shown in Fig. 4. The prefix piezo- means 'push' or 'squeeze' in Greek. When the accident occurs, it senses the unusual changes in pressure and acceleration and process the data further.



**Fig. 4 Piezoelectric Sensor**

5) *Vibration Sensor:* Here we are using SW460D Vibration Sensor. According to reference [1], Vibration Sensor is used to detect vibrations, shown in Fig. 5. When there is no vibration, the sensor outputs logic Low, and when there is vibration, the sensor outputs logic High. When the accident occurs, it senses the unusual vibrations and processes this information further.



**Fig. 5 SW460D Vibration Sensor**

6) *Vibration Motor:* Vibration motor is a coreless DC motor and the size of this motor is very small. It produces highly powerful vibration. The main features of this motor are its magnetic properties, lightweight and small size. Based on these features, the motor performance is highly efficient is shown in Fig. 6.



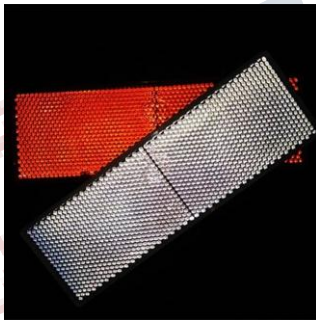
**Fig. 6 Vibration Motor**

7) *GSM/GPS Module:* Here we are using SIM808 Module. According to reference [3], this is a GSM and GPS Modem based on Simcom's SIM808 Module shown in Fig. 7. The SIM808 module is a dual-function GSM and GPS module. It works with the GSM/GPRS Quad-Band network and combines satellite navigation with GPS technology. It has an ultra-low power consumption in sleep mode and is combined with a Li-Ion battery charging circuit, giving it a very long standby duration and making it ideal for applications that use rechargeable Li-Ion batteries. With 22 tracking and 66 acquisition receiver channels, it boasts a high GPS receive sensitivity.



**Fig. 7 SIM808 GSM/GPS Module**

8) *Reflector*: It is a tape type material which has an array of mirrors. They reflect the most amount of light from vehicle headlights that falls on them. Because of their high reflectivity, they are visible from a long distance, when even the smallest amount of light falls on them is shown in Fig.8.



**Fig. 8 Reflector**

9) *Visor*: A visor is a surface that protects the eyes, such as shading them from the sun or other bright light or protecting them from objects. It is the part of a helmet in a suit of armor that protects the eyes shown in Fig.9.



**Fig. 9 Visor**

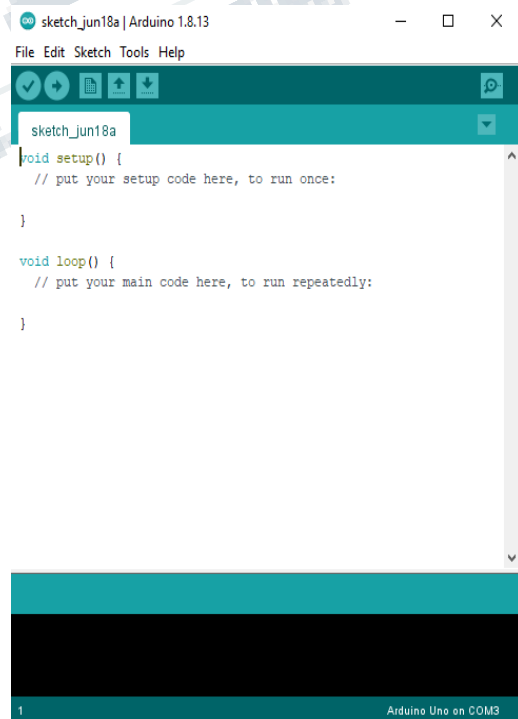
10) *Buzzer*: A buzzer is a small and compact 2-pin structure shown in Fig. 10. When we give power to the buzzer, it will produce a beep sound. The buzzer can be powered by using a DC power supply. The buzzer is used as a warning or alarm system in projects.



**Fig. 10 Buzzer**

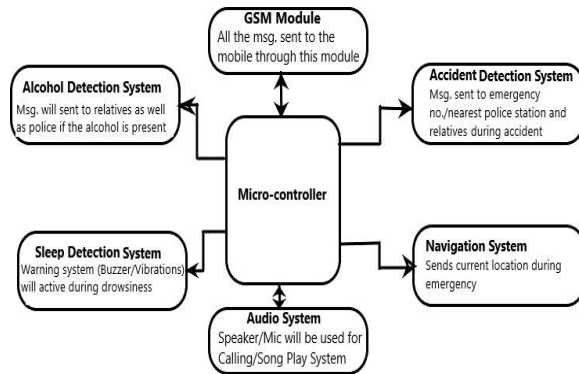
**B. Software Module**

11) *Arduino IDE*: The Arduino Integrated Development Environment is a cross-platform application that is written in functions from C and C++. It's used to write and upload programs to Arduino-compatible boards, as well as other vendor development boards with the help of third-party cores. In this project, we are using Arduino Mega2560 microcontroller board and code to be uploaded on this board is written in the Arduino IDE is shown in Fig. 11.



**Fig. 11 Arduino IDE Software**

**C. Block Diagram**



**Fig. 12 Block Diagram**

1) **GSM Module:** GSM (Global System for Mobile Communication) is a standard developed by the European Telecommunications Standard Institute. In embedded systems, GSM/GPRS modules are one of the most commonly used communication modules. A GSM/GPRS Module is used to enable communication between a microcontroller and the GSM/GPRS Network. In case of emergency the NexG Helmet will send a text message including the current location of the rider through this module.

2) **Alcohol Detection System:** It has an alcohol sensor. Based on the amount of alcohol in the system, this sensor produces an analogue resistive output. When the alcohol gas exists, the sensor's conductivity gets higher along with the gas concentration rising. It will detect alcohol from person mouth whoever wear this helmet. If alcohol is detected, then helmet will send an alert with rider's location to the police and to the relative.

We can also give the feature like vehicle will not start if the transmitter gets the HIGH signal from the microcontroller, then transmitter will transmit the signal which will be received by the receiver. Receiver is connected with relay and relay is connected with ignition button. So, when receiver get signal that the rider is drunk then the ignition switch will be off and bike will not start.

3) **Accident Detection System:** It detects the shock or impact produced during an accident. When the accident occurs, it senses the unusual changes in pressure and acceleration. It will send alert messages and rider's location to the nearest hospital, police as well as relative. It also has an option to pause this alert system if there is a case of no serious injury and the biker is able to continue his ride.

4) **Sleep detection System:** It has an eye blink sensor. This sensor has the diode which will check the person's eye is close or not and then send request to microcontroller. This diode detects the black surface. So, we used this because when the human will wear helmet then IR Led photodiode detects the black surface of eye and send signal and it will check continuously. If the eye is closed then it will not absorb black surface and send signal to the microcontroller, it will check the duration of closed eyes. If it is more than 1 second, then the microcontroller will start the buzzer and vibration motor installed in it.

5) **Navigation System:** Navigation refers to the method of determining aspects such as position, speed and direction during travel. In modern sense, navigation is mechanical devices equipped in ground vehicles, ships and aircraft to determine their positions. Similarly, here we have used navigation system to help the rider to reach its destination.

6) **Audio System:** In this helmet, audio system is the integral part of the helmet and working wirelessly for song play system, navigation system, and calling system.

**D. Methodology**

When the rider will wear this helmet, it'll automatically get ON and it's all sensors will get activated.

After wearing the helmet, firstly the alcohol detection system will start and check whether the rider is drunk or not. If rider is drunk then it will send an alert to the police and also gives a warning to the rider.

The sleep detection system will work continuously, it will put the sight on the rider's eye to check continuously that rider feel drowsiness or not. If the rider is found sleepy then the helmet will alert the rider by generating vibrations, large beep sound through buzzers and speakers.

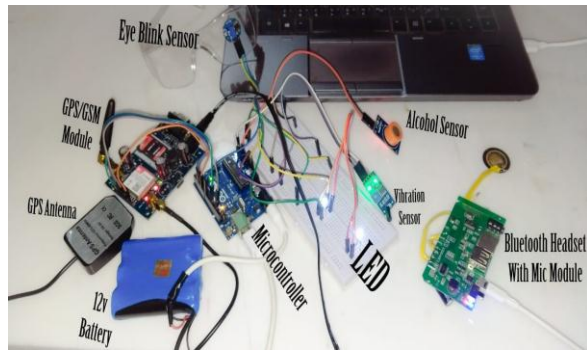
It also senses the shock produced by an impact during the rider got into an accident. It has a navigation system that will send the current location of the rider to the police, his relatives and nearest hospital which will be very helpful to avoid late medication as well as late hospitalization.

It will compatible with a Bluetooth handsfree system that can be used to play songs, navigation routes and also whenever the rider receives a call then rider can receive the call without his phone with help of helmet.

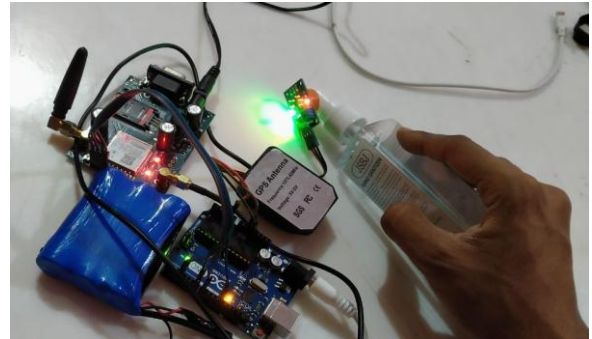
**IV. RESULT**

All the system (Alcohol detection system, Sleep detection system, Accident detection system, Audio system) in the NexG Helmet was successfully able to detect alcohol consumption, drowsiness and to send message with precise location if there is an accident. Helmet also able to navigate, play songs and on incoming call, helmet can receive the call.

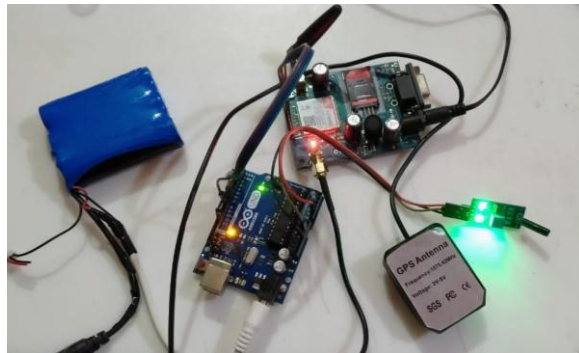
NexG Helmet ensures the safety of the rider. Figure 13 depicts the entire mechanism. Results shown in Fig.14-20.



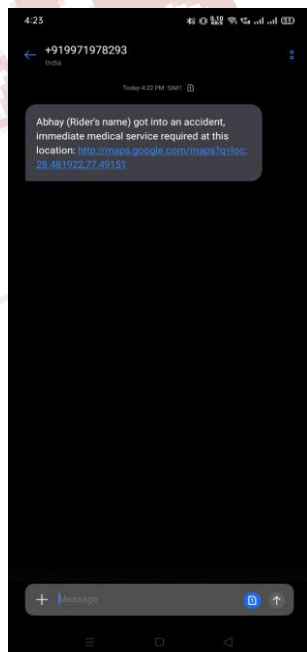
**Fig. 13 Complete System of NexG Helmet**



**Fig. 16 Alcohol Detection System**



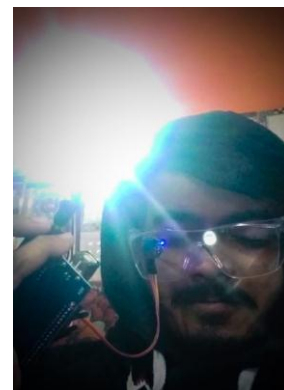
**Fig. 14 Accident Alert System**



**Fig. 15 Message sent by Helmet after accident**



**Fig. 17 Message sent by Helmet after detecting alcohol consumption**



**Fig. 18 Sleep Detection System**



**Fig. 19 Wireless (Solar) Charging Module**



**Fig. 20 Audio System**

## V. CONCLUSION

In this paper, we developed a NexG Helmet which was successfully able to detect the alcohol consumption of the rider, drowsiness. Apart from this, Helmet was able to send message to nearest hospitals, his relatives and police, if person got into an accident. The helmet can reduce number of road accidents that takes place every day. It ensures the safety of the rider. Also, by making this circuit essential while driving, the death rate can be dramatically lowered, making everyone's life easier and smoother. Further, this NexG Helmet can be powered with more intelligent system that can be fabricated in a compact size. So that it is globally acceptable to notify No Entry and No Parking areas with navigation map on its visor.

## VI. ACKNOWLEDGMENT

This paper and the research behind it would not have been possible without the exceptional support of our mentor 'Dr. Seema Nayak' HOD of Electronics and Communication Department. Her enthusiasm, knowledge and exacting attention have been an inspiration to us.

We would also like to express our deep gratitude to our parents, all well-wishers whose enormous help assist us to complete this project.

## REFERENCES

- [1] <https://www.elprocus.com/vibration-sensor-working-and-applications/>
- [2] <https://www.elprocus.com/mq-135-alcohol-sensor-circuit-and-working/>
- [3] [https://seeeddoc.github.io/Mini\\_GSMGPRS\\_Plus\\_GPS\\_Breakout-SIM808/](https://seeeddoc.github.io/Mini_GSMGPRS_Plus_GPS_Breakout-SIM808/)
- [4] [https://www.nskelectronics.com/eye\\_blink\\_sensor.html](https://www.nskelectronics.com/eye_blink_sensor.html)
- [5] <https://www.ieee.org/org/conference-template-A4>
- [6] [fortunebusinessinsights.com/smart-helmet-market-103519](https://fortunebusinessinsights.com/smart-helmet-market-103519)
- [7] <https://www.sciencedirect.com/topics/engineering/piezoelectric-sensor>
- [8] <https://www.ijedr.org/papers/IJEDR1811028.pdf>
- [9] [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3643615](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3643615)
- [10] [https://www.researchgate.net/publication/331281166\\_Smart\\_helmet\\_for\\_safe\\_driving](https://www.researchgate.net/publication/331281166_Smart_helmet_for_safe_driving)
- [11] <https://www.ijert.org/smart-helmet-with-message-alert-system>