SMART HELMET FOR ACCIDENT ALERT

A MINI-PROJECT REPORT

Submitted by

HARISH S **210701077**

HARISH DHAMODARAN **210701073**

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RAJALAKSHMI ENGINEERING COLLEGE, CHENNAI

An Autonomous Institute

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BONAFIDE CERTIFICATE

Certified that this project titled **"SMART HELMET FOR ACCIDENT ALERT"** is the bonafide work of **"HARISH DHAMODARAN (210701073) and HARISH S(210701077)"** who carried out the project work under my supervision.

SIGNATURE

Dr.N. Duraimurugan, M,E., Ph.D.

Academic Head ,Assistant Professor,

Computer Science & Engineering

Rajalakshmi Engineering College (Autonomous)

Thandalam, Chennai -602105.

Submitted for the **ANNA UNIVERSITY** practical examination Mini-Project work viva voce held on_____

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7	FORCE SENSOR	1
8	SIM CARD	1
9	HELMET	1
10	BREAD BOARD	1

LIST OF ABBREVIATION

ABBREVIATION	ACRONYM
SRS	Software Requirement Specification
CLIENT/SERVER	The entity who will be using the interview feedback system.
SERVER	A system that runs in Linux

ABSTRACT

In the critical moments following a road accident, timely medical assistance is paramount to saving lives. The Emergency Alert Helmet is a groundbreaking innovation designed to expedite emergency response times and enhance the chances of survival for accident victims. This smart helmet is equipped with a force resistive sensor and a GSM module, integrated with an Arduino microcontroller, to detect significant impacts indicative of an accident. Upon detecting a force exceeding a predefined threshold, indicative of a collision, the helmet's system automatically triggers an alert message. This message is sent to the nearest ambulance service and emergency contacts, ensuring that first responders are dispatched promptly to the location. By bridging the gap between the occurrence of an accident and the arrival of medical help, the Emergency Alert Helmet stands as a beacon of hope, potentially reducing fatalities and improving outcomes for accident victims.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

In the fast-paced world of modern transportation, road accidents remain a pressing concern, with countless lives lost or irrevocably changed due to delayed medical response. In the critical moments following a road accident, the swift arrival of emergency services can mean the difference between life and death. Recognizing this crucial need, the Emergency Alert Helmet emerges as a revolutionary solution aimed at transforming emergency response dynamics. This innovative smart helmet is engineered to detect significant impacts that indicate accidents and promptly alert emergency services, thereby expediting the delivery of life-saving medical assistance. The core technology of the Emergency Alert Helmet centers around a force resistive sensor and a GSM module, both integrated seamlessly with an Arduino microcontroller. The force resistive sensor is designed to detect impacts that exceed a predefined threshold, signaling a potential accident. Upon registering such an impact, the helmet's system activates the GSM module to send out an alert message. This message is dispatched not only to the nearest ambulance service but also to pre-programmed emergency contacts, ensuring that a network of responders is instantly mobilized.

Moreover, the Emergency Alert Helmet represents a proactive approach to road safety, combining advanced sensor technology with communication capabilities to create a responsive and reliable safety device. It not only exemplifies the potential of wearable technology in enhancing personal safety but also underscores the importance of innovation in addressing real-world problems. As road safety continues to be a global challenge, the Emergency Alert Helmet stands as a beacon of hope, demonstrating how technology can be harnessed to save lives and improve outcomes in the aftermath of road accidents.

1.2 SCOPE OF THE WORK

The proposed project centers on the development and implementation of the Emergency Alert Helmet, an innovative solution aimed at enhancing road safety and emergency response times. The primary objective of this project is to create a smart helmet equipped with advanced technology to automatically detect accidents and promptly alert emergency services. The helmet integrates a force resistive sensor and a GSM module with an Arduino microcontroller. When a significant impact, indicative of an accident, is detected, the system immediately triggers an alert message. This message is sent to the nearest ambulance service and the victim's emergency contacts, ensuring that help is dispatched without delay.The scope of this project includes the design and assembly of the helmet's hardware, programming the Arduino microcontroller to accurately interpret sensor data, and configuring the GSM module for reliable message transmission. Additionally, the project will involve extensive testing to calibrate the impact threshold and ensure the system's reliability in various scenarios. The integration with local emergency services and the development of a robust communication protocol are also key components. By addressing the critical time gap between an accident and the arrival of medical assistance, the Emergency Alert Helmet aims to significantly reduce fatalities and improve recovery outcomes for road accident victims.

1.3 PROBLEM STATEMENT

In recent years, road accidents have become a leading cause of injury and death worldwide, often exacerbated by delayed medical response times. To address this critical issue, the Emergency Alert Helmet has been developed as a cutting-edge solution to improve the chances of survival for accident victims. This innovative helmet incorporates advanced technology, including a force resistive sensor, a GSM module, and an Arduino microcontroller, to detect significant impacts associated with accidents. When the helmet registers a force above a specified threshold, it automatically sends an alert message to the nearest ambulance service and designated emergency contacts. This immediate notification ensures that first responders are quickly dispatched to the scene, significantly reducing the time between the accident and the arrival of medical help. By enhancing the efficiency of emergency response, the Emergency Alert Helmet aims to decrease fatalities and improve the overall outcomes for those involved in road accidents, ultimately saving lives.

1.4 AIM AND OBJECTIVES OF THE PROJECT

The aim of this project is to enhance the safety and survival chances of road accident victims through the development and deployment of the Emergency Alert Helmet. This innovative helmet is designed to provide timely medical assistance by leveraging smart technology to detect accidents and promptly notify emergency services.

The primary objective of the project is to integrate a force resistive sensor and a GSM module with an Arduino microcontroller into a helmet to accurately detect significant impacts indicative of accidents. Upon detecting a collision, the system will automatically send an alert message to the nearest ambulance service and designated emergency contacts, ensuring rapid dispatch of first responders. Another key objective is to ensure the system's reliability and accuracy in distinguishing between minor impacts and serious collisions, thereby minimizing false alerts. Additionally, the project aims to create a user-friendly interface for configuring emergency contacts and ensuring the system is easy to use for all riders. Ultimately, the project aspires to bridge the critical time gap between the occurrence of an accident and the arrival of medical help, thereby reducing fatalities and improving the outcomes for accident victims. Through this innovative solution, the Emergency Alert Helmet seeks to serve as a crucial tool in road safety, offering a beacon of hope and significantly enhancing emergency response times.

CHAPTER 2

LITERATURE SURVEY

In [1] the paper explains about the bike accidents happening around us right now. a number of the causes individuals fall ill or can die is because they are not wearing helmets. If a helmet had been worn at that point of the tragedy, many individuals may have survived. There is constant breaking of traffic laws. A smart helmet with a system of internal controls is suggested as a solution to these issues. The purpose of the Smart Helmet for Bikers project aims to improve motorcycle riders' rate of road safety. The concept was developed as it became apparent that motorcycle riders are becoming increasingly concerned about the rising frequency of fatal traffic incidents over time. It is made up of an RF reception system and an RF transmitter.

In [2] This paper works a smart helmet is a wearable device that has attracted attention in various fields, especially in applied sciences, where extensive studies have been conducted in the past decade. In this study, the current status and trends of smart helmet research were systematically reviewed. Five research questions were set to investigate the research status of smart helmets according to the year and application field, as well as the trend of smart helmet development in terms of types of sensors, microcontrollers, and wireless communication technology.

In [3] safety with luxurious and intelligent features using a smart helmet. Two modules one on the helmet and bike each will work in synchronization, to ensure that the biker is wearing the helmet. A radio frequency module is responsible for the wireless communication between the helmet and the bike circuit. The Piezo electric buzzer is used to detect speeding and this feature is extended by limiting the speed of the user.

[4] This paper introduces the development of the smart helmet needed to respond to accidents of rescue workers in the event of a disaster. With the emergence of many IoT-based devices and applications, many of the services that use them are active. However, each service was developed in a specific field, making it difficult to apply new devices, modify application and make changes to services. With the advent of a variety of IoT-based devices and services, we need middleware that can easily integrate them. Our

researchers have developed the new software framework enable to integrate a wide range of devices and services and efficiently manage resources. In addition, based on this, we develop the smart helmet to respond the disaster safety accidents.

[5] This paper aims for avoidance of accidents and develop helmet detection system. The proposed system is an intelligent/safety helmet. A module affixed in the helmet, such that, the module will sync with the module affixed on bike and will also ensure that biker has worn Helmet. Additional feature of accident avoidance detection module will be installed on the bike.

[6]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 alcohol detection, 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.

[7] Road accidents are increasing day by day because the riders are not using the helmet and due to consumption of alcohol. In today's world, huge numbers of people are dying on road accidents. By using smart helmet, the accidents can be detected. The main target of the project is designing a smart helmet for accident avoidance and alcohol detection. The IR sensor checks if the person is wearing the helmet or not. The Gas sensor recognizes the alcoholic substance in the rider's breath. If the person is not wearing the helmet and if he consumes alcohol, the bike will not start. If there is no sign of alcoholic substance present and helmet is used, then only the bike will start.

CHAPTER 3

SYSTEM SPECIFICATIONS

3.1 HARDWARE SPECIFICATIONS

Processor	:	12th Generation Intel® Core™ i7 processor
Memory Size	:	256 GB (Minimum)
HDD	:	40 GB (Minimum)
BOARD	:	Arduino Uno
SENSOR	:	Force Sensor
Bread Board	:	1
Jumper Wire	:	Required amount

3.2 SOFTWARE SPECIFICATIONS

Operating System	:	WINDOWS 10 AND PLUS
Open-source Platform	:	Arduino IDE
Library	:	Force Sensor GSM Module GPS Module

CHAPTER 4

MODULES DESCRIPTION

Arduino Uno

This is microcontroller setup for the car parking system which acts as the CPU of the whole system. This takes inputs from the Sensors and triggers the actuators.

GSM Module

A GSM module is a crucial component in modern communication systems, enabling devices to connect to cellular networks and transmit data, messages, and alerts over long distances. It plays a vital role in the Emergency Alert Helmet by facilitating real-time communication with emergency services and designated contacts, ensuring swift response in critical situations.

GPS Module

A GPS module can be integrated into the Emergency Alert Helmet to accurately determine the location of an accident. This precise geolocation information ensures that emergency responders can reach the accident site swiftly, further enhancing the helmet's life-saving capabilities.

CHAPTER 5

SYSTEM DESIGN

5.1 FLOW CHART

A flowchart is a representation of the Emergency Alert Helmet's operation begins with the detection of significant impacts by a force resistive sensor. Once an impact exceeding the predefined threshold is detected, the Arduino microcontroller processes the signal and activates the GSM module. The GSM module then sends an alert message to the nearest ambulance service and emergency contacts. This message contains critical information about the accident, including the location of the victim. Upon receiving the alert, emergency responders are dispatched promptly to the scene. This timely communication ensures that medical assistance is provided swiftly, potentially reducing fatalities and improving outcomes for accident victims.

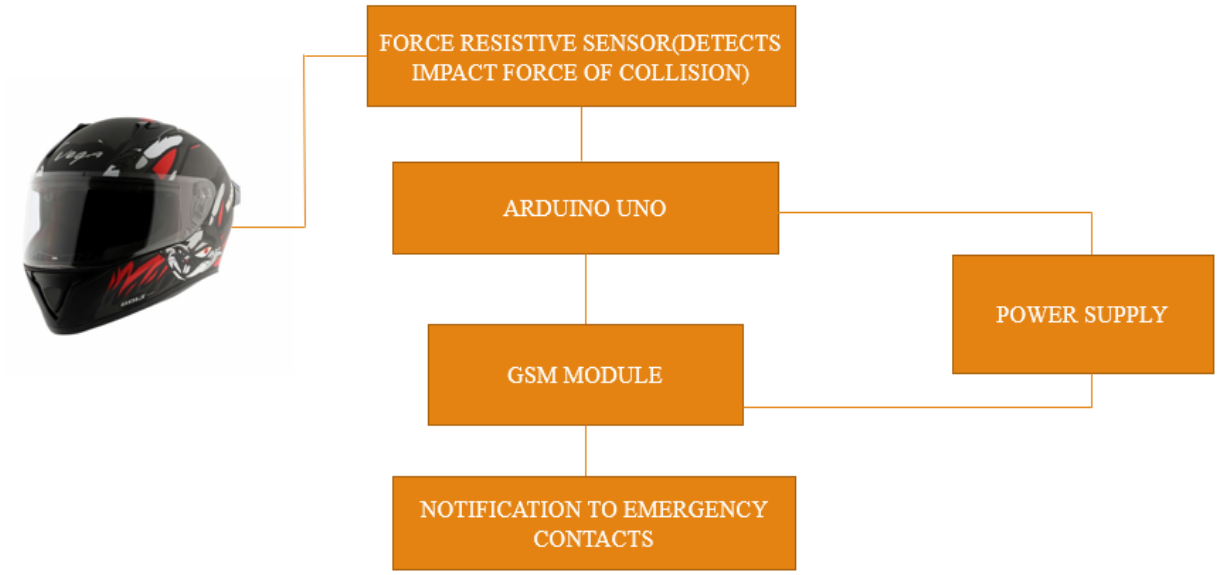

Figure 4.1 Architecture diagram

5.2 ARCHITECTURE DIAGRAM

An activity in Unified Modelling Language (UML) is a major task that must take place in order to fulfil an operation contract. Activities can be represented inactivity diagrams. An activity can represent: The invocation of an operation. A step in a business process.

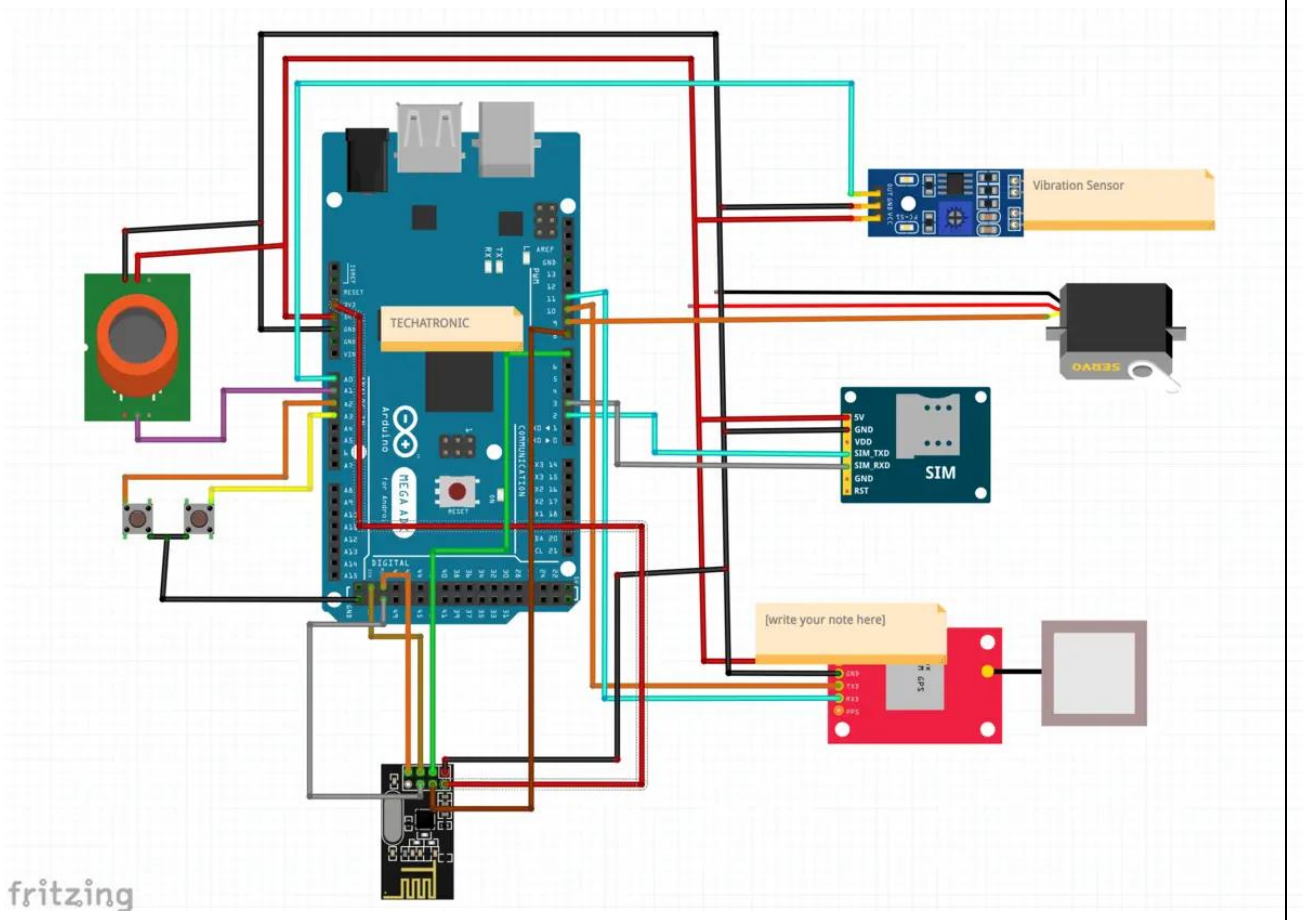

Figure 4.2 Block diagram

CHAPTER 6

CODING

1.ARDUINO IDE- C++

```
// Sensor characteristics (replace these values with your actual sensor data)
 const float VOLTAGE_AT_ZERO_PRESSURE = 0.5;  // Voltage output at zero pressure (in volts)
 const float VOLTAGE_PER_UNIT_PRESSURE = 0.1; // Change in voltage per unit change in pressure (in volts per unit)
 // Threshold pressure (adjust this value according to your requirement)
 const float FALL_THRESHOLD_PRESSURE = 42.0; // Example threshold pressure in units
 #include <SoftwareSerial.h>
 // Configure the software serial port for communication with the GSM module
 SoftwareSerial gsmModule(2, 3); // RX, TX
 // Function to calculate pressure from analog reading
 float calculatePressure(int analogReading) {
    // Convert analog reading to voltage (assuming 5V reference voltage)
    float voltage = analogReading * (5.0 / 1023.0);
    Serial.print("voltage reading: ");
    Serial.print(voltage);
    // Calculate pressure using linear interpolation
    float pressure = (voltage - VOLTAGE_AT_ZERO_PRESSURE) / VOLTAGE_PER_UNIT_PRESSURE;


    return pressure;
 }
void sendMessage(String phoneNumber, String message) {
   Serial.println("Sending a message to: " + phoneNumber);
   gsmModule.println("AT+CMGF=1"); // Set the GSM module to text mode
   delay(1000);
```

```
  gsmModule.print("AT+CMGS=\""); // AT command for sending a message
  gsmModule.print(phoneNumber); // Phone number to send the message to
  gsmModule.println("\"");
  delay(1000);
  gsmModule.print(message); // Message content
  delay(100);
  gsmModule.println((char)26); // End of message character
  delay(5000); // Delay for the message to be sent
  Serial.println("Message sent.");
}

void setup() {
    Serial.begin(9600);
    while (!Serial) {
    ; // Wait for serial port to connect. Needed for native USB port only
  }
  // Initialize the software serial port for communication with the GSM module
  gsmModule.begin(9600);
  delay(1000);
  Serial.println("Initializing GSM module...");
  gsmModule.write("AT\r\n");
  delay(1000);
  gsmModule.write("ATE0\r\n");
  delay(1000);
  // Verify if the module is responding
  if(gsmModule.find("OK")) {
    Serial.println("GSM module initialized.");
  } else {
    Serial.println("Error initializing GSM module!");
    while(1);
  }
```

```
    pinMode(A0, INPUT);
}
```

2.Loop

```
void loop() {
    // Read analog sensor value
    int sensorValue = analogRead(A0);
    // Calculate pressure
    float pressure = calculatePressure(sensorValue);
     // Print pressure to serial monitor
    //Serial.print("Analog reading: ");
    //Serial.print(sensorValue);
    Serial.print(", Pressure: ");
    Serial.println(pressure);
    //Serial.println(" units");

    // Check if the helmet falls with a certain force
    if (pressure >= FALL_THRESHOLD_PRESSURE) {
        // Helmet has fallen with sufficient force
        Serial.println("Helmet has fallen!");
        // Here, you can include code to send an SMS or take other actions
        sendMessage("+917010824704", "Helmet has fallen!");
        delay(2000);
    }
     delay(1000); // Delay for stability
}
```

CHAPTER 7

SCREEN SHOTS

CONNECTION

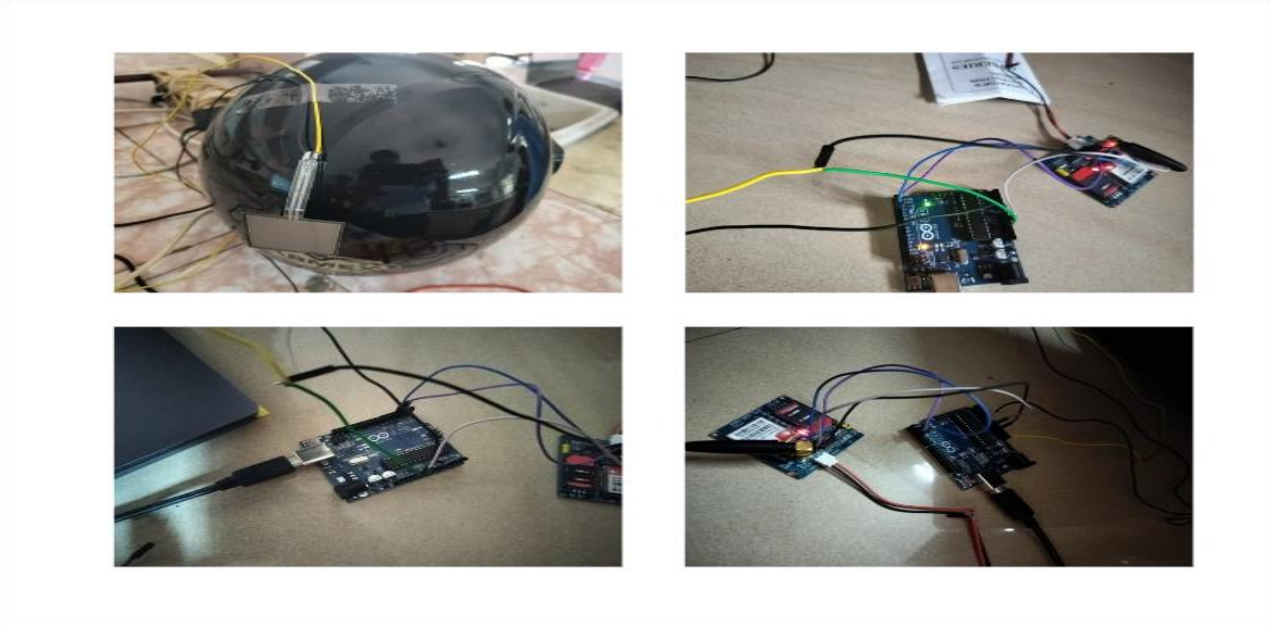

Figure 7.1 Connection Setup

The connection setup for the Emergency Alert Helmet involves integrating several critical components to ensure seamless operation. The force resistive sensor is attached to the helmet's structure, continuously monitoring for impacts. This sensor is connected to an Arduino microcontroller, which processes the sensor data to determine if the force exceeds the predefined threshold indicative of an accident. Upon detecting such an impact, the Arduino triggers the GSM module to send an alert message. The GSM module, equipped with a SIM card, is pre-programmed with emergency contacts and the nearest ambulance service numbers. When activated, it sends the precise location of the accident, derived from a GPS module connected to the Arduino, ensuring that help is dispatched promptly. This coordinated setup between the sensor, Arduino, GSM module, and GPS ensures a reliable and efficient emergency response system, bridging the critical gap between an accident and the arrival of medical assistance.

CHAPTER 8

CONCLUSION AND FUTURE ENHANCEMENT

In conclusion, the Emergency Alert Helmet represents a significant advancement in emergency response technology, offering a critical lifeline to accident victims through its automated alert system. By harnessing the capabilities of a force resistive sensor and GSM module integrated with an Arduino microcontroller, this smart helmet ensures that emergency services are notified immediately upon detecting a severe impact. The rapid dissemination of accident alerts to the nearest ambulance service and designated emergency contacts facilitates quicker medical intervention, thereby enhancing the chances of survival and recovery for those involved in road accidents. This innovation underscores the importance of timely medical assistance and serves as a testament to the potential of technology in saving lives.

Looking ahead, the Emergency Alert Helmet can be further enhanced by incorporating machine learning algorithms and accelerometer sensors. By integrating machine learning, the helmet can analyze patterns and improve the accuracy of impact detection, reducing false alarms and ensuring that alerts are triggered only during genuine emergencies. The addition of an accelerometer will enable the helmet to measure the exact force and direction of impacts more precisely, providing a comprehensive understanding of the accident's severity. These enhancements will not only refine the helmet's ability to detect accidents but also personalize the response mechanism based on the severity and nature of the collision. Furthermore, advancements in connectivity technology could facilitate real-time data sharing with medical personnel, enabling them to better prepare for the specific needs of the victim before arriving at the scene. As these future enhancements are implemented, the Emergency Alert Helmet will continue to evolve, offering even greater protection and support to road users, and reinforcing its role as a pivotal tool in emergency response and accident prevention.

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