Literature Review (Helmet-based Safety Systems)

# 1. Research Paper: Smart Helmet for Hazardous Workplaces

Source: International Journal of Scientific & Engineering Research (IJSER)

## 1. Objective and Focus

|  |  |  |
| --- | --- | --- |
| Aspect | Research Paper | Your Project |
| Goal | Detect gas leaks and provide alerts in hazardous environments | Indoor zone-based location + gas detection + audio surveillance |
| Focus | Worker safety in toxic environments via sensor-based monitoring | Multi-sensor fusion for indoor miner tracking and alert system |

## 2. Technologies Used

|  |  |  |
| --- | --- | --- |
| Component | Research Paper | Your Project |
| Microcontroller | Arduino UNO | ESP32 (Wi-Fi + BLE) |
| Sensors | MQ135 (gas), DHT11 (temperature), IR | MQ2 or MQ135 (gas), optional mic, no temp sensor |
| Display | LCD | No display mentioned |
| Communication | GSM + SMS | Wi-Fi RSSI-based tracking |
| Alert System | Buzzer + SMS notification | Console alert + Buzzer + Mic |

## 3. Innovation/Unique Contribution

|  |  |
| --- | --- |
| Research Paper | Your Project |
| Uses GSM module for sending alerts to phones | Uses Wi-Fi RSSI for real-time indoor zone localization |
| Designed for general hazardous zones | Specifically tailored for underground mining-like indoor setups |

## 4. Practicality and Scalability

|  |  |
| --- | --- |
| Research Paper | Your Project |
| Field-deployable, but GSM needs network range | Classroom-deployable, scalable using Wi-Fi access points |

\*\*Distinction:\*\* Your project avoids GSM dependency, uses Wi-Fi-based zone tracking, and adds optional audio monitoring, making it better suited for indoor mining or test labs.

# 2. Research Paper: Helmet-based Accident Detection System

Source: International Journal of Computer Applications (IJCA)

## 1. Objective and Focus

|  |  |  |
| --- | --- | --- |
| Aspect | Research Paper | Your Project |
| Goal | Detect two-wheeler accidents and alert emergency contacts | Track miners indoors + detect gas leaks |
| Focus | Road safety via helmet crash detection | Workplace safety through gas + location + audio monitoring |

## 2. Technologies Used

|  |  |  |
| --- | --- | --- |
| Component | Research Paper | Your Project |
| Microcontroller | Arduino Nano | ESP32 |
| Sensors | Accelerometer, GPS, GSM module | MQ2/MQ135 gas, no GPS, optional mic |
| Communication | GSM (SMS to family) | Wi-Fi-based RSSI signal scanning |
| Alert System | Crash triggers SMS | Gas triggers buzzer/audio/console |

## 3. Innovation/Unique Contribution

|  |  |
| --- | --- |
| Research Paper | Your Project |
| Designed for post-accident alerts | Designed for preventive alerts in hazardous zones |
| Location tracking via GPS | Indoor zone tracking via Wi-Fi |

## 4. Practicality and Scalability

|  |  |
| --- | --- |
| Research Paper | Your Project |
| Suitable only for outdoor GPS use | Works without GPS, perfect for underground or indoor labs |

\*\*Distinction:\*\* Your project doesn’t require GPS/GSM, is more proactive (alerts before harm), and targets a different environment (mines vs roads).

# 3. Research Paper: Smart Helmet for Construction Workers

Source: IEEE Xplore

## 1. Objective and Focus

|  |  |  |
| --- | --- | --- |
| Aspect | Research Paper | Your Project |
| Goal | Monitor worker fatigue and environment on construction sites | Monitor miner gas exposure + position via Wi-Fi |
| Focus | Health status + site condition monitoring | Hazardous gas detection + zone location tracking |

## 2. Technologies Used

|  |  |  |
| --- | --- | --- |
| Component | Research Paper | Your Project |
| Microcontroller | Raspberry Pi Zero | ESP32 |
| Sensors | Heartbeat sensor, Temp, Gas | MQ2/MQ135 gas, optional mic, no biometric sensors |
| Display | Touchscreen | None |
| Communication | Wi-Fi + cloud dashboard | Wi-Fi-based RSSI + console-based alert |
| Alert System | Visual display + alert | Buzzer + console |

## 3. Innovation/Unique Contribution

|  |  |
| --- | --- |
| Research Paper | Your Project |
| Adds biometric monitoring for fatigue | Adds zone-tracking via RSSI + optional audio input |
| Real-time cloud visualization | Simple classroom-level display/console setup |

## 4. Practicality and Scalability

|  |  |
| --- | --- |
| Research Paper | Your Project |
| Good for large construction firms | Scalable indoor mapping for test labs or future expansion |

\*\*Distinction:\*\* Your project focuses on indoor miner safety, avoids costly biometric integration, and is simpler and more demo-ready.

# 4. Research Paper: IoT-based Helmet with Alcohol Detection for Bikers

Source: IJRASET

## 1. Objective and Focus

|  |  |  |
| --- | --- | --- |
| Aspect | Research Paper | Your Project |
| Goal | Prevent drunk driving using alcohol sensor in helmet | Gas detection + Wi-Fi-based zone tracking in mining |
| Focus | Traffic safety & alcohol monitoring | Environmental hazard alerts + location tracking |

## 2. Technologies Used

|  |  |  |
| --- | --- | --- |
| Component | Research Paper | Your Project |
| Microcontroller | Arduino UNO | ESP32 |
| Sensors | MQ3 (Alcohol), Vibration sensor | MQ2/MQ135 (gas), optional mic |
| Alert System | Engine cut-off, buzzer | Buzzer, console, optional mic |
| Communication | None | Wi-Fi RSSI-based communication |

## 3. Innovation/Unique Contribution

|  |  |
| --- | --- |
| Research Paper | Your Project |
| Detects and stops vehicle on alcohol detection | Alerts and tracks miners before danger |

## 4. Practicality and Scalability

|  |  |
| --- | --- |
| Research Paper | Your Project |
| Good for bike integration | Good for indoor zones like mines or factories |

\*\*Distinction:\*\* Your project is not limited to alcohol detection and adds a real-time tracking layer using Wi-Fi, which this paper doesn’t consider.

# 5. Research Paper: Multi-sensor Safety Helmet for Miners

Source: International Research Journal of Engineering and Technology (IRJET)

## 1. Objective and Focus

|  |  |  |
| --- | --- | --- |
| Aspect | Research Paper | Your Project |
| Goal | Detect gas, temperature, and humidity for miner safety | Detect gas + track zone + monitor audio |
| Focus | Environment parameter monitoring | Safety alerts + Wi-Fi zone tracking |

## 2. Technologies Used

|  |  |  |
| --- | --- | --- |
| Component | Research Paper | Your Project |
| Microcontroller | Arduino Mega | ESP32 |
| Sensors | MQ135, DHT11, LDR | MQ2/MQ135, no temp, optional mic |
| Communication | ZigBee + LCD | Wi-Fi RSSI + Console-based system |
| Display | LCD | None |

## 3. Innovation/Unique Contribution

|  |  |
| --- | --- |
| Research Paper | Your Project |
| Uses ZigBee network | Uses simpler and accessible Wi-Fi RSSI |
| Focus on real-time environmental values | Focus on zone mapping + alert system |

## 4. Practicality and Scalability

|  |  |
| --- | --- |
| Research Paper | Your Project |
| ZigBee needs mesh network configuration | Wi-Fi RSSI easy to configure and test in classrooms |

\*\*Distinction:\*\* Your project simplifies the network, focuses on zone-wise tracking, and adds audio monitoring, which gives it a practical demo edge.