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# "Smart Helmet for Electrical Workers Using IOT Technology for Safety Monitoring"

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**Abstract** -Electrical workers face danger due to electric faults, high temperature, smoke, gas leakage, and fall accidents. A normal helmet cannot detect these conditions. This paper presents an IoT based smart helmet that monitors temperature, gas/smoke, pulse rate, helmet wear status, and fall detection. The controller compares sensor values with safety limits and generates buzzer/LED warning. It also sends alerts to a cloud/mobile dashboard for supervisor monitoring. The proposed helmet improves worker safety by giving early warning and faster emergency response.

**Keywords**— Smart Helmet, IoT, Electrical Safety, Gas Sensor, Temperature Sensor, Fall Detection, Health Monitoring.

## 1. INTRODUCTION

Electrical workers perform risky jobs such as maintenance of panels, substations, and overhead lines, where accidents can occur due to electric shock, overheating, smoke/gas leakage, or falls. Normal safety helmets provide head protection but cannot detect danger or give early warning. To improve safety, this project introduces an IoT based smart helmet that monitors important parameters using sensors and sends alerts through buzzer/LED and mobile notification. This helps in early detection of unsafe conditions and quick emergency response.

## 2. BACKGROUND

Electrical workers often operate in dangerous conditions where sudden faults, high temperature, smoke/gas leakage, or falls can cause serious accidents. Traditional safety equipment like helmets and gloves provides basic protection, but it cannot monitor the worker's condition or surroundings in real time. Also, supervisors cannot continuously watch every worker, especially in remote or large industrial areas. Using IoT technology with sensors in a helmet can solve this problem by detecting unsafe conditions early and sending quick alerts to the worker and supervisor for fast action.

## 3. OBJECTIVES

The main objective of this project is to design and develop an IoT based smart helmet to improve the safety of electrical workers. The helmet continuously monitors important parameters such as temperature, gas/smoke level, heart rate, helmet wearing status, and fall detection. The system gives an immediate buzzer/LED warning when any unsafe condition is detected. It also sends real-time alerts and sensor data to a cloud/mobile application so that the supervisor can take quick action during emergency situations.

## 4. METHODOLOGY

The proposed Smart Helmet system is developed by integrating different safety sensors with a microcontroller and IoT communication. First, required sensors such as temperature sensor, gas/smoke sensor, heart rate sensor, fall detection sensor, and helmet wear sensor are selected and mounted on the helmet. These sensors continuously collect real-time data while the worker is performing electrical work.

The sensor outputs are connected to a controller unit (ESP32/ESP8266), which reads the values and compares them with predefined safe threshold limits. If any sensor value crosses the limit, the controller immediately activates the buzzer and LED to warn the worker. At the same time, the system sends an alert message and live sensor data to a cloud/mobile dashboard using Wi-Fi or GSM communication. This allows supervisors to monitor worker safety remotely and take quick action during emergency conditions.

Finally, the system is tested under different conditions to check sensor accuracy, alert response, and IoT data

transmission performance. This methodology ensures reliable monitoring, fast warning, and improved safety for electrical workers.

## 5.CONCLUSION

The Smart Helmet for Electrical Workers using IoT Technology for Safety Monitoring provides a reliable solution for protecting workers in hazardous electrical environments. By monitoring voltage, current, temperature, gas, heart rate, and fall detection, the system generates real-time alerts and sends emergency notifications to supervisors. This reduces accident severity, improves response time, and enhances overall worker safety in industries and field electrical work.

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