iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** V **Month of publication:** May 2025

DOI: https://doi.org/10.22214/ijraset.2025.70461

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue V May 2025- Available at www.ijraset.com

IOT Based Smart Helmet

Prof. H. R. Dhananjay[1], Dhanamma Dolle[2], Saipranay Tumma[3], Jivan Mane[4], Pooja Gavali[5]
[1]*Prof,* [2,3,4,5]*Students, Dept. of Electrical Engineering, Brahmdevdada Mane Institute of Technology, Dist. Solapur, Maharashtra, India*

Abstract: ***This project presents the design and development of a smart helmet equipped with gas, temperature, and humidity sensors, along with a microcontroller unit and a 16x2 display. The helmet is designed to be worn by miners and workers in other industrial settings to provide real-time data on their immediate environment. The helmet's microcontroller unit, based on the NodeMCU, collects data from the sensors and displays it on the helmet's display, allowing the user to monitor the conditions around them. In addition to local monitoring, the helmet's data can be transmitted to a web or mobile application, providing remote monitoring and alerting features. The application can generate alert signals on a buzzer in response to high concentrations of harmful gases, ensuring that the user is aware of potential hazards in their surroundings. The results of the project demonstrate the feasibility of a low-cost, wearable device that can improve safety and awareness for workers in hazardous environments. The smart helmet is versatile, and its design can be adapted to different industrial applications. This project lays the foundation for future research and development in the field of wearable technology for occupational safety.***

This project aims to develop a smart helmet that can be used for miners and various other industrial uses. The helmet is equipped with a gas sensor, a DHT temperature and humidity sensor, and a 16x2 display. The main microcontroller unit used in this project is NodeMCU, which facilitates the display of data on a web or mobile app. The web and mobile app also have the functionality to generate alert signals on a buzzer. The gas sensor installed in the helmet can detect high concentrations of harmful gas and trigger the buzzer to generate an alert signal. The helmet can help improve the safety of miners and other industrial workers by providing real-time data on gas levels, temperature, and humidity. This project can be further developed to incorporate more sensors and features to enhance its functionality and application in various industries.

I. INTRODUCTION

Industrial workers, especially miners, work in hazardous environments where they face a constant threat to their safety and health. To address this issue, we have developed a smart helmet that can help ensure the safety of miners and other industrial workers. The helmet is equipped with various sensors such as a gas sensor, DHT temperature and humidity sensor, and a 16x2 display. These sensors can detect gas concentrations, temperature, and humidity levels in real-time, providing valuable information to the workers. The main microcontroller unit used in this project is NodeMCU, which is used to display the data on a web or mobile app. The app also includes an alert system that triggers a buzzer when the gas sensor detects high concentrations of harmful gases. This project has the potential to significantly improve the safety of workers in various industries by providing them with real-time data on their working environment. Furthermore, this project can be expanded to incorporate additional sensors and features to further enhance its functionality and application in various industries.

II. PROBLEM STATEMENT

Working in hazardous environments, such as mines or industrial plants, poses a significant risk to workers' safety and health. Exposure to high concentrations of harmful gases, extreme temperatures, and other environmental factors can cause serious health issues, including respiratory problems and heat stroke.

Traditional safety measures, such as ventilation and protective equipment, can only go so far in mitigating these risks. Therefore, there is a need for a more advanced safety system that can provide real-time monitoring of environmental hazards and alert workers to potential dangers.

This project addresses this problem by developing a smart helmet that integrates gas, temperature, and humidity sensors, along with a microcontroller unit and a display. The helmet provides workers with real-time data on the surrounding environment, allowing them to detect hazardous conditions and take necessary precautions. The system also includes remote monitoring capabilities via a web or mobile application and alerting features in response to high concentrations of harmful gases, ensuring that workers are aware of potential hazards at all times.

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III. LITERATURE REVIEW

"Development of an IoT-based smart helmet for industrial safety".
This paper describes the development of a smart helmet that uses IoT technology to monitor environmental hazards in industrial environments.

"Smart Helmet for Coal Mines Safety Monitoring and Alerting System"
This paper presents a smart helmet system that uses IoT sensors to monitor coal mines for gas leaks and other hazards.

"Design and implementation of a wearable IoT system for hazardous environments"
This paper describes the design and implementation of a wearable IoT system that can be used in hazardous environments such as chemical plants or oil refineries.

"Design and development of a smart helmet for real-time monitoring of hazardous gases in underground mines" This paper presents the design and development of a smart helmet that uses gas sensors and IoT technology to monitor underground mines for hazardous gases.

"IoT-based smart helmet for coal miners using air quality sensors and wireless sensor network."
This paper presents an IoT-based smart helmet system that uses air quality sensors and wireless sensor networks to monitor coal mines for hazardous gases.

"A smart helmet with environmental sensing and location tracking for worker safety in confined spaces"
This paper describes a smart helmet system that uses environmental sensors and location tracking to improve worker safety in confined spaces such as underground tunnels.

"Smart helmet system for monitoring workers in hazardous environments"
This paper presents a smart helmet system that uses IoT sensors to monitor workers in hazardous environments such as chemical plants or oil refineries.

"IoT-based smart helmet for real-time monitoring of environmental parameters in industrial plants."
This paper describes an IoT-based smart helmet system that can be used to monitor environmental parameters in industrial plants.

"Smart helmet for mining industry safety"
This paper presents a smart helmet system that uses IoT sensors to improve safety in the mining industry.

"Wearable safety helmets with wireless sensing and data acquisition for hazardous work environments"
This paper describes the design and implementation of wearable safety helmets that use wireless sensing and data acquisition to monitor hazardous work environments.

"Smart helmet for safety in mining industry using IoT."
This paper presents a smart helmet system that uses IoT sensors to improve safety in the mining industry.

IV. OBJECTIVE

The objective of this project is to develop a smart helmet that can improve the safety of miners and other industrial workers by providing real-time data on their working environment. By incorporating various sensors such as a gas sensor, DHT temperature and humidity sensor, and a 16x2 display, workers can easily monitor the gas concentrations, temperature, and humidity levels around them. The NodeMCU microcontroller unit is used to display the data on a web or mobile app, making it easily accessible to workers. The web and mobile app also include an alert system that triggers a buzzer when the gas sensor detects high concentrations of harmful gases.
The ultimate goal of this project is to help prevent accidents and improve the overall safety of workers in various industries.

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V. BLOCK DIAGRAM

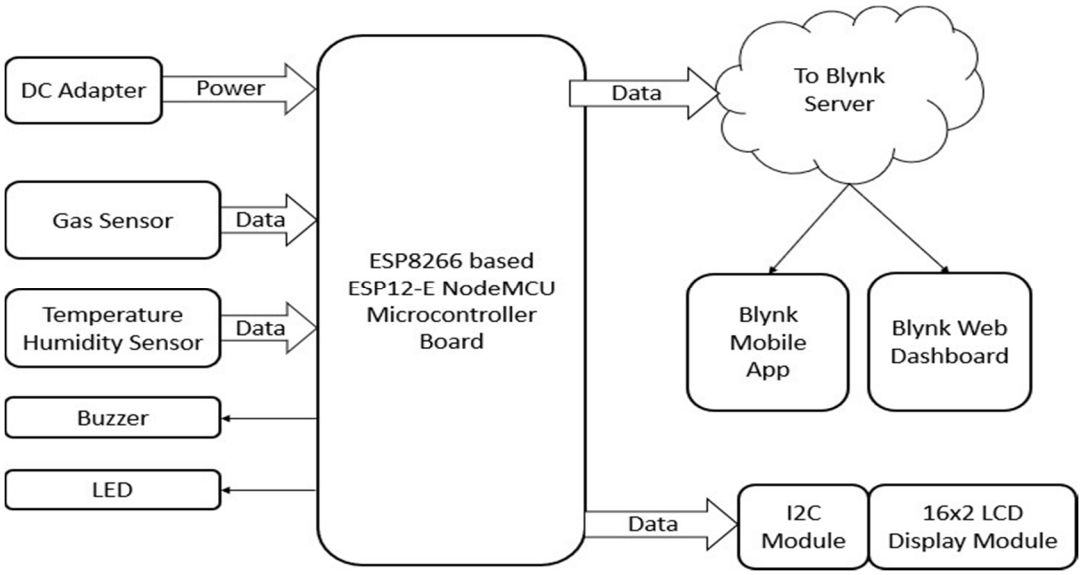
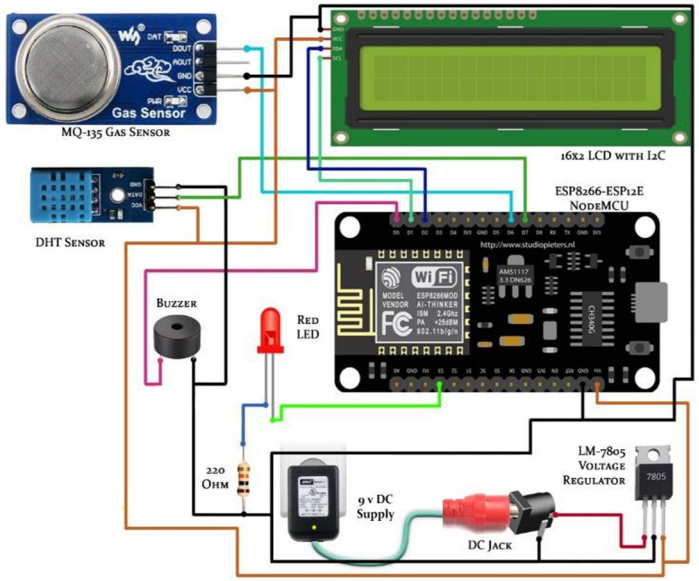


Figure 1. Block Diagram of a system

VI. HARDWARE SECTION SPECIFICATION AND WORKING



VII. WORKING

The smart helmet with gas sensors and other environmental sensors works by constantly monitoring the surrounding air for hazardous gases and other environmental conditions. The gas sensor in the helmet detects the concentration of harmful gases such as carbon monoxide, methane, and nitrogen oxides. The temperature and humidity sensors measure the ambient temperature and humidity levels. The data from these sensors is sent to the microcontroller unit (MCU), which processes the data and displays the readings on the 16x2 display on the helmet. The user can read the data on the display and take appropriate action if the readings indicate hazardous conditions.

In addition to displaying the data on the helmet, the MCU also sends the sensor data to a web or mobile app. The app displays the real-time data and provides alerts if the readings exceed a preset threshold. For example, if the gas sensor detects high levels of carbon monoxide, the app will generate an alert and sound the buzzer.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
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VIII. HARDWARE TESTING

A. *System Testing*

The framework going for delicate products is the looking at achieved on an outright, included machine to assess the machine's congruity with its exact necessities. gadget testing would also fall inside the range of the dark compartment looking at, and in this way, it must need no data around the interior structuring of the presence of mind or the code. It's miles a totally comparable deliberate check case lettering. inside the check case lettering we ought to be equipped for compose the check case circumstances and moreover the utilization cases.

B. *Black Box Testing*

The Black-box looking at is an approach to "test programming that uncovers out the ability and running of a product without the peering into the inward structures or into the operations, explicit data of the products inside shape, code and programming understanding is commonly not required". Furthermore, the analyser is enjoyably careful about unequivocally what our item is thought to do anyway it isn't responsive of ways it would do it. as a case, our analyser is responsive that one careful enter may restore a definite, never-ending yield yet it isn't sure generally how the item would convey the yield inside the essential spot.

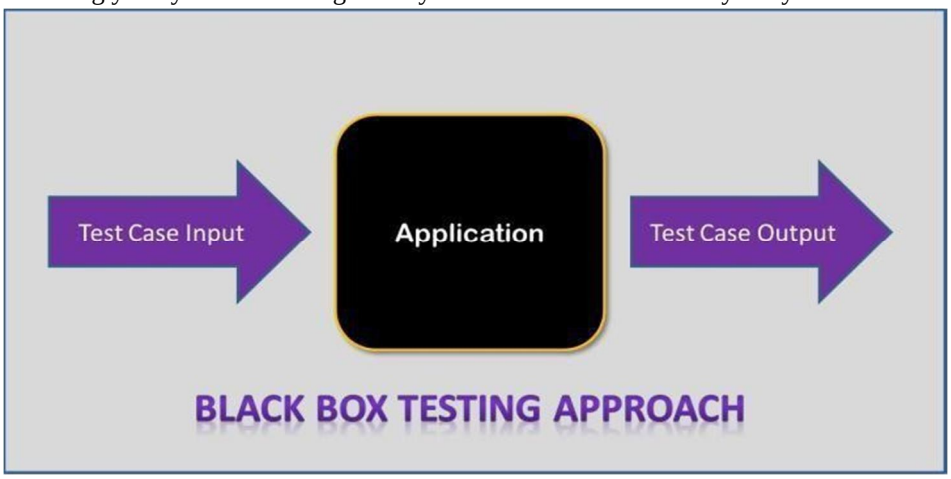


Figure 1: Black Box Testing

C. *Unit Testing*

Throughout pc programming and coding, we have this unit testing assisting which of the product tests approaches with the methods for which specific units of the supply code, or a fixed of 1 and now and then additional PC programming component together with related control records, managing procedures, and working methodologies, are experienced, and analysed to see whether they are strong for use. Instinctively, we likewise can locate a unit to be the littlest checkable component of an apparatuses. For this situation of the procedural programming, our unit could have been a whole module, but it's miles more usually a man or woman manner or characteristic.

The objective of unit checking out is in order to separate every detail of this system and to illustrate that the person factors are accurate.

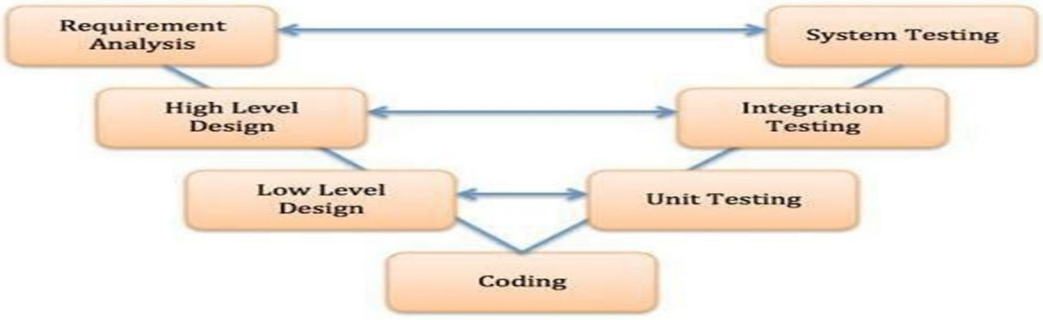


Figure 2: Unit Testing

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IX. ACKNOWLEDGEMENT

It plunges us in exhilaration taking privilege in expressing our heartfelt gratitude to all those who helped, encouraged and foreseeing successful completion of our project. Ecstasies to work under gregarious guidance of Prof.H.R.Dhananjaya to whom we are extremely indebted for his valuable and timely suggestions.

We wish to convey our sincere thanks to Prof.P.K. Magadum Head of the Dept. of Electrical Engineering, and we would like to give our thanks to all teaching and non-teaching staff members for their keen interest and excellent support. We would also like to thanks to all those who had directly or indirectly contributed their assistance in finishing out this project successfully.

Finally, we wish to thanks our parents and friends for being supportive to us, without this project could not have seen light of the day.

X. CONCLUSION

In conclusion, the smart helmet with gas sensors and other environmental sensors is a valuable tool for monitoring the environment and detecting hazards in real-time. The project's objective is to provide a safety system that can be used in different industries, such as mining, construction, and agriculture. The smart helmet is equipped with gas sensors, DHT temperature, and humidity sensors, which continuously monitor the environment and provide real-time data. The data is displayed on a 16x2 display and can be accessed through a web or mobile app. The web and mobile app can also generate alerts on a buzzer, providing early warning and enabling users to take appropriate safety measures.

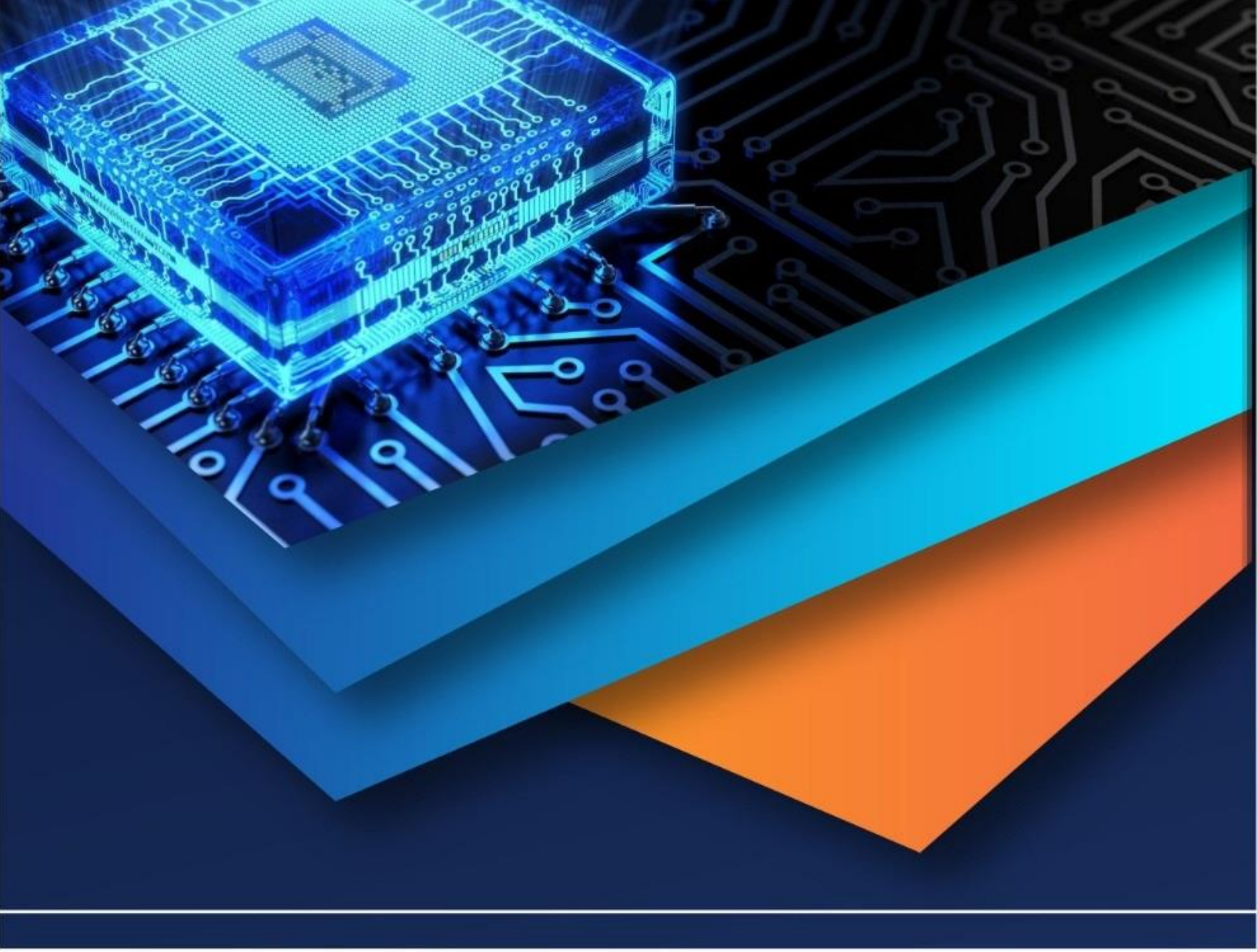
The project involves designing and implementing the hardware components, including the NodeMCU microcontroller, gas sensors, and display. The software involves programming the microcontroller, developing the web and mobile app, and processing the data generated by the sensors. The project has several advantages, including real-time monitoring, early warning, mobility, customizability, cost-effectiveness, and ease of use. However, it also has potential disadvantages, such as limited range, false alarms, maintenance requirements, power supply, data processing, and user acceptance.

XI. FUTURE SCOPE

Overall, the smart helmet with gas sensors and other environmental sensors is a promising safety system that can enhance safety and prevent accidents in different industries. The project's success depends on proper design, implementation, and maintenance, as well as user acceptance and compliance.

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