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Wearable Wireless Protective Gear for Human Safety with Emergency Panic Switch

Mr. Mayur Balpande[1], Mr. Kunal Wandile[2], Mr. Harsh Dandekar[3], Mr. Ankit Meshram[4], Mr. Pawan Ghormade[5]
Tulsiramji Gaikwad-Patil, College of Engineering & Technology, Nagpur, Maharashtra, India

Abstract: ***Worker safety in hazardous environments such as industries, construction sites, and electrical zones remains a major concern despite the availability of conventional protective measures. Delays in detecting danger and responding to emergencies often lead to serious injuries or loss of life. To address this issue, this project presents a Wearable Wireless Protective Gear for Human Safety with an Emergency Panic Switch, designed to provide immediate and reliable assistance during critical situations. The proposed system consists of a wearable transmitter unit and a receiver unit connected to the main control system. The wearable device is equipped with sensors to monitor abnormal conditions such as unsafe voltage levels and includes a panic switch for manual activation during emergencies. When a hazardous situation is detected automatically or the panic switch is pressed, the system sends a wireless alert signal to the receiver unit. The receiver then performs necessary actions, such as cutting off the power supply and activating an alarm to alert nearby personnel.***

I. INTRODUCTION

In today's rapidly advancing industrial and construction environments, worker safety has become more important than ever. Employees are often exposed to hazardous conditions such as high-voltage electricity, heavy machinery, and unpredictable emergencies. Despite the use of traditional safety measures, accidents still occur due to delayed response times and lack of real-time monitoring systems. This highlights the urgent need for smarter and more responsive safety solutions.

II. LITERATURE SURVEY

In recent years, the development of wearable safety devices has gained significant attention due to the increasing need for personal and industrial safety. Researchers have explored various approaches by integrating wearable technology, wireless communication, and intelligent systems to provide quick and reliable emergency responses. Early research mainly focused on basic wearable safety devices equipped with panic buttons and GPS modules. These systems allow users to send emergency alerts along with their real-time location to predefined contacts. For example, several IoT-based safety devices were designed with components such as GPS, GSM, and microcontrollers to ensure immediate communication during emergencies. These systems proved useful in providing quick alerts, but they largely depended on manual activation by the user.

III. METHODOLOGY

The methodology of the proposed Wearable Wireless Protective Gear for Human Safety with Emergency Panic Switch focuses on designing a reliable system that can detect hazardous situations and provide immediate response through both automatic sensing and manual activation. The overall process is divided into system design, working mechanism, and communication flow.

A. System Design

The system is developed using two main units: a transmitter unit and a receiver unit. The transmitter unit is designed as a wearable device that can be easily attached to the worker's clothing or safety gear. It consists of a microcontroller, sensors for detecting abnormal conditions (such as voltage differences or environmental hazards), a panic switch, and a wireless communication module.
The receiver unit is placed near the main power supply or control panel. It includes a wireless receiver, control circuitry, and a relay module. This unit is responsible for receiving signals from the wearable device and taking necessary actions such as cutting off power or triggering an alarm.

B. Working Mechanism

The system operates in two modes: automatic detection mode and manual panic mode.

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1) Automatic Detection Mode: Sensors continuously monitor the worker's condition and surrounding environment. If any abnormal parameter is detected, such as electric leakage or unsafe voltage levels, the system immediately processes the data using the microcontroller. Once the threshold limit is exceeded, a danger signal is generated automatically.

2) Manual Panic Mode: In situations where the worker senses danger but the sensors may not detect it, the panic switch can be pressed manually. This ensures that the worker has direct control over triggering an emergency alert without depending entirely on automated detection.

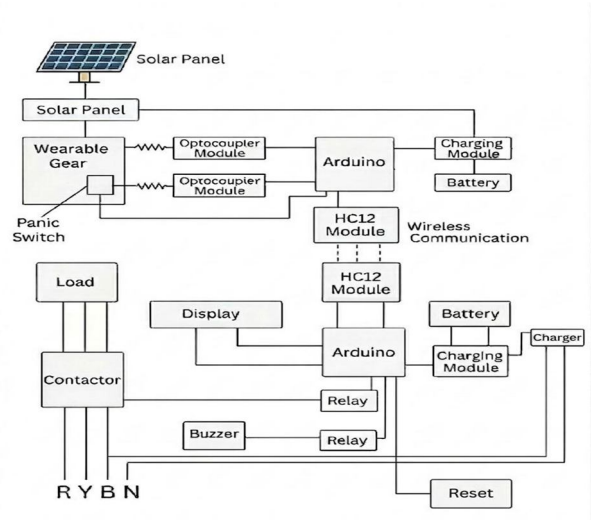
C. Signal Transmission

Once a danger signal is generated (either automatically or manually), the transmitter unit sends a wireless alert to the receiver unit using communication technologies such as RF or Bluetooth. The signal transmission is designed to be fast and reliable to minimize response time during emergencies

IV. RESULT AND DISCUSSION

The developed Wearable Wireless Protective Gear for Human Safety with Emergency Panic Switch was successfully designed and tested under different simulated conditions to evaluate its performance and reliability. The system demonstrated effective operation in both automatic detection mode and manual panic mode.

During testing, the sensors were able to accurately detect abnormal conditions such as unsafe voltage levels and trigger the system without delay. The wearable transmitter unit responded quickly by sending a wireless signal to the receiver unit. The receiver successfully processed the signal and activated the relay mechanism to cut off the power supply, thereby preventing potential hazards.



V. CONCLUSION

The Wearable Wireless Protective Gear for Human Safety with Emergency Panic Switch presents an effective and practical solution to enhance safety in hazardous working environments. This project successfully demonstrates how wearable technology, combined with wireless communication, can be used to provide immediate assistance during emergency situations.

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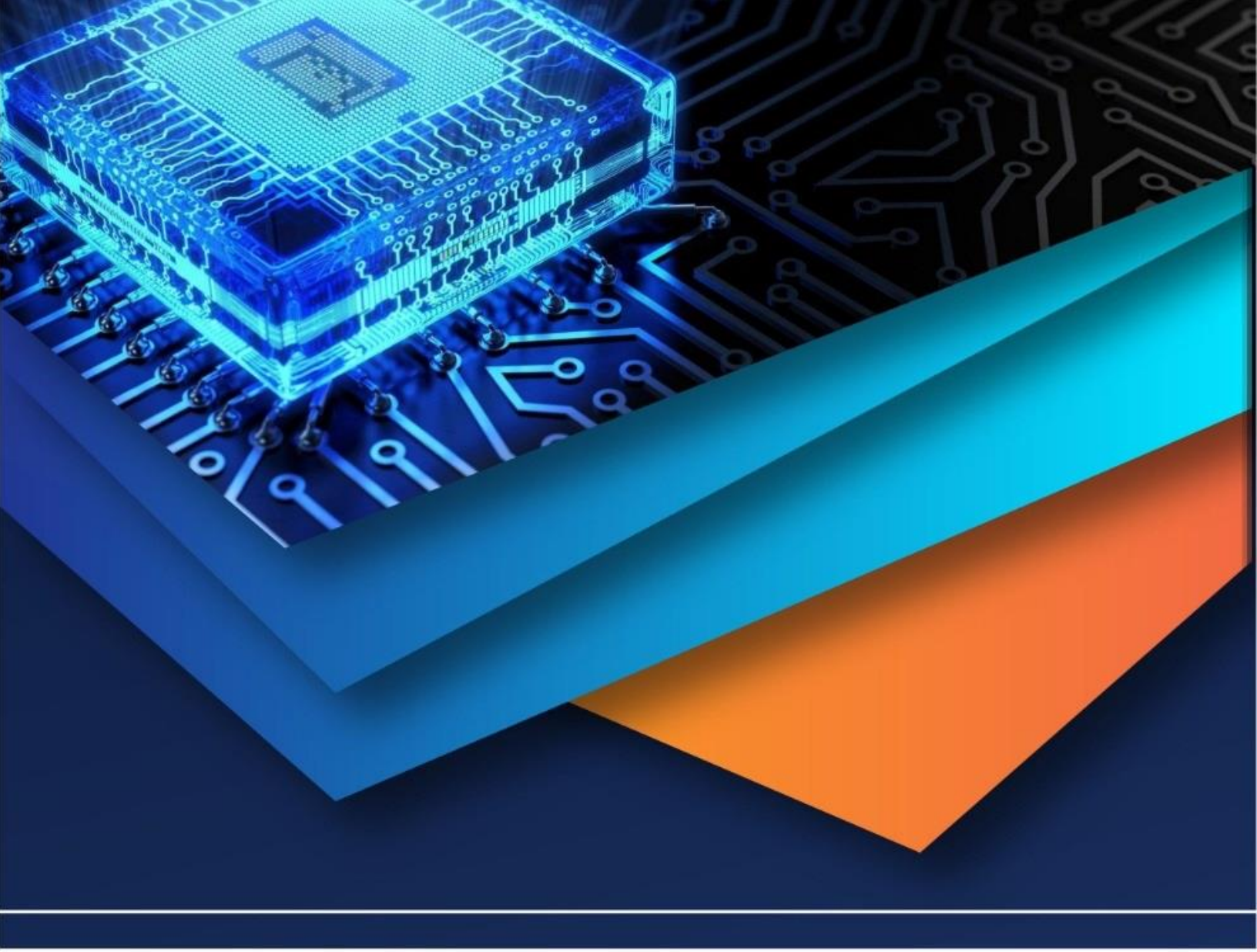
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