SMART WEARABLE SAFETY JACKET DESIGN FOR COAL MINERS

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ABSTRACT: ***The Shrewd Security Coat is a piece of IoT innovation that is utilized to guarantee the wellbeing of development and mining laborers. According to the statistical report, mining and construction industry research has established that accidents are always brought on by a combination of hazards and causes. Gas blast or residue could be the cause of the breakdown and surge in underground work. In a similar vein, a fire may cause dangerous substances to be released. Miners' excessive proximity to the blast was the primary cause of explosive-related fatalities, followed by poisoning from explosive fumes, misfires, and premature blasts. Explosives may have caused an earthquake that shattered the structure of the mine and trapped miners underground. Mine activated seismicity ought to be added to that overview. The excavators will get an unsafe sickness because of the risky gases, like carbon dioxide, carbon monoxide, methane, ethane, propene, and others, that are available in the mining region. All of the previously mentioned issues can be tried not to by go to fitting precaution lengths. The solution to this issue is the Smart safety jacket, an IoT device that is affixed to the jacket. This shrewd security coat interfaces with various sensors, including a gas sensor, fire sensor, temperature sensor, moistness sensor, ultrasonic sensor, and notice board. These sensors, which are connected to the network via Wi-Fi, have never been more important or valuable. Ongoing mining climate information can be observed and controlled from a distance from anyplace by changing over sensor information into activities. Controllers process and store the information that is retrieved from the mining environment by the network-connected sensors in a database for later use. The data can be monitored remotely using personal computers and an app called Blynk. There are two components to the entire procedure: The miner is required to wear a smart safety jacket that has sensors and is networked with the control room. In case of a basic circumstance, a screen in the control room who is continually observing the excavators and the mining site ought to really look at the situation with the sensors and tell the diggers.***

Key words: Shrewd Security Coat, Gas blast, ultrasonic sensor, IoT device, proximity, Smart safety jacket.

I.INTRODUCTION

In the present period where wellbeing and security is the top most need in different basic cycles in basically the same manner in coal ventures individuals guarantee exactly the same thing. While concentrating on the most recent realities it has been accounted for around one episode by Worldwide Coalition On the side of Laborers in Iran. Six people died as a result of poisonous gases in the Sanjdi coal mine near Quetta, Baluchistan, during this incident. The Industrial Global Union and the Pakistan Central Mines Labor Federation are well aware of this issue, but there is no ideal solution for it. Although the proposed system cannot be used in a coal mine, thousands of lives could be saved at the right time if it were managed on a wireless sensor network and then implemented. Additionally, this is a first-of-its-kind solution due to the number of effective sensors proposed in this paper. There are a number of possible solutions to the same problem, many of which have been tried before, but one major problem is keeping track of them after a coal mine collapses for any reason. In such a scenario, the disaster management authority begins lengthy excavation of the entire site. The majority of the time, the rescue team is unable to save all of the victims because they are unable to locate those with the proper pulse rate. In addition to determining the miner's precise depth and GPS location, this system will continuously update the miner's pulse rate. The rescue team can use this system to dig precisely where the miners are trapped and at the right depth to return them to the ground.

1.1OVERVIEW

New healthcare, lifestyle analysis, and environmental protection solutions have emerged as a result of the Internet of Things (IoT) paradigm's evolution and diffusion in recent years. The scientific community and businesses have shown an interest in wearable devices that use a variety of sensor types to collect characteristics that are relevant to a variety of quantifiable domains. Continuous monitoring of a user's health as it is affected by behavioural, physiological, psychological, and, most importantly, environmental parameters has been demonstrated to be particularly effective for these technologies. Hybrid solutions for monitoring multiple parameters, such as devices that can evaluate both biophysical and environmental aspects, have developed in addition to conventional wearables that can only measure parameters in one domain. Hybrid solutions are significantly changing workplace safety in a number of industrial sectors, including the metallurgical, chemical, mining, and food industries, among many others. In these areas, laborers are regularly presented to dangerous circumstances, which can be destructive to their wellbeing. Among the most common dangers in the metallurgical industry are exposure to dangerous gas leaks caused by combustion processes or steel production additives, as well as exposure to high temperatures. In a similar vein, both the food industry and the chemical industry, where chemical products are frequently used to preserve or treat food products, face the constant threat of being exposed to harmful gases caused by chemical reactions. Additionally, miners are constantly at risk of falling or becoming injured as a result of collapses, as well as being exposed to gas that is released as a result of drilling or excavation. As a result, wearable technologies can improve workplace safety, monitor a worker's health in real time while engaging in risky activities, and analyse collected data for prompt emergency response. On the other hand, wearable devices need to meet a number of criteria, including how easy they are to use, how much they cost, how easy it is to set up sensors, and how easy it is to get data. Scientists and businesses are interested in wearable devices that use different kinds of sensors to collect characteristics that are relevant to different quantifiable domains.

1.2 LITERATURE REVIEW

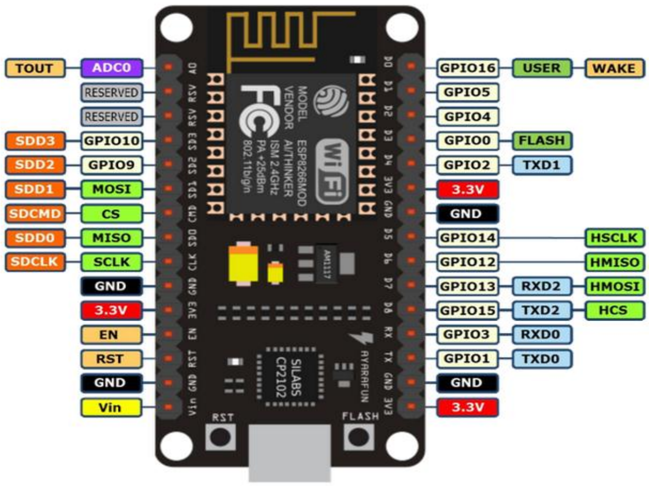
In [1], the prototype detects a variety of health-related parameters, including the miner's pulse rate, the current temperature and humidity, the precise depth location, and the miner's global positioning. One of the most efficient methods for detecting the presence of poisonous gases is described in [5] as making use of a semi-conductor gas sensor. These sensors can be introduced in the coal mineshaft region. In [7], the sensor device was frequently damaged by mistake. Another approach is to employ a robot. In the meantime, ZigBee-based wireless sensor networks have recently been the subject of research due to their capacity for far-reaching environmental monitoring.

1.3 IMPACT OF INTERNET OF THINGS

For the miners' convenience, the system we propose makes use of an external intelligent coat or wearable device. Not at all like the current frameworks that utilizes a cap which could place the digger in risk at the hour of short out and impact the cerebrum, a coat is more helpful. The temperature, beat of coal mineshaft laborers is checked utilizing temperature and heart beat sensor. The gas spillage will be recognized by gas sensor and insinuated through IOT utilizing Blynk application. The flame sensor will identify the fire, and the sound sensor will notify Alert. GPS is utilized to distinguish the area of coal mineshaft laborers.

II.DEVICES USED IN THE ENTIRE SYSTEM

An eLua-based firmware for the ESP8266 WiFi SOC from Espressif Systems is known as NodeMCU. The equipment depends on the ESP-12 module. The Espressif NON-OS SDK 2.1.0 serves as the foundation for the firmware, which employs a spiffs-based file system. The SDK's thin Lua veneer is held in place by 98% C code in the code repository. Model for event-driven asynchronous programming.



2.1 FUNCTIONAL DIAGRAM

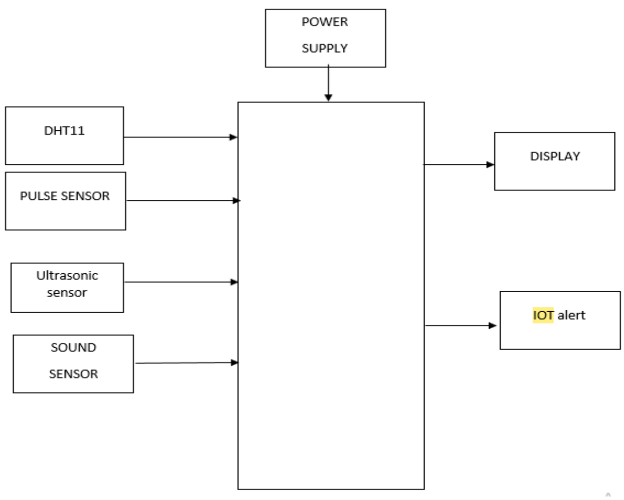


Fig :2.1 FUNCTIONAL DIAGRAM

2.2 OVERVIEW

As a result, wearable technologies can improve workplace safety, monitor a worker's health in real time while engaging in risky activities, and analyse collected data for prompt emergency response. On the other hand, wearable devices need to meet a number of criteria, including how easy they are to use, how much they cost, how easy it is to set up sensors, and how easy it is to get data. Scientists and businesses are interested in wearable devices that use different kinds of sensors to collect characteristics that are relevant to different quantifiable domains. Continuous monitoring of a user's health as it is affected by behavioural, physiological, psychological, and, most importantly, environmental parameters has been demonstrated to be particularly effective for these technologies. Hybrid solutions for monitoring multiple parameters, such as devices that can evaluate both biophysical and environmental aspects, have developed in addition to conventional wearables that can only measure parameters in one domain. Hybrid solutions are significantly changing workplace safety in a number of industrial sectors, including the metallurgical, chemical, mining, and food industries, among many others. In these areas, laborers are regularly presented to dangerous circumstances, which can be destructive to their wellbeing. Among the most common dangers in the metallurgical industry are exposure to dangerous gas leaks caused by combustion processes or steel production additives, as well as exposure to high temperatures. In a similar vein, both the food industry and the chemical industry, where chemical products are frequently used to preserve or treat food products, face the constant threat of being exposed to harmful gases caused by chemical reactions. Additionally, miners are constantly at risk of falling or becoming injured as a result of collapses, as well as being exposed to gas that is released as a result of drilling or excavation. As a result, wearable technologies can improve workplace safety, monitor a worker's health in real time while engaging in risky activities, and analyse collected data for prompt emergency response. However, wearable devices must meet a number of requirements, including ease of use, sensor setup, cost, and data accessibility.

III.SOFTWARE DESCRIPTION

Programming for embedded systems is distinct from developing desktop applications. When compared to personal computers, the following are key characteristics of an embedded system: Implanted gadgets have asset constraints (limited ROM, restricted Smash, restricted stack space, less handling power) Parts utilized in implanted framework and computers are unique; The components in embedded systems are typically smaller and consume less power. The hardware is more closely related to embedded systems. The speed and size of the code are two important aspects of embedded programming. Code speed is administered by the handling power, timing imperatives, though code size is represented by accessible program memory and utilization of programming language. The goal of embedded system programming is to get as many features as possible in as little time as possible.

IV.PROPOSED METHODOLOGY

The proposed system makes use of an external intelligent coat or wearable device for the convenience of the miners. Not by any stretch of the imagination like the ongoing structures that uses a cap which could put the digger in risk at the hour of short out and affect the frontal cortex, a coat is more useful. Using a temperature and heart rate sensor, coal mine shaft workers' temperatures and heart rates are monitored. The gas spillage will be perceived by gas sensor and implied through IOT using Blynk application. The fire will be detected by the flame sensor, and Alert will be informed by the sound sensor. Coal mineshaft workers use GPS to determine their location.

4.1. ADVANTAGES

- Wearable coat will screen the laborers' wellbeing and security.
- Blynk will be used to notify employees about health issues.
- GPS will be used to determine where they are.

4.2. SYSTEM OVERVIEW

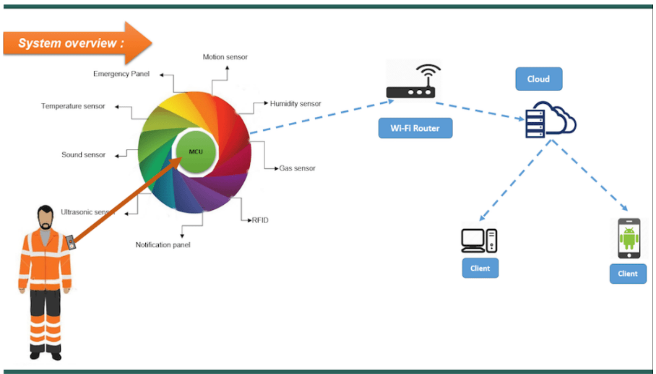


Fig:4.2 System overview

4.3. WORKING

A temperature sensor estimates the temperature of an item or climate. There are various kinds of temperature sensors, like thermistors, thermocouples, and RTDs (obstruction temperature identifiers). When temperature changes, these sensors measure the change in resistance or voltage. An ultrasonic sensor measures the distance between an object and the sensor by using sound waves. After releasing a high-frequency sound wave, the sensor measures the amount of time it takes for the sound wave to return. The sensor's distance from the object can then be determined using this information. A pulse sensor measures an individual's heartbeat or pulse rate. The sensor typically shines through the skin with a light source, like an LED, to detect the changes in blood volume caused by the heartbeat. Sound levels in an environment are detected by a sound sensor. Microphones and piezoelectric sensors are two examples of various sound sensors. Sound waves are converted into electrical signals that can be measured and analysed by these sensors. The functioning system of every sensor will rely upon its particular plan and application. However, these sensors generally function by converting changes in electrical or acoustic signals into a measurable form that can be used to detect, monitor, or control a variety of parameters. These sensors can be coordinated into different frameworks and gadgets to empower computerization, observing, and control in a great many applications.

V. RESULTS

When working in coal mineshafts, the health of workers is impacted by a variety of factors, including the temperature, oxygen level, mine depth, and the presence of hazardous gases. In this kind of work, numerous accidents have already been reported. Salvage groups invest a great deal of energy and cash attempting to get the casualty out of the mishap scene. A system has been developed to address this problem. It not only provides a precise location, depth, and a GPS locator, but it also monitors the miner's pulse rate to provide prompt, highest-priority medical assistance in the event that it is required.

VI.CONCLUSION AND SCOPE FUTURE

The presence of risky gases, temperature, oxygen level, mine profundity, and different factors all affect human wellbeing while working in coal mineshafts, particularly those with high convergences of these gases. Numerous accidents have already been reported in this type of work. Rescue teams spend a lot of time and money trying to get the victim out of the accident scene. To address this issue, a system has been developed that not only provides precise location, depth, and a GPS locator but also monitors the miner's pulse rate to provide prompt medical assistance with highest priority if necessary. Consequently, the proposed embedded system, which was developed with coal miners in mind, not only provides the parameters needed to communicate with all miners and learn about their current health status, but it also does so. In future work, smart helmet-based personal PWS can be expanded by adding sensors to the Arduino board. To really take a look at the specialist's condition, for example, a pulse sensor or a liquor sensor can be added. By adding sensors for carbon monoxide, methane gas, temperature, and humidity, the mine site's environment can also be monitored. The pedestrian worker can be warned of danger if a lot of harmful gases are found. The worker could then follow the necessary instructions to ensure safety.

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