

REAL TIME MONITORING AND ANALYSIS OF HAZARDOUS PARAMETERS USING SMART HELMET

Submitted in partial fulfilment of requirements for the award of
Bachelor of Engineering in
Electronics and Communication Engineering

by

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SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

**Accredited with Grade "A" by NAAC
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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of KARNATI ROHITH KUMAR (Reg.No.37130188) and GUNDA PRANAY KUMAR (Reg.No.37130151) who carried out the project entitled "**Real Time Monitoring And Analysis of Hazardous Parameters Using Smart Helmet**" under our supervision from December 2020 to March 2021.

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We, KARNATI ROHITH KUMAR (Reg.No. 37130188) and GUNDA PRANAY KUMAR (Reg.No.37130151) hereby declare that the Project Report entitled “**Real Time Monitoring And Analysis of Hazardous Parameters Using Smart Helmet**” done by us under the guidance of Dr.A.SAHAYA ANSELIN NISHA M.E., Ph.D. is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

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ABSTRACT

Mining is the method of extracting precious minerals such as coal, gold, and silver etc... from the earth. Mining ensures a steady supply of all essential natural resources such as coal and gas. Used by modern civilization. perhaps the most essential fuel sources is The coal industry and many industries, also known as black diamonds, is of vital importance. It is the world's most valuable reserve of indigenous energy. In order to satisfy India's ever-increasing demand for electricity, it has become a national necessity to dig up more and more gas.

It is, however, a dangerous and potentially lethal job for those who do this function. Coal miners will face many obstacles, including high humidity, high temperatures, and toxic gasses in their environment. These situations provide an environment in which workers are extremely dangerous and pose a serious risk to their own lives. The basis of this project is to design and Analysis of smart helmets for miners using Embedded systems. This project is used to analyse dangerous incidents that can be prior. This project is to reduce the life risk of mineworkers by implementing the smart safety helmet. This device includes a wireless network of sensors to track the real-time situation of the base station underground mines.

This project has a model that detects certain environmental parameters from different mine locations and sends alerts to the mine control area so that urgent steps can be taken anywhere there appears to be a dangerous scenario. To lessen the seriousness of the issue. NodeMcu is a kind of microcontroller that is used by different sensors to monitor these parameters. Using IoT software, the mining location data was sent in real time. If those threshold values are crossed, the mine control office will be notified by e-mail, allowing the appropriate actions to be taken.

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CHAPTER - 1

INTRODUCTION

With 536.5 million metric tonnes of coal produced per year, India is the world's fourth-largest coal and gas producer. India has about 3,33,097 miners.. The healthy output level of coal mines is still low particularly in recent years, disasters in coal mines have occurred regularly, resulting in significant loss of property and life; as a result, coal mine safety issues have increasingly become a subject of national and societal interest. Mine injuries can be caused by a number of factors, including toxic gas leaks, roof collapses, and low oxygen levels. During mine incidents, miners who are still alive are often trapped by roof falls and die as a function of a setback of or failure in rescue operations. So It's critical to remember monitor the mine environment condition and minors health.

Since the atmosphere underneath of deep coal mines is hazardous and complicated, collisions and natural hazards are more likely. The Smart Helmet is used to identify toxic gases using various gas sensors, and there is a version that uses a heart beat tracker to determine how many miners are still alive under the mine after collisions. We create a smart helmet by combining these two elements, which constantly monitors environmental parameters such as toxic gas levels, surrounding oxygen levels, and the miner's heartbeat. It gives an early warning to all miners present inside the mine, allowing them to save their lives before any casualties occur. This machine is extremely useful for miner rescue and safety. Health is the main component of some kind of business. Security and safety is a first part of everything in the mining industry.

Any mining industry follows certain simple precautions to prevent some forms of unfavourable conditions. [7] Today, communication is the most critical factor for continuous monitoring in sensors such as the LM35, MQ2 gas sensor, humidity sensor, and carbon monoxide gas in all possible parameters such as temperature, raise moisture levels. Take the necessary precautions to prevent any potentially dangerous situations. Adequate communication system between moving personnel and a fixed base station is needed to achieve safety in underground mines.

1.1 AIM OF PROJECT

The internet's perspective on things was evaluated as a result of the convergence of various technologies such as omnipresent remote correspondence, continuous analysis, AI, and so on[9]. This entails contributing to Internet of Things empowerment through the traditional fields of implant frames, remote sensor networks, control frames, mechanization, and other technology (IOT). In 1982, the idea of arranging brilliant devices was a new Coca-Cola system at Carnegie University that could check on inventories and whether freshly piled-up beverages were cold. The concept of organization was discussed. The original 1991, "the Computer of the Twenty-First Century," Weiser paper on omnipresent processing, as well as academic sceneries, presented a contemporary perspective of IoT by UbiComp and PerCom, for example. Reza Raji defined the term in IEEE Spectrum in 1994 as "[transforming] small packages of data into a vast array of hub locations, in order to coordinate and robotize everything from home machines to whole production lines". A few associations recommended arrangements like Microsoft's at his Work NEST somewhere in the range of 1993 and 1996.

In any case, the industry only began to accelerate in 1999. As a part of the "Six Webs" scheme, Bill Joy conceived Device to Device (D2D) mailing. The concept of IoT became popular in 1999 by means of the MIT University Auto Verification ID Center and associated business testing distributions. Kevin Ashton (one of the writers of the first automobile ID center), who was then an integral to the Internet of things, regarded the radio recurrence distinguishing evidence (RFID). The term "Web for Stuff" is used by Ashton. In case all articles and persons are provided with identifiers every day, they can be controlled and stored by PCs. Compared to RFID, product labeling can be performed using technology like close communication, uniform identifications, QR codes and computerized watermarking. One of the main consequences of the Internet of things by planning all posts with infinitesimal devices or machine-intelligible markers on the earth is changing every day in its special comprehension.

1.2 APPLICATIONS

As of 2020, about 20.8 billion gadgets will be available on the IoT, according to Gartner, Inc. (an software discovery and alert organization). [4] [4] [4] ABI Research estimates that by 2020 it will be connected more than 30 billion devices remotely. According to a Pew Research Internet Project overview and survey from 2014, a broad majority of tech experts and drawn in internet customers who responded, 83 percent, decided to have unmissable and advantageous impacts of the Internet/Cloud of Things embedded and wearable recordings (and different frameworks) by 2025.

The Internet of Things is unmistakably made up of various Internet computers. In its 2015 budget proposal, the UK government dedicated £40,000,000 to Internet research in an effort to accommodate new and evolving mechanical development. George Osborne, the former British chancellor of trade, said that the Internet of Things is the next step in the data revolution, pointing to the network that connects everything from metropolitan vehicles to medical equipment and home appliances. Because of its ability to arrange mounted gadgets with a small CPU, memory, and force asset, IoT finds applications almost anywhere.

These mechanisms may be in charge of data collection in environments ranging from normal biological systems to buildings and manufacturing facilities, leading to the development of technology for pollution monitoring and metropolitan planning. Again, IoT frameworks may be in charge of carrying out operations in addition to detecting objects. Smart retail frameworks, for example, can directly screen customers' shopping proclivities by tracking their cell phones. These customers will then offer special goods or items that they enjoy, such as a microwave, for their favorite brands.

Extra instances of identification and incitement are repeated in applications that regulate boards for fire, water, fuel, and electricity, as well as in transportation networks. The numerous applications that IoT can provide allow for enhanced home security highlights and home robotics. illustrating natural sensor organizations that might use cloud-based surveys to enable consumers to measure DNA or different atoms

1.3 SOCIAL INTERFACE

To sharpen the way things, media, and vast information are intertwined, a setting in the instrument used for media measurement must first be created. According to Nick Couldry and Joseph Turow, marketing professionals approach enormous sums of information as multiple prominent data marks for a wide variety of entities. [1] The company seems to be moving away from the conventional model of using simple media criteria, such as newspapers, magazines, and network shows, in order to reach audiences with progress that is preferably aimed at individuals in suitable areas.

Clearly, one distinct feature is the distribution of (measurably conversational) messages or substances based on the purchaser's conduct. For instance, the delivery conditions will increasingly adjust messages (marketing items) and substances (articles) to customers that have only been gathered from numerous information mining exercises. The media enterprises measure large information in a double, interconnected way: Targeting of buyers (for publicizing by advertisers) Data-catch. Thus, the Internet of things sets out a freedom to gauge, gather and dissect a consistently expanding assortment of social insights. Cross-connection of this information could upset the focused on showcasing.

For instance, as verified by Danny Meadows-Klue, the blend of investigation for change following conduct focusing on has opened another degree of exactness that empowers show promoting to be centered around the gadgets of individuals with significant interests. Large information and the IoT work related. From a media viewpoint, information is the critical subordinate of gadget interconnectivity, although it is important to allow for more precise emphasis. The IoT transforms the newspapers, companies and even all states, starting another era of financial growth and gravity.

CHAPTER 2

LITERATURE SURVEY

SHIRISH GAIDHANE, MAHENDRA DHAME et.al (2016) Smart Helmet is proposed, which includes two-way communications, dangerous gas warning, a helmet removal alarm, an emergency panic crash turn, constant environmental control of conditions such as mining sector temperature and pressure, and GPS tracking of a miner's position. Coal meets about 30.3 percent of the world's primary energy needs and generates 42 percent of the world's electricity.

After China and the United States, Indian coal mining countries are the third largest production country. India's main energy supply is coal. India's primary source of energy is coal. Coal accounts for 51% of today's total commercial energy requirements. The mining of coal from the land surface and underground mines is largely accomplished by the use of two techniques. The vast majority are surface mining with open pits or cast mines. The surface mine is open and operates entirely from the ground level. Surface mines perform well, have low maintenance costs, and have adequate safety benefits.

L. MA and H.GUO et.al (2017) Developed a [15] in a mining mask Coal mining is the most important source of fuel for many sectors, including those classified as black diamonds. It is the world's most significant indigenous energy source. As India strives to meet its rising energy demand, coal mining has become an increasingly significant domestic target. In mines with a poor rock structure, supported mining is often used. For unsupported mining methods, artificial supports are not usable.

Unsuitable methods are used in areas where solid rock structure is available. Surface coal mining has a lower chance of ventilation and loss than underground coal mining. There is a complete crash in subterranean mines.

H.M. ZHU and L. ZHANG et.al (2006) Analysed that [12]Today wellbeing of diggers is a significant test. Excavators wellbeing is in peril predominantly in light of the outflow of Toxic gases, deficiency of oxygen and mine debacles. In this plan a nonstop checking framework, which screens the ecological boundaries, for example, oxygen level and toxic gases (methane, carbon dioxide and carbon monoxide). It additionally gauges the digger's heartbeat rate, which is finished by utilizing the pulse sensor. During the mishaps, by utilizing this gadget we become acquainted with that the number of diggers are alive under the mine. This framework utilizes Zigbee innovation for remote transmission. The boundaries are recognized constantly by different sensors, if any unusual condition happens the digger will get a caution through the bell present on the head protector. The estimations of various sensors are persistently sent by remote transmitter to the distant checking unit which is put outside the mine and got by the recipient module (PC).

DAVID KOKKAN et.al (2019) Developed Helmet Device to zero in on a mine overseeing framework which depends on the practical Zigbee framework. This venture targets building up a remote sensor organizations, acknowledged ongoing observation with early-notice insight on unsafe gases, temperature, and stickiness around there and utilized zigbee correspondence to decrease potential security issues in coal creation utilizing a Zigbee remote innovation. Each of these three limits consistently identifies the temperature sensor, the gas sensor, the humidity sensor, and the pre-characterized limits. When the signal with LED signs comes on, the customer prepares. Through a zigbee wireless positioning system, the frame can be conveniently expanded. The values of various sensors are continuously transferred via Zigbee transmission to the remote monitoring unit, which is obtained via the Zigbee receiver module.

B. GE and Z. WEI et.al (2011) developed a [6] Intelligent helmet capable of identifying dangerous injuries in mining and traffic crashes. The helmets were designed with the three major hazard categories of air quality, helmet removal, and accident in mind. The intelligent helmet is often used to avoid road accidents. If the rider is involved in a collision, a warning message about the position will be sent to the contacts that are commonly used (using GSM). If there is a threat, the buzzer triggers a helmet alert and transmits information to the control unit (Ambulance) through the Zigbee trans-

receiver, giving miners/riders the chance to save their lives from unforeseen occurrences.

A. GEETHA et.al (2019) analyzed Tens of thousands of miners are analyzed every year[4] and many more injured in accidents, particularly in the processes of coal mining and rock mining. Coal or dust explosions, chemical intoxication, excessive use of explosives, electrical burns, flames, mine collapses, rock falls from roofs and side walls, floods, The most likely cause of injury was personnel stumbling/slipping/falling or mal-operated or poorly-used mining machinery. Personal safety clothing, such as a hat and shoes, is used in coal mines.

A.P. Squelch et.al (2009) Proposed to [3] address the improvement of a head protector to guarantee more wellbeing mindfulness among diggers and riders. When working with an uproarious hardware, staying alert one's environmental factors can now and again be testing. Using the cask reduces the chance of serious injuries by 79 percent and death by 43 percent. When it is too difficult, hot, or uncomfortable to work in the mining industry, miners choose to remove all of their protective gear. It can also absorb toxic gases such as CO₂, SO₂, NO₂, and particulate matter, either deliberately or unintentionally. When it comes to road injuries, the public's main concern has been their health.

2.1 SUMMARY

A coal mineshaft that employs Bluetooth radiation theft. Bluetooth's innovation is the creation of a conventional low-power, easy-to-use remote air interface and monitoring the opening mechanism for programming[3] as a standard for global short-distance communication. The only issue with this device is that Bluetooth is only a small distance away from the remote invention, and using cabling is difficult. If a normal disaster or a rooftop collapse occurs, the cabling is hazardous. As a result, standard communication is not entirely dependable and long-term. As a result, the efficiency and duration of the traditional communications scheme are poor. Because of ongoing COVID circumstances on the off chance that one got affected all out work ought to be stopped the framework doesn't distinguish oxygen level of laborer.

CHAPTER 3

AIM AND SCOPE OF THE PRESENT INVESTIGATION

3.1 INTRODUCTION

An embedded structure is a particular explanation PC system expected to perform one two or three dedicated limits, consistently with progressing enlisting necessities. It is by and large embedded as a segment of an absolute contraption including hardware and mechanical parts. Curiously, an all around valuable PC, similar to a PC, can do different endeavors depending after programming. Introduced structures have become indispensable today as they control enormous quantities of the typical contraptions.

Since the inserted structure is dedicated to specific tasks, schedule planners may improve it, reducing the item's size and cost while increasing its dependability and execution. To take advantage of economies of scale, any inserted structures are mass-produced.

[1]Physically, inserted frameworks range from versatile gadgets like advanced MP3 players and watchmakers, for large fixed institutions, such as traffic signals, plant manufacturing regulators or thermal power station control frameworks. The complexity ranges from low to extremely high with a solitary microcontroller chip with different devices, peripherals and organisations assembled in a big case or closed in areas.

When all is said and done, "implanted structure" isn't exactly a well-defined concept, since many frameworks have any level of programmability. [7]Handheld PCs, for example, share a few components with implanted frameworks, such as the operating frameworks and chip that control them, but they are not really implanted frameworks because they enable many applications to be stacked.and peripherals to be associated.

Screen the climate; installed frameworks read information from input sensors. This information is then prepared and the outcomes showed in some arrangement to a client or usersTransform the data; installed frameworks change the information gathered in some significant manner, like information pressure/decompression

Since sensor and actuator collaboration with the outside world is a significant part of the inserted structures, these architectures still give explicit meaning to their implementations. [9] The following are examples: [9] Formalized paraphrase Monitor law, small state processors, and sign planning calculations are popular programs that run on integrated frames. These frameworks should also be able to distinguish between the internal processing environment and the electromechanical frameworks, as well as respond to failures.

There are numerous classifications of inserted frameworks, from specialized gadgets to home apparatuses to control frameworks. Models incorporate

Communication devices

e.g.: modems, cellular phones

Home Appliances

e.g.: CD player, VCR, microwave oven

Control Systems

e.g.: Automobile anti-lock braking systems, robotics, and satellite control

3.2 DETAILED EXPLANATION OF AN EMBEDDED SYSTEM

An inserted framework generally contains an installed processor. Numerous apparatuses that have an advanced interface - microwaves, VCRs, vehicles - use implanted frameworks. Some installed frameworks incorporate a working framework. [11] Others are exceptionally particular bringing about the whole rationale being carried out as a solitary program. These frameworks are installed into some gadget for some particular reason other than to give broadly useful figuring.

Installed frameworks are described by a remarkable arrangement of attributes. Every one of these attributes forced a particular arrangement of plan imperatives on installed frameworks originators. [13] The challenge to planning installed frameworks is to adjust to the particular arrangement of requirements for the application.

3.3 APPLICATION

Embedded devices aren't the same as regular machines. The architectures of embedded systems are tailored to a particular application. Before the hardware is built, much of the work characteristics are understood. After that, the designer should focus on the design constraints of a well-defined application. As a result, the consumer's reprogrammability is limited. Any embedded devices, on the other hand, need reprogramming versatility. Programmable DSPs are common for such applications.

3.4 REACTIVE SYSTEMS

As referenced before, a regular installed frameworks model reacts to the climate through sensors and control the climate utilizing actuators. This requires implanted frameworks to run at the speed of the climate. This trait of implanted framework is designated "responsive". [14]Reactive calculation implies that the framework executes because of outer occasions. Outer occasions can be either intermittent or aperiodic. Occasional occasions make it simpler to plan preparing to ensure execution. Aperiodic occasions are more diligently to plan. The most extreme occasion appearance rate should be assessed in most pessimistic scenario circumstances. Most inserted frameworks have a critical responsive segment. Perhaps the greatest test.

3.4.1 CPU ARCHITECTURE

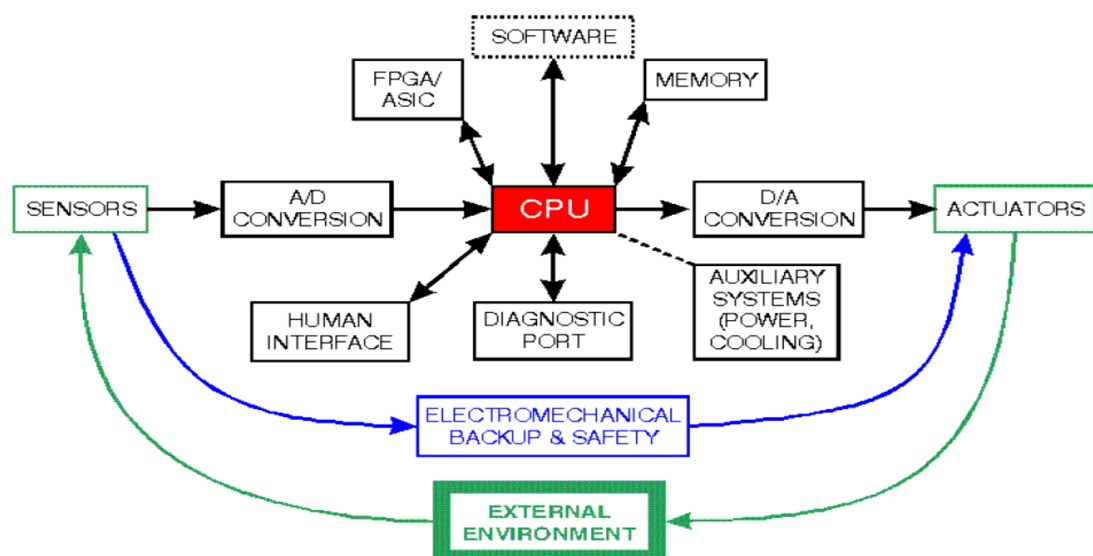


Fig.3.1. CPU Architecture.

3.5 EXISTING SYSTEM

In the current framework mining cap guarantees to shield the diggers head from a few wounds. Monitoring the natural condition turns into a difficult piece of the current framework. Since the cap is excessively substantial, awkward to work with the excavators will in general eliminate the protective cap off their head. In the event of its evacuation excavators are inclined to hazardous conditions. There is no current brilliant head protector that can consider the climate and settle on choices to support laborer security. Oxygen supply isn't accommodated the excavators if there should be an occurrence of noxious gas spillage. Building up an obstacle free correspondence climate is the greatest test the mining associations face.

Yongping Wu and Guo Feng's Bluetooth remote transmission system is used to test the charcoal mining vessel. Bluetooth engineering is the standard that connects short-distance international communication and creates a conventional low-power, short-distance air interface, as well as regulates opening programming frameworks. At the same time, May transport innovation was maturely introduced, and the combination of wired and remote communication systems was grasped.

3.5.1 EXISTING BLOCK DIAGRAM

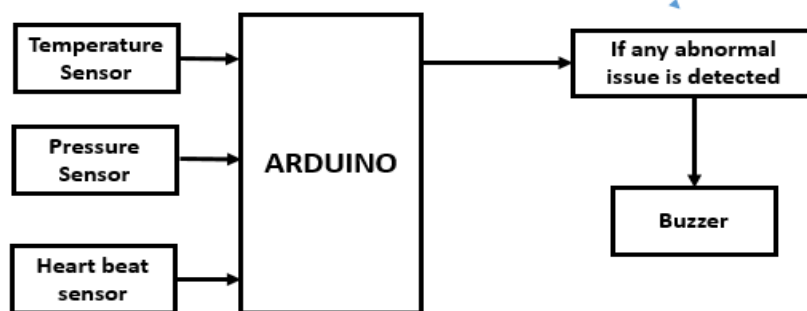


Fig.3.2 Existing block Diagram

[2] The remote correspondence module supplies the sensor array in the frame, which is estimated by the miniature regulator and monitors temperature, humidity, and different boundaries in the underground mine. The collected data is dispatched to the important distance tracking concentration by link.

The issue with this design is that if a typical cataclysm or roof collapse happens, the building will be trapped inside the coal mine shaft. The system is counterproductive. As a result, the normal communication system's unwavering stability and long existence are compromised. [16] The next issue is that the coal mining shaft is in poor condition, and the digger would not obtain an acceptable signal if the distance between the excavator and the system is too great. Pranjal Hazarika is presenting a welfare cap for coal mining employees.

In prior days, the mishap proportion was high because of the way that individuals were driving without protective cap and had absence of attention to use of head protector. Accordingly the demise rate steadily raised. The issue tended to was the improvement of a cap to guarantee more security mindfulness among diggers and riders. When working with a loud gear, staying alert one's environmental factors can now and then be testing. Wearing the cap can decrease the danger of serious injury by 79% and the danger of death by 43%.

In thought with mine enterprises, diggers will in general eliminate a portion of their security gear since it is excessively substantial, warm or awkward to work with. They additionally will devour fixation level of the harmful gases, for example, CO₂, SO₂, NO₂ and particulate matter intentionally or unconsciously. With regards to street mishaps, wellbeing has become a significant danger for the residents.

In any case, individuals typically doesn't wear the protective cap while they are driving the cruisers. Along these lines, this stands as a fundamental explanation for the extraordinary addition in the demise rates in India. Building up this work comes from our social obligation from society.

The way to controlling such mishaps is the forecast of upheaval by executing sensors and microcontrollers and to create a caution framework before basic environmental level. [17]A nonstop observing is important which again requires some powerful and exact detecting framework.

3.6 PROPOSED SYSTEM

The temperature sensor, humidity sensor, and humidity monitor will all be used in the project to accurately determine the temperature. Heart-beat sensors and gas sensors to determine whether poisonous gas was emitted, as well as sensors to monitor workers' conditions in carbon mining. [5] A data is obtained, it is managed by mcu nodes, IOT, and so on.

3.6.1 HARDWARE USED

- Nodemcu
- Smoke Sensor
- Temperature Sensor
- Humidity Sensor
- Heartbeat sensor
- SpO2 Sensor
- Jumper Wires

3.6.2 BLOCK DIAGRAM

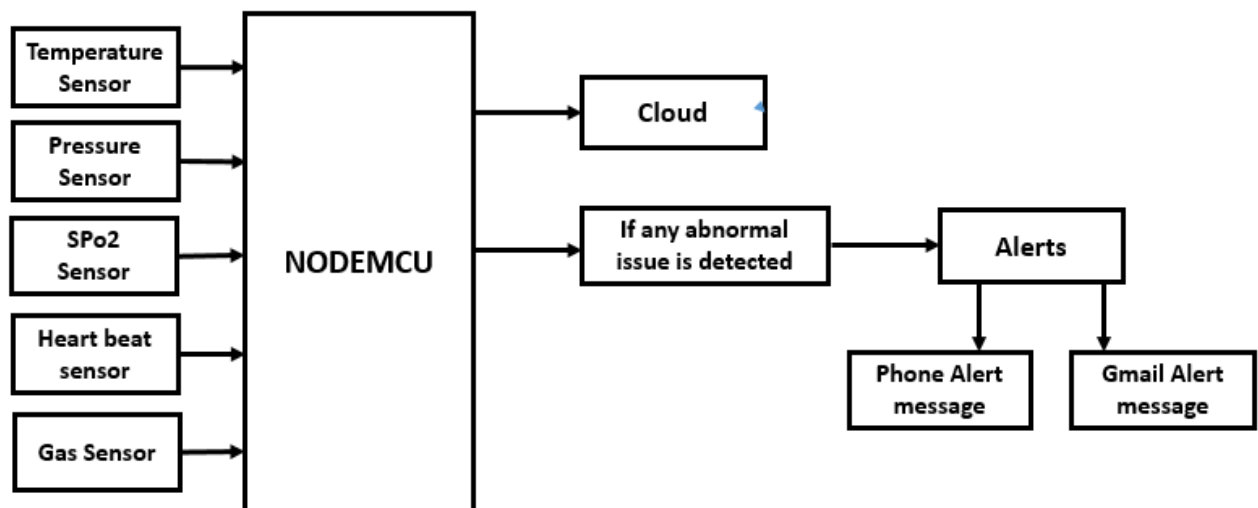


Fig. 3.3 Proposed Block Diagram.

CHAPTER 4

HARDWARE DESCRIPTION

4.1 NODE MCU

The Espressif Systems tiny regulator is known as the ESP8266. The ESP8266 is a stand-alone Wi-Fi company that sells as a tool from an internal miniature control system to WiFi, and it is frequently suited for autonomous applications. This kit includes a USB connector as well as a comprehensive collection of pin-outs. You can attach a NodeMCU computer to your PC with a micro USB link and quickly burn it like an Arduino device. It is likewise quickly breadboard agreeable.

ESPlorer is an IDE (Integrated Development Environment) for ESP8266 gadgets. It's a multi stage IDE, can be utilized in any OS climate, this just implies that it runs on Windows, Mac OS X or Linux. Upheld stages: • Windows(x86, x86-64) • Linux(x86, x86-64, ARM delicate and hard buoy) • Solaris(x86, x86-64) • Mac OS X(x86, x86-64, PPC, PPC64) This product permits you to set up a sequential interchanges with your ESP8266 module, send orders, and transfer code and substantially more. Prerequisites: • You need to have JAVA introduced in your PC. On the off chance that you don't have, go to this site: <http://java.com/download>, download and introduce the most recent variant. It contains an introduction to JAVA (seven or more adjustments). • To finish the project example provided in this guide, you must uninstall the NodeMCU firmware from your ESP8266. This is the simplest method for stripping Node MCU firmware for Section 4 of this guide.

ESPlorer is an IDE for gadgets ESP8266 (Integrated Development Environment). It is a multi-stage IDE that can be used in any OS environment, it just means that it is running on Windows, Mac OS X or Linux. Stages of upgrading: • Windows (x86, x86-64) • Mac OS X • Mac OS X • Linux(x86, x86-64, fragile ARM, and hard boot) (x86, x86-64, PPC, PPC64) This product allows you to create, submit orders, pass code and more sequential exchange with your ESP8266 module. Preconditions: • You must add JAVA to your computer. If you have not, go this website and update, download and introduce the latest version of <http://java.com/download>. It includes introduction of JAVA (seven or more adjustments). • You must strip your ESP8266 with NodeMCU firmware in order to conclude the sample project introduced

in this Guide. Here is the easiest way to strip Node MCU firmware for Section 4 of this guide.

4.1.1 ESP8266 ARDUINO CORE

As Arduino.cc started growing new MCU sheets dependent on non-AVR processors like the ARM/SAM MCU and utilized in the Arduino Due, they expected to adjust the Arduino IDE so it would be generally simple to change the IDE to help substitute apparatus chains to permit. These new processors will be assembled using Arduino C/C++. The board manager's and SAM Core's presentations helped to do this. The programming parts used to assemble an Arduino C/C++ source grind to the machine language of the target MCU by the Board Manager and the Arduino assembled of the IDE are one of the 'centers.'

Any inventive ESP8266 fans have set up an Arduino center on the GitHub ESP8266 Core platform for WLAN ESP8266. This is the primary programming development step for the various ESP8266 modules and advancement sheets such as NodeMCUs, referred to as [1]"ESP8266 Core for Arduino IDE."

4.1.2. NODE MCU



Fig.4.1. NODE MCU(ESP 8266)

4.1.3. PIN CONFIGURATION

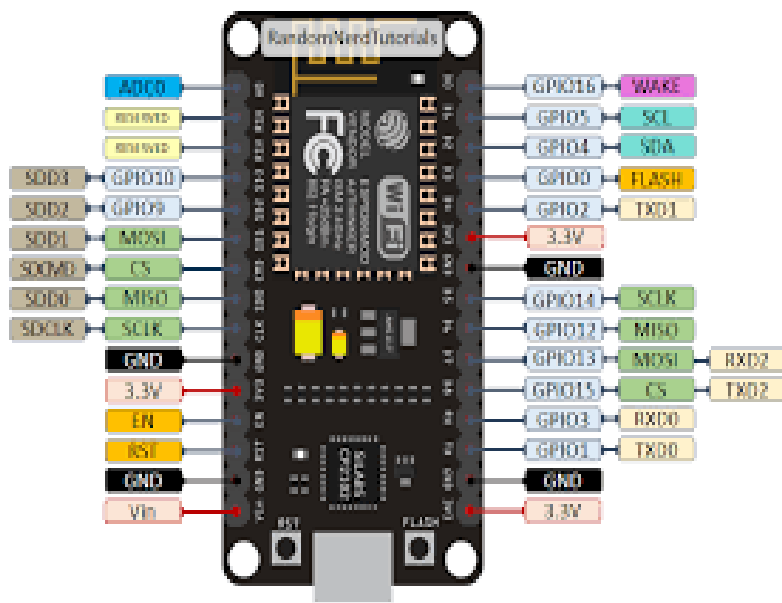


Fig. 4.2. Pin Configuration

4.1.3. PIN CONFIGURATION TABLE

Label	GPIO	Input	Output	Notes
D0	GPIO16	no interrupt	no PWM or I2C support	used to wake up from deep sleep
D1	GPIO5	OK	OK	often used as SDA(I2C)
D2	GPIO4	OK	OK	often used as SDA(I2C)
D3	GPIO0	pulled up	OK	connected to FLASH button, boot fails if pulled LOW
D4	GPIO2	pulled up	OK	connected to on-board LED, boot fails if pulled LOW
D5	GPIO14	OK	OK	(SCLK) SPI
D6	GPIO12	OK	OK	(MISO)SPI
D7	GPIO13	OK	OK	(MOSI)SPI
D8	GPIO15	pulled to GND	OK	(CS)SPI Boot fails if pulled HIGH
RX	GPIO3	OK	RXT PIN	HIGH at boot
TX	GPIO1	TXT PIN	OK	debug output at boot, boot fails if pulled LOW
A0	ADC0	Analog Input	X	

Table.4.1 PIN CONFIGURATION TABLE

4.2 TEMPERATURE SENSOR

Estimation and control of temperature and relative dampness discovers applications in various zones. Nowadays gadgets are accessible which have both temperature and stickiness sensors with signal molding, ADC, alignment and correspondence interface all worked inside them. The utilization of such brilliant sensors incredibly work on the plan and lessens the general expense. We examined in past about Humidity and temperature estimations with Sensirion's SHT1x/SHT7x sensors. These sensors are fit for estimating both temperature and relative dampness and give completely aligned computerized yields. [14] While SHT1x/SHT7x are extremely precise sensors, they are as yet costly for specialists use. This article examines the DHT11 sensor which likewise gives adjusted computerized yields to temperature and moistness however is generally part less expensive than the Sensirion sensors. The DHT11 sensor utilizes an exclusive 1-wire convention which we will investigate here and carrying out with the PIC16F628A microcontroller that will get the temperature and moistness esteems from the sensor and show them on a 16×2 character LCD.

The DHT11 sensor is available in a four-pin single box and can supply voltages ranging from 3.5 to 5.5V. It can measure temperatures ranging from 0 to 50 degrees Celsius with an accuracy of 2 degrees Celsius, as well as relative humidity ranging from 20 to 95 percent with an accuracy of 5%. The sensor has completely optimized computerized rates for all calculations. The device has its own small 1-wire convention, followed by an immediate interface with all of its peripherals, which means that the sensor and a microcontroller are in sync. The convention should be carried out with the sensor precisely prepared in the MCU's firmware. The following timetables depict the MCU and the DHT11 Sensor traveling information convention. With a "Start" signal, the MCU begins transmitting data. As a result, the MCU pin is to be used as yield. Before the knowledge is discharged, the MCU first pulls down to 18 ms and then pulls up to 20-40 ms.

4.2.1. TEMPERATURE SENSOR

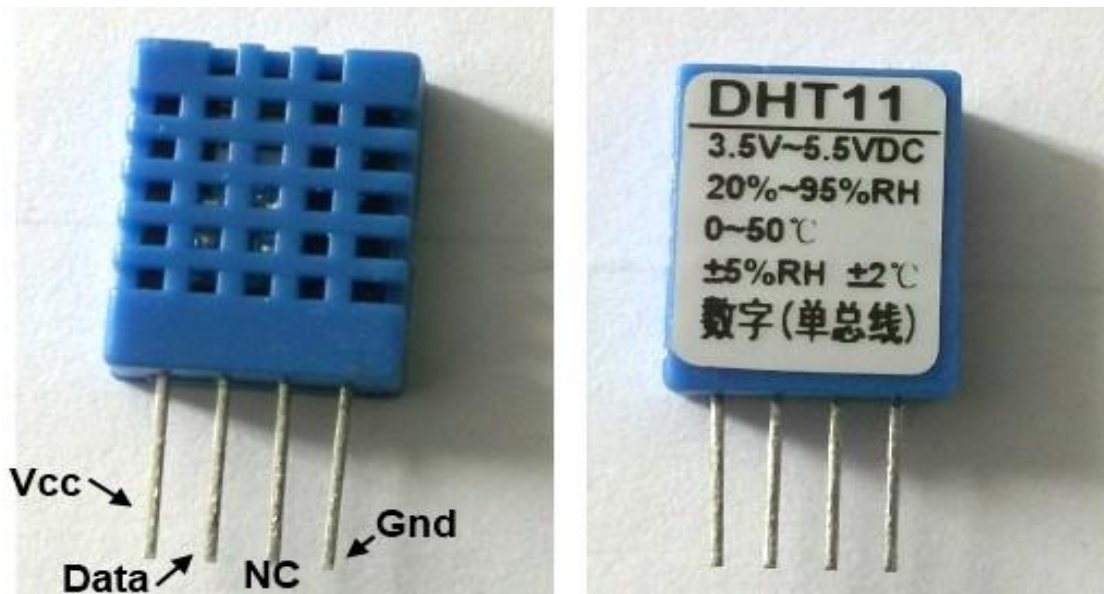


Fig.4.3 DHT11 sensor

4.3 SMOKE DETECTOR/SENSOR

A smoke detector is a smoke sensing device that is typically used as a fire alarm. Commercial protection devices deliver an alert as part of a fire alarm panel, while domestic smoke detectors, also known as smoke alarms, often send a local audible or visual alarm from the detector itself. [4] Plastic enclosures include smoke detectors, which are usually in the shape of a disk with a diameter of about 150 mm (6 in) and a thickness of 25 mm (1 in), though shape and scale vary. Smoke may be detected as a physical process, by optical (photoelectric) detectors, or by both.

Smoking detectors may be used to recognise and deter smoking in places where it is banned. In large commercial, retail, and residential buildings, smoke detectors are typically controlled by a central fire alarm system that is activated by building control and uses a battery restraint. Smoke detectors in the home vary from single battery systems to various battery-backed, interconnected battery-operated devices; and when the electricity goes out, all smoke detectors in the house are activated when one of the interconnected units detects smoke. The risk of dying in a house fire is cut in half in homes with working smoke alarms. The US National Fire Protection Association reports 0.53 deaths in 100 fires in homes with activated smoke detectors, relative to 1.18 deaths in homes without active smoke detectors.

4.3.1 Design

An ionization smoke alarm utilizes a radioisotope. a distinction because of smoke is distinguished and a caution is created. Ionization indicators are more touchy to the flaring phase of flames than optical identifiers, while optical detectors are more delicate to flames in the early seething stage.

The smoke detector has two chambers, one open to the air and one that does not allow contaminants to enter. The radiation source sends alpha particles into two chambers, which are responsible for ionizing certain air atoms. [9] Formalized paraphrase The below are examples: [9] The chambers are most likely compounded by a voltage; an electric charge on the particles causes an electric current to flow. There is a high voltage present. The flows in the two chambers ought to be equivalent to they are similarly influenced via pneumatic stress, temperature, and the maturing of the source. In the event that any smoke dust particiles enter the open chamber, a portion of the particles will connect to the particles and not be accessible to convey the current around there. When an ebb and flow contrast between the open and set chambers is detected, an electrical circuit sounds the alarm. The hardware also monitors the battery used to supply or backup power, and sounds an unusual warning when it gets tired.

4.3.2. Smoke Sensor



Fig.4.4 Smoke Sensor

The Ionized gas alarms are usually less expensive to produce than optical locators. [14] They might be more inclined to bogus alerts set off by non-unsafe occasions than photoelectric indicators, and have been discovered to be much more slow to react to commonplace house fires. Some countries in Europe have banned the use of ionic smoke cautions as a result of concerns that they are not reliable enough as various developments have been analyzed. Where a lone-screener is an ionizing smoke detector, fires were usually not viable in the early stages.

4.3.3 Area scope Tabulation

Surface area (square metres)	Type of detector	Height (m)	Ceiling slope $\leq 20^\circ$		Ceiling slope $> 20^\circ$	
			Smax(square metres)	Rmax (m)	Smax (square metres)	Rmax(m)
SA ≤ 80	EN54-7	≤ 12	80	6,6	80	8,2
SA > 80	EN54-7	≤ 6	60	5,7	90	8,7
		$6 < h \leq 12$	80	6,6	110	9,6
SA ≤ 30	EN54-5 Clase A1	$\leq 7,5$	30	4,4	30	5,7
SA > 30	EN54-5 Clase A2,B,C,D,F,G	≤ 6	30	4,4	30	5,7
		$\leq 7,5$	20	3,5	40	6,5

Table.4.2 Area Scope

4.4 SPO2 SENSOR

The Arduino Oximeter sensor can be used to monitor blood oxygen and heart rate on a 16x2 display. SpO2 (blood oxygen saturation) is measured in percent, and BPM (beats per minute) is used to quantify the rate of heart rhythm and pulse. The MAX30100 is a dual pulse oximetry and oximetry sensor.

Checking SpO2, the immersion level of oxygen in the blood, has gotten a norm of patient consideration across the globe. Pretty much every quiet screen has an inherent or appendable capacity to screen this essential fundamental sign. [13]SPO2 is a circuitous and non-invasive technique for estimating oxygen immersion in blood. It ought to be tried alongside the wide range of various physiological boundaries during precaution or remedial support on a patient screen, or independent gadget.

The SpO2 technology, which is usually measured with one finger, is used to assess the health of the cardiovascular and respiratory systems. The oxygen saturation of a patient is measured non-invasively using a pulse oximeter. This system contains a red and infrared light source, image finders, and a test that allows it to relay light on a daily basis through a translucent, throbbing blood vessel bed, fingertips, or ear cartilage. Hemoglobin oxygenated (O₂Hb) and hemoglobin deoxygenated (HHb) absorb red and ultraviolet radiation in unexpected forms. Calculating differences in light ingestion caused by streaming throbs of the blood vessel can be used to determine the amount of hemoglobin immersion in the blood vessel.

Specific variables such as skin types, colours, injuries, scar tissue, tattoo, smooth nail, hypothermia, faintness, prescribing, light obstruction and growth can be influenced by a variety of variables. A sensor, usually paired with the patient's finger, is calculated to use SPO2. SpO2 Creativity has two strategies: transmissive and smart. The communications technique is the most often seen of the two. As seen in Figure 1, transmitting innovations are transmitting red and infrared light to a photo identification.

4.4.1 Transmission technology of oximeter

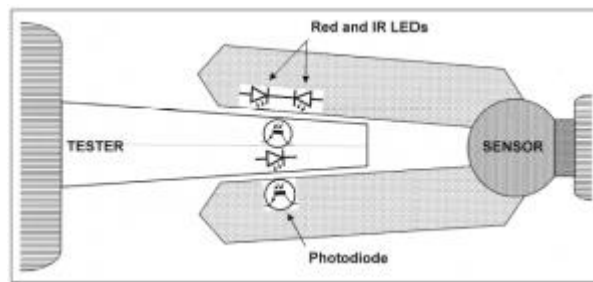


Fig.4.5. Transmission technology

Reflective technology is used with the other process for SPO₂. The signal transmitting and the signal receiving are in the same phase in this form, as seen in Figure 2. SPO₂ sensors that reflect light can be mounted on other parts of the body besides the finger, such as the forehead.

4.4.2 Reflective technology

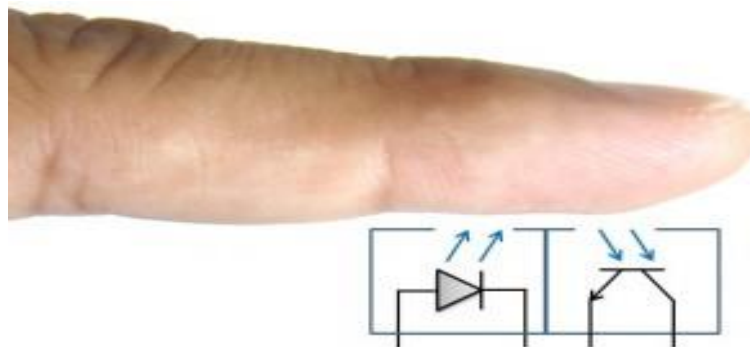


Fig.4.6. Reflective technology

Intelligent innovation, an option in contrast to transmission estimations. A schematic for the same SPO₂ sensor and display model follows this evaluation. An R-course is the name given to this scheme. Figure 3 depicts the relationship between the exact proportion of red and infrared light obtained during human experiments and the visible oxygen immersion. A R-bend is visible. The R-bend is then used in the firmware for a specific instrument and the SPO₂ analyser.

Test systems, calibrators, and practical analyzers for beat oximeters are characterized in the ISO standard 80601-2-61. In contrast to different kinds of clinical gadgets, beat oximeters are not intended to be adjusted outside of the plant. There are no acknowledged techniques for confirming the right adjustment of a heartbeat

oximeter other than human testing. Most SpO2 test gear available is in the practical analyzer class.

4.4.3 R-Curve

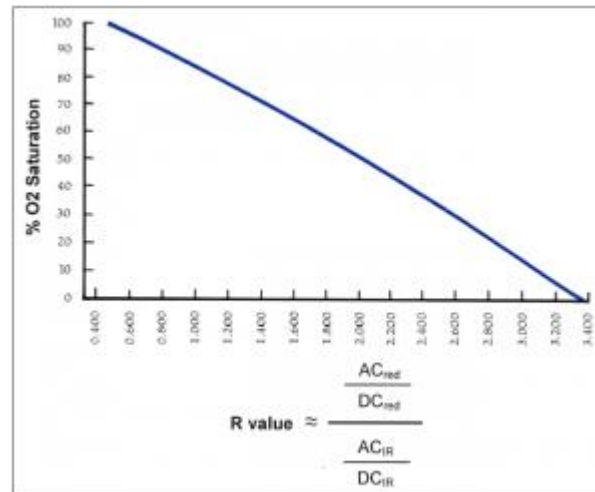


Fig.4.7 R-Curve

As Tobey Clarke says in his book Quality Assurance for Medical Equipment, patient screens should be tested almost every year. 2 The SPO2 sensor is optically most useful analyzers. This takes into account the trial of the sensor, link, and screen. Some practical analyzers input a sign straightforwardly to the screen, just testing the screen. Others can test the link for congruity. Most utilitarian analyzers just test transmissive advances, not intelligent.

A common work process for testing a patient screen or independent SPO2 screen incorporates checking the state of being, performing electrical wellbeing tests, playing out any maker suggested protection upkeep, directing execution testing.

4.4.4. SpO2 Range

SpO2 Range	Condition
85% - 99%	Person was very healthy
84% or less	Person was effected by Pneumonia We have to isolate him/her.

Table.4.3 SpO2 Range

4.4.5 Area scope Tabulation

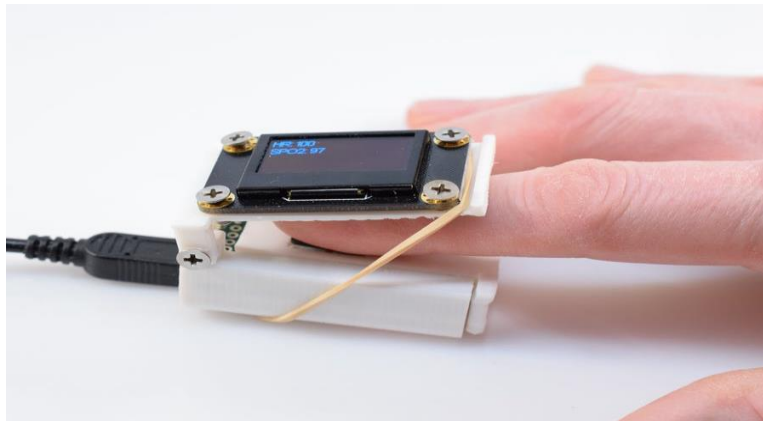


Fig.4.8 SpO2 Sensor

4.5 PRESSURE SENSOR

Barometric pressing factor or environmental pressing factor results from the load of the air on the earth. This pressing factor is around 1 kg for every square centimeter at the ocean level. There are a few units to communicate the environmental pressing factor, that can undoubtedly be changed over to one another. The SI unit for estimating the pressing factor is Pascal (Pa).

4.5.1 Pressure Range

UNIT	1hPa
Pascal(Pa)	100
Atmosphere(atm)	0.000986923
Milibar(MBR)	1
Milimeter Mercury(mmHg)	0.750063755
Inch of Mercury(inHg)	0.02953
Torr(torr)	0.750061683
Pounds per square inch(psi)	0.014503774

Table.4.4. Pressure Ranges

The barometric pressing factor has an around straight converse proportion with the elevation from the ocean level so on the off chance that we measure the barometric pressing factor of a spot, we can compute the height from the ocean level utilizing a straightforward numerical activity.

Perhaps the most widely recognized sensors for estimating the pressing factor and elevation is BOSCH BMP180. The main highlights of this module are:

- Pressure estimation scope of 300 to 1100hPa
- -0.1hPa estimating exactness for total pressing factor
- 12hPa estimating exactness for relative pressing factor
- Low power utilization (5μA in standard mode and one example each second).
- Internal temperature sensor with an accuracy of 0.5 °C
- Supporting I2C convention for correspondence
- Fully aligned

4.5.2 Atmospherics pressure Vs altitude

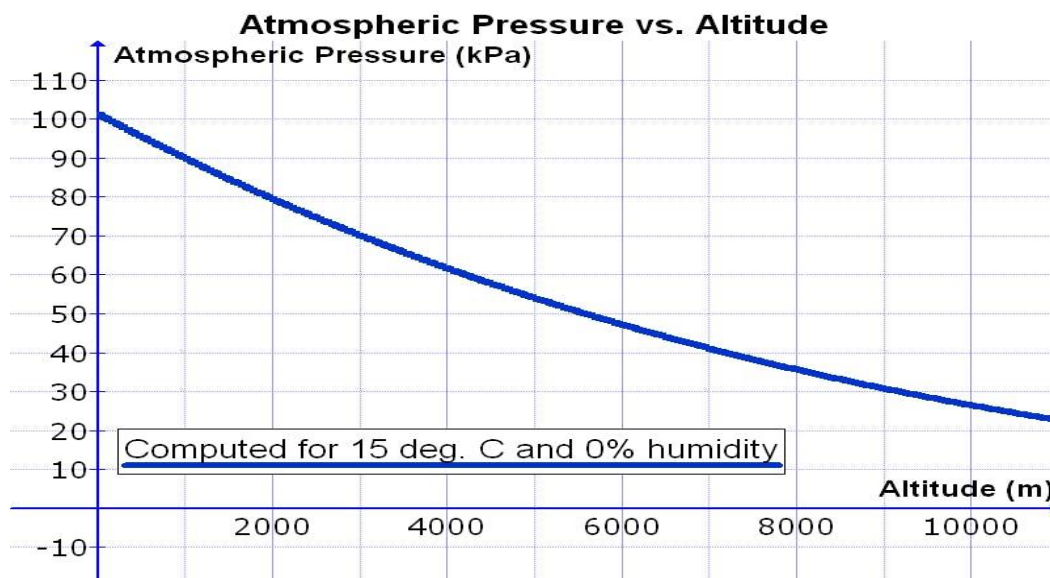


Fig.4.9 Atmospheric Pressure Vs Altitude

The barometric pressing factor has an around direct reverse proportion with the height from the ocean level so on the off chance that we measure the barometric pressing factor of a spot, we can figure the elevation from the ocean level utilizing a basic numerical activity. First we begin to ascertain the temperature utilizing start Temperature(), at that point we store the temperature in factor T utilizing get Temperature(T). From that point forward, we compute the pressing factor with startPressure(3). The number 3 is the greatest goal that can be changed somewhere in the range of 0 and 3. utilizing get Pressure (P) we store the outright pressing factor in factor P. The measure of this pressing factor is in hPa, which can be changed over to various units as indicated by the past table. The total pressing factor changes with elevation. At the point when eliminate the

impact of that esteem height on the determined pressing factor, The sealevel(P, ALTITUDE) function should be used as indicated in an altitude variable, and in a subjective variable, such as p_0 , we should store the deliberated value. To figure the altitude, use $\text{altitude}(P, p_0)$. The height per meter is calculated with this power.

4.5.3 Pressure Sensor

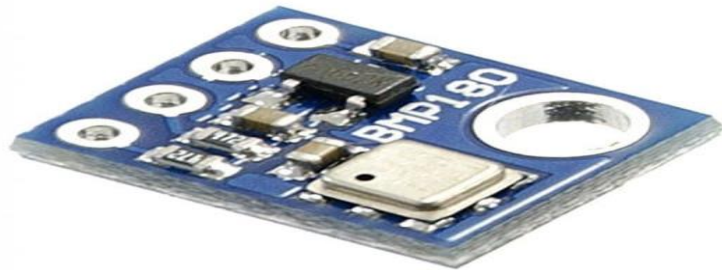


Fig.4.10 PRESSURE SENSOR (BMP 180)

4.6 HEARTBEAT SENSOR

A heartbeat sensor is an electrical instrument that, for example, measures the rate of a person's heartbeat. Internal heat, pulse, and circulatory strain are all important indicators of our stability. Thermometers and an arterial pressure or blood pressure sphygmomanometer are used to measure the internal heat level. The heart rate can be measured in two ways: one needs a physical check of the heartbeat at both wrists and the throat, and the other requires a blood test.

By using Heart Beat Rate system monitoring utilizing Arduino and Heartbeat Sensor to get time to time analysis. You will discover Heartbeat Sensor Principle, which is used by a Heartbeat Sensor and Arduino based Hair Rate Monitoring System. For athletes, patients when deciding the status of the heart, pulse control is crucial (just pulse). The pulse of the measuring pulse is multiple and the most exact solution is an electrocardiograph. Whatever the case, a Heartbeat sensor is the simpler way to screen the pulse. It appears in different forms and calculations and allows a moment to quantify the pulse. In Wrist Watch (Smart Watches), Smart Phones, chest ties and so on Heartbeat sensors are available Per moment or bpm, which indicates the times the cardiovascular contraction or extension occurs, is measured in pulsates.

Photoplethysmograph is the standard for the use of the Heartbeat Sensor. In accordance with this law, blood volume changes in an organ are estimated by the light force adjustments across the organ. The light source would usually be an IR LED and the photo sensor would be a photo-detector, such as the photo diode, the LDR, and a photo-transistor. The two unique types of sensors are a transmissible sensor and an intelligent sensor, for example. In a transmissive sensor, the light source and the finder face each other, and the individual's finger should be placed within the transmitter. Again, the intelligent sensor has the light source and the locator next to each other and the individual's finger must be placed in front of the sensor.

4.6.1 Heartbeat Sensor



Fig.4.11 Heartbeat Sensor

4.7 SENSOR CS

A wide variety of temperature sensor ICs are available to operate on the widest possible range of temperature control problems. These sensors of silicone temperature effectively contrast two or three significant ways with the forms previously described. The first one is the spectrum of temperatures. The ostensible IC temperature will operate in temperatures ranging between - 550°C and +150°C. Usefulness is the second important comparison.

Since a silicone temperature sensor is an integrated circuit, it can house a lot of signal processing hardware in the same box as the sensor. There is no compelling reason for the inclusion of compensation loops for the temperature sensor ICs. Some

of these are simple circuits that have one of two voltages present. Others use standard detector circuits and voltage comparators to create preprogrammed power. For chip-based frameworks, other sensor ICs combine the base sensing hardware with the input/output and control registers.

Computerized yield sensors usually include a temperature sensor, a single to-advanced (ADC) converter, an advanced double-wire interface and IC operation control registers. Temperature is estimated consistently and can be read any time. The sensor can be taught to screen the temperature and receive a high or low yield pin when a temperature exceeds an adjusted breakpoint, whenever it wants. Lower edge temperature can also be adjusted and when the temperature is under this edge the host may be told. For solid temperature observation in chip-based frameworks advanced yield sensors may also be used.

4.7.1 Sensor LM35

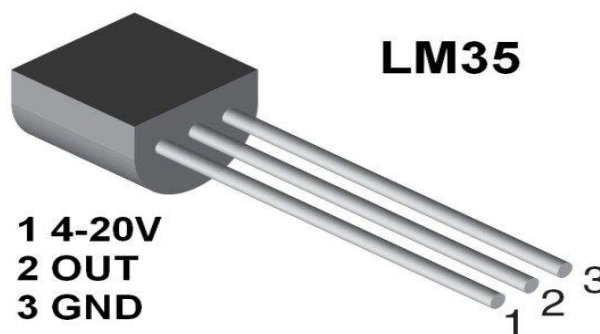


Fig.4.12 Sensor LM35

Above temperature sensor has three terminals and required Maximum of 5.5 V inventory. This kind of sensor comprises of a material that plays out the activity as per temperature to fluctuate the opposition. This difference in obstruction is detected by circuit and it figures temperature. At the point when the voltage builds then the temperature likewise rises. We can see this activity by utilizing a diode.

Temperature sensors straightforwardly associated with microchip information and consequently prepared to do immediate and solid correspondence with chip. The sensor unit can discuss successfully with minimal effort processors without the need of A/D converters.

The LM35 is a temperature sensor model. The LM35 arrangement consists of precision integrated circuits for DTH11 sensors, whose yield voltage is directly proportional to the degree Celsius temperature. The LM35 operates between -55° and +120°C.

- The LM35 can be connected easily in the same way as other integrated circuit temperature sensors. It can always be a high value compared can to bestuck established to a surface and its temperature will be within around the range of 0.01°C of the surface temperature.
- ·The temperature controls are well known for environmental and process control applications as well as for testing, measuring and connectivity purposes. The digital temperature is called a sensor that provides 9-bit temperature measurements. Digital temperature metres have outstanding precision and can read from 0 to 70 degrees Celsius with an accuracy of 0.5 degrees Celsius. The optical temperature measurements in degrees Celsius is perfectly matched with these sensors.
- That assumes that the atmospheric temperature of the air is about the same as that of the surfaces. The average temperature of the air supply will be at an equilibrium temperature between the air and surface temperatures, if the air temperature was either higher or lower than the surface temperature.

4.8 SOFTWARE SETUP DETAILS

4.8.1 *Arduino c*

- Open-source equipment shares a significant part of the standards and approach of free source programming.
- In specific, we accept that individuals ought to have the option to consider our equipment to see how it functions, make changes to it, and offer those changes. To work with this, we discharge the entirety of the first plan documents (Eagle CAD) for the Arduino equipment.

Get the most recent adaptation from the download page. You can pick between the Installer (.exe) and the Zip bundles. We propose you utilize the first that introduces straightforwardly all you require to utilize the Arduino Software (IDE), including the drivers. With the Zip bundle you need to introduce the drivers physically. The Zip record is additionally valuable in the event that you need to make a portable establishment.

Arduino is an apparatus for seeming well and good and control a greater amount of the actual world than your work station. It's an open-source actual figuring stage dependent on a straightforward microcontroller board, and an improvement climate for composing programming for the board.

Arduino uno can be used to produce intuitive objects, take in a range of switches and manage a variety of lighting, engines and other real results. Arduino companies should be autonomous or talk to programming on your PC (for example Streak, Processing, MaxMSP.) The sheets may be collected by hand or pre-assembled; the open-source IDE is free to download.

4.8.2 Arduino IDE

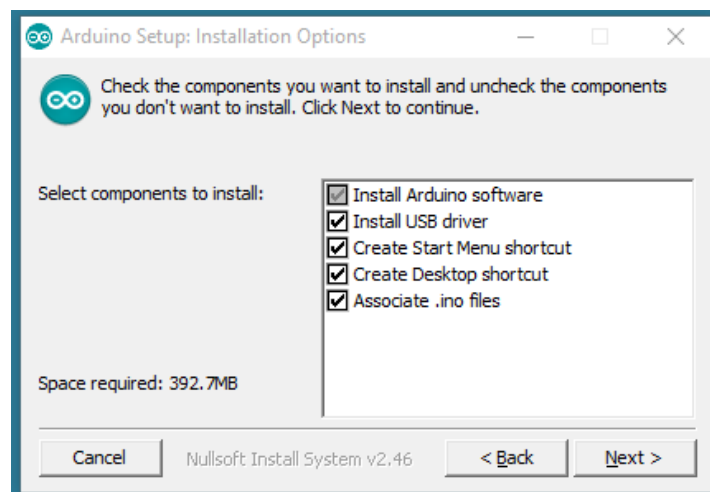


Fig. 4.13 Arduino IDE Software

The Arduino IDE is incredibly modest, but offers most Arduino-based practices a narrow, absolute climate. The top menu bar has the usual options, such as "Document (new, load save, etc.), "Change" (text type, duplicates, glue, and so on), "Device" (for organizing and programming) and "Help." The central section of IDE is a

simple word processor, where the program code can be entered. The base portion of the IDE is dedicated to a return window used to see the accumulation condition.

4.9 UBIDOTS SOFTWARE

The basic components of any ubidot-friendly internet program are: devices, variables, synthetic variables engine, dashboards and events. Within this post, each of these ideas is addressed by identifying with the ubidots of the IoT platform and how you can organize the ubidots apps to better link them to customers.

When your gadgets, factors, and general Application is gathered, give your App a few layers with to study ubidots interior design and how you can utilize Apps, Organizations, and Users to effectively associate yoAur information with the individuals who ought to utilize it.

A Ubidots' gadget is a virtual portrayal of an information source or basically, a resource taking sensor information and communicating said information through an association convention to Ubidots' cloud. for current firmware models and instructional exercises for associating your gadget to Ubidots.

All devices are different, but the standard setup on any device entails:

- A library that ought to be introduced in the gadget's IDE.
- Filling boundaries for validation and association like a TOKEN (for example extraordinary ID for each record or client), gadget and variable marks (for example gadgets and factors extraordinary identifiers in Ubidots), Wi-Fi SSID and Password, contingent upon the gadget and the prerequisites.
- Making API demand (for example a call from a gadget to the web worker). Ubidots' libraries spare the need to physically make these solicitations. In any case, in case you're working with a gadget not as of now in the rundown of upheld equipment, you can pick an availability convention, for example, MQTT or HTTP and make a solicitation utilizing the API likewise.
- Devices are made consequently in Ubidots the first run through a dab is gotten to a client's private TOKEN or an Organizational TOKEN. Tapping the "+" symbol in the upper right corner of any single gadget's screen.

4.9.1 Ubidots software

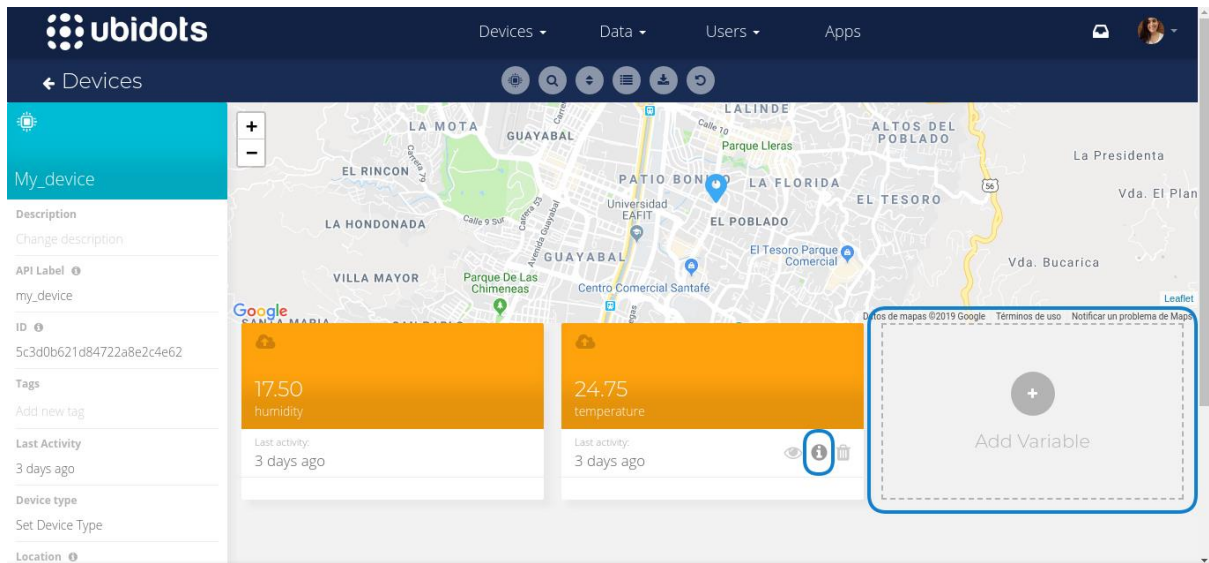


Fig.4.14 UBIDOTS Software

Once a computer is generated and data from the hardware or other data source from a third party is received.

4.9.2 Sensor Connected Information

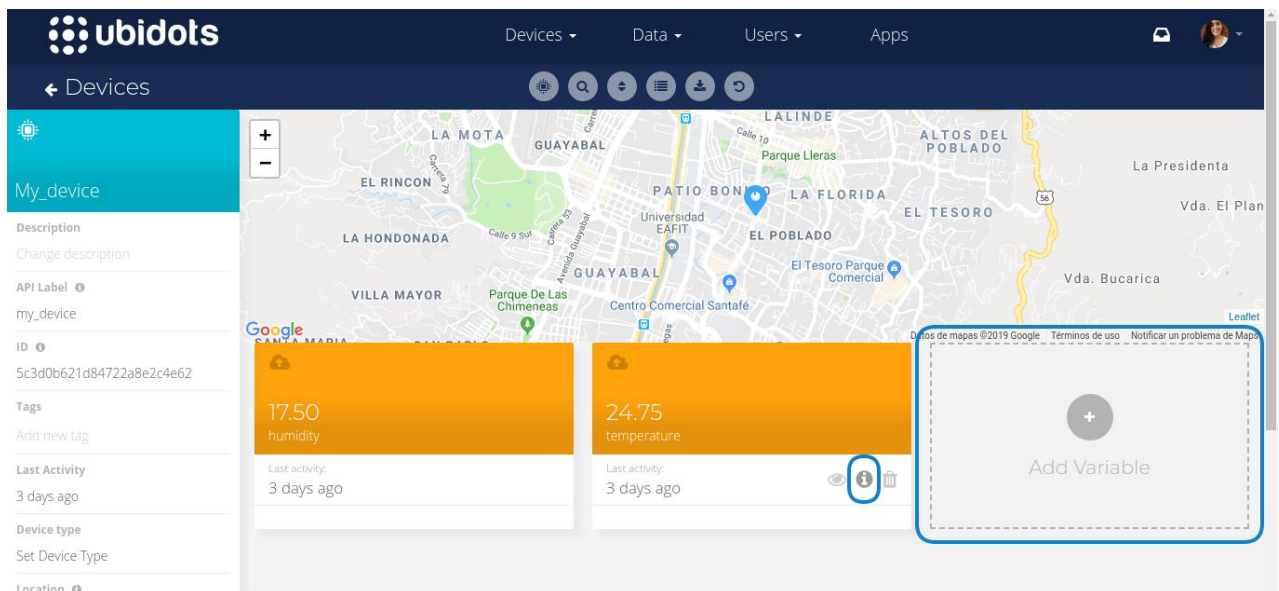


Fig.4.15 Sensors Connected Information

4.9.3 Remote Connection

Ubidots Synthetic Variables (SV) is an easy and efficient way in which raw data in Ubidots' cloud can provide insight. Users will generate synthetic variables using Ubidots SV Engine to measure and enhance data to offer users with a Ubidots controlled application data-driven decision.

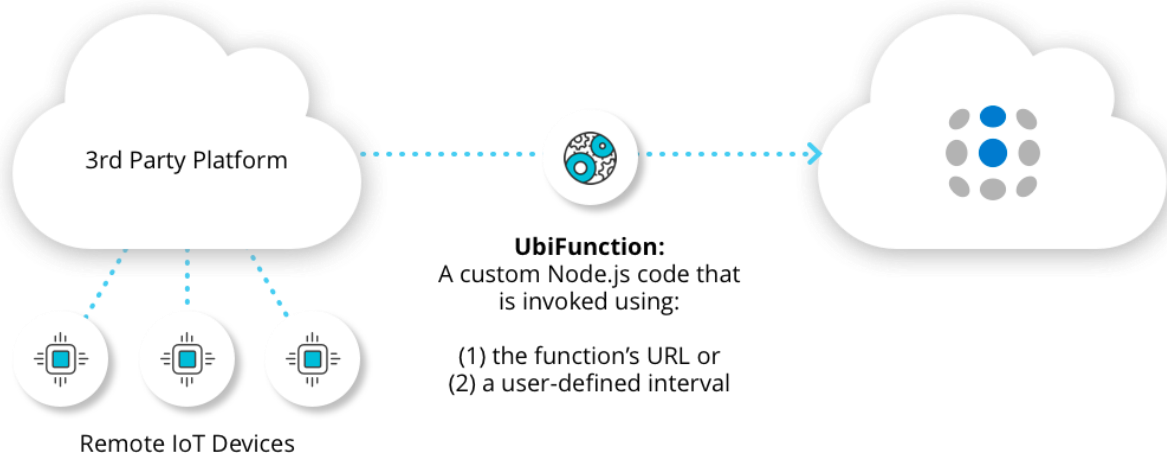


Fig.4.16 Remote Connection

CHAPTER 5

RESULTS AND DISCUSSION

The sensors mounted on the helmet are tested for their capacities for the specified limits and also for their specific work like measurement of oxygen, humidity, temperature, SpO2 level and presence of gas. Alerting system also works well on the grounds of inputs from sensors. When the limits specified to the sensors are crossed then it will automatically triggers a email and message notification to manager or an authorized person. Then he can clear the place where the danger will occur various tests concluded on the smart helmet are summarized in below.

5.1 SENSOR RANGE

Name of Sensor	Set Values
Temperature Sensor	40°C - 45°C
Humidity Sensor	65 Precipitations
SpO2 Sensor	85% - 80%
Gas Sensor	Gases like mixtures Methane
HeartBeat Sensor	72-80 BPM

Table.5.1 Sensors Range



Fig.5.1 Mining Helmet



Fig.5.2. Smart Helmet with Sensors

A sensor which will detect any harmful gasses around the device and alerts is gas sensor. This form of equipment tracks gas leaks or other pollutants and can communicate with a control device to shut down a process automatically. Chemical sensors include a subset of gas sensors. The concentration of gas in the vicinity to a gas sensor is measured. To measure the concentration of a chemical, a gas sensor communicates with it.

The DHT 11 thus has many benefits over a direct track of Kelvin-calibrated temperature sensors so users do not need to subtract a broad constant voltage in output form in order to achieve a comfortable degree of scaling. The DHT 11 allows no external calibrating at standard temperature, with room temperature, of any average accuracy of $\pm 1/4^{\circ}\text{C}$ and $\pm 3/4^{\circ}\text{C}$ to -55 to $+150^{\circ}\text{C}$ temperature range.

These sensors are connected to NodeMcu and Nodemcu will connect to a IoT software called Ubidots and a e-mail and a mobile number will be pre-registered if temperature sensor, gas sensor, SpO2 sensor, heartbeat sensor and humidity sensor detected any abnormal conditions it will auto sends a message alert and e-mail alert.

5.2 RECEIVING END

The helmet unit which collects the temperature, pressure, force and hazardous gas data and SpO2 level of worker has been created in order to alert the control room in case of abnormal condition. The voice transmission system has been implemented to have direct contact with miners in case of emergency situations. Then the authorised person will alerts and vacates the dangerous place to save workers.

5.2.1. Temperature Check

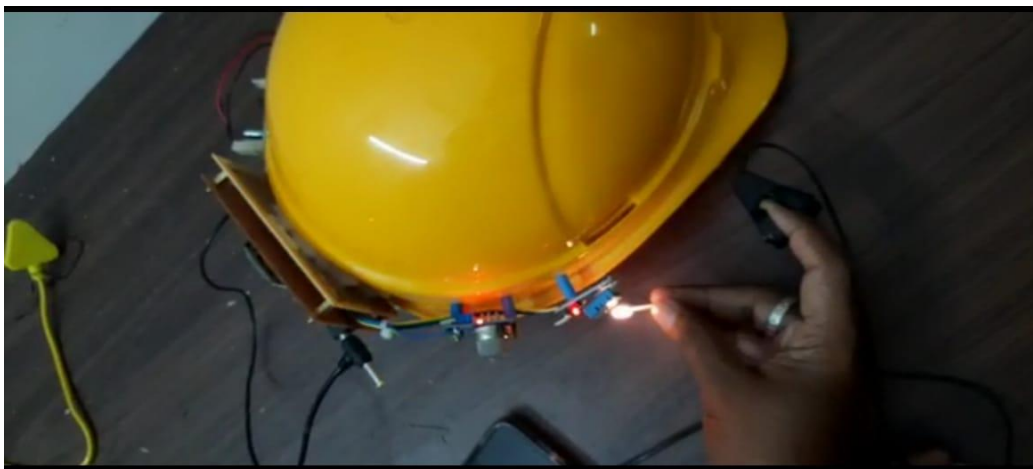


Fig.5.3. Temperature Check

In this temperature check when surroundings had any abnormal changes like increase in temperature than threshold value it will alert a message and notification to authorized number and mail-id.

5.3 ALERTING SYSTEM



Fig.5.4 Message Alert Notification

E-mail is configured to IoT software in uidots and a mobile number is also configured to it once sensor values are exceeded then it will alert through messages.

5.4 SpO2 RESULTS

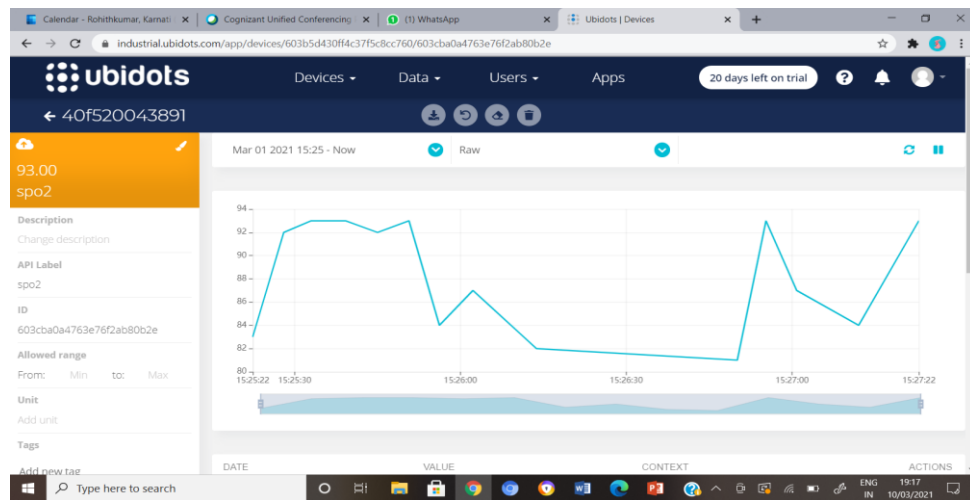


Fig.5.5. SpO2 Result Graph.

Live graph monitoring of SpO2 values of a particular worker a authorized person can live monitor and if any abnormal conditions like if oxygen level decreases 85% then a alert will auto generate to manager that SpO2 values.

DATE	VALUE	CONTEXT	ACTIONS
2021-03-01 15:27:22 +05:30	93.00	{}	
2021-03-01 15:27:12 +05:30	84.00	{}	
2021-03-01 15:27:00 +05:30	87.00	{}	
2021-03-01 15:26:55 +05:30	93.00	{}	
2021-03-01 15:26:50 +05:30	81.00	{}	
2021-03-01 15:26:13 +05:30	82.00	{}	
2021-03-01 15:26:02 +05:30	87.00	{}	
2021-03-01 15:25:56 +05:30	84.00	{}	
2021-03-01 15:25:50 +05:30	93.00	{}	
2021-03-01 15:25:45 +05:30	92.00	{}	

Table.5.2 SpO2 Sensor Result.

Second to second tabulation monitoring of SpO2 values of a particular worker a authorized person can live monitor and if any abnormal conditions like if oxygen level decreases 85% then a alert will auto generate to manager that SpO2 values. Through this table previous values can also be monitored.

5.5 GAS SENSOR

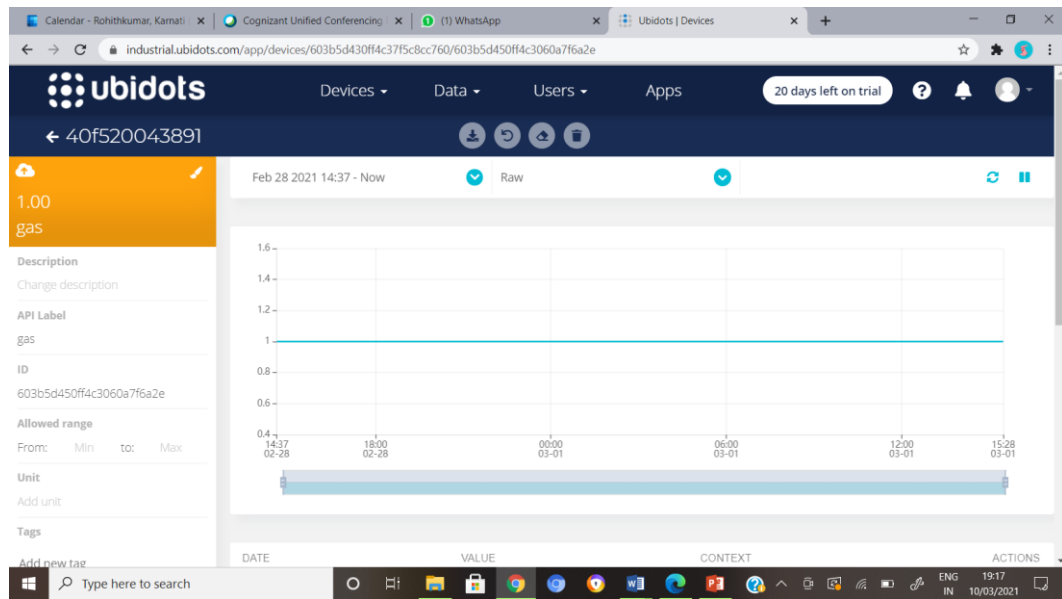


Fig.5.6 GAS Sensor Result Graph.

When a hazardous gases like methane, carbon etc., Gas sensor is a chemical sensor subclass. The gas sensor detects the nearby gas concentration. The gas sensor interfaces with a the quantity of gas concentration these are harmful to workers so if any gases detected alert will send to authorized person.

DATE	VALUE	CONTEXT	ACTIONS
2021-03-01 15:28:14 +05:30	1.00	{}	
2021-03-01 15:28:09 +05:30	1.00	{}	
2021-03-01 15:28:03 +05:30	1.00	{}	
2021-03-01 15:27:57 +05:30	1.00	{}	
2021-03-01 15:27:51 +05:30	1.00	{}	
2021-03-01 15:27:46 +05:30	1.00	{}	
2021-03-01 15:27:40 +05:30	1.00	{}	
2021-03-01 15:27:34 +05:30	1.00	{}	
2021-03-01 15:27:28 +05:30	1.00	{}	
2021-03-01 15:27:22 +05:30	1.00	{}	

Table.5.7 GAS Sensor Result

Second to second tabulation monitoring of SpO2 values of a particular worker a authorized person can live monitor and if any abnormal conditions like oxygen level decreases 85% then a alert will auto generate to manager that SpO2 values.

5.6 Pluse Sensor

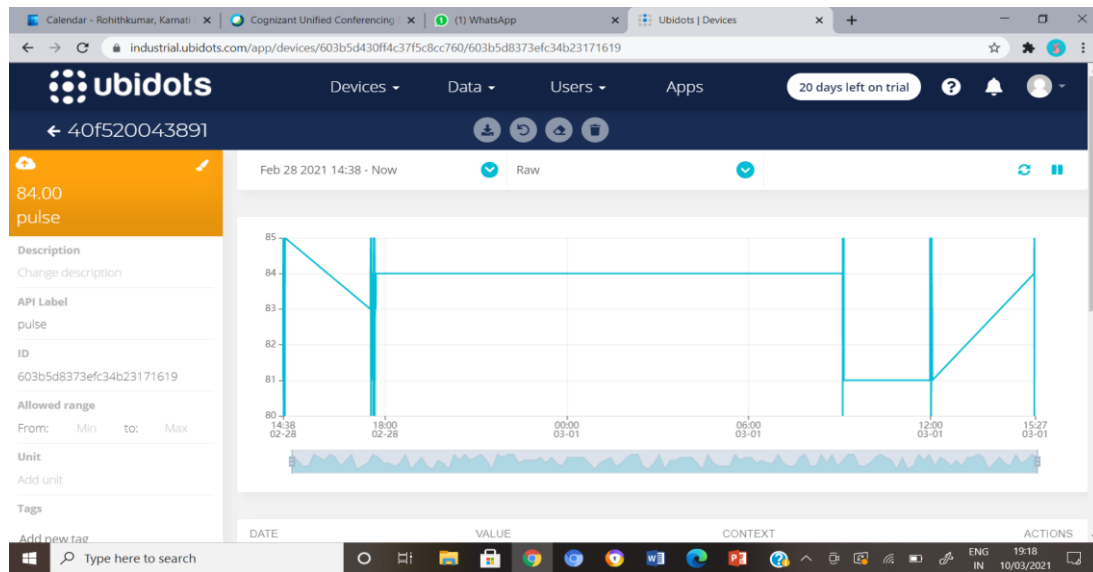


Fig.5.7 Pluse Sensor Result Graph.

For data collection, this device makes use of the capabilities of a heart pulse sensor. The microcontroller captures and processes a human pulse as data signals. The data will be processed and submitted A more research and visualization IoT platform. The test results were found to be correct as the systems were able to senses and read the cardiac rate at >40 and <60, at >60 and <100, at >100 and <150 at medium heart beat rates.

DATE	VALUE	CONTEXT	ACTIONS
2021-03-01 15:27:22 +05:30	84.00	{}	
2021-03-01 15:27:12 +05:30	85.00	{}	
2021-03-01 15:27:00 +05:30	83.00	{}	
2021-03-01 15:26:55 +05:30	82.00	{}	
2021-03-01 15:26:50 +05:30	85.00	{}	
2021-03-01 15:26:13 +05:30	81.00	{}	
2021-03-01 15:26:02 +05:30	82.00	{}	
2021-03-01 15:25:56 +05:30	84.00	{}	
2021-03-01 15:25:50 +05:30	82.00	{}	
2021-03-01 15:25:45 +05:30	80.00	{}	

Table.5.4 Pluse Sensor Result

5.7 Humidity Sensor Results

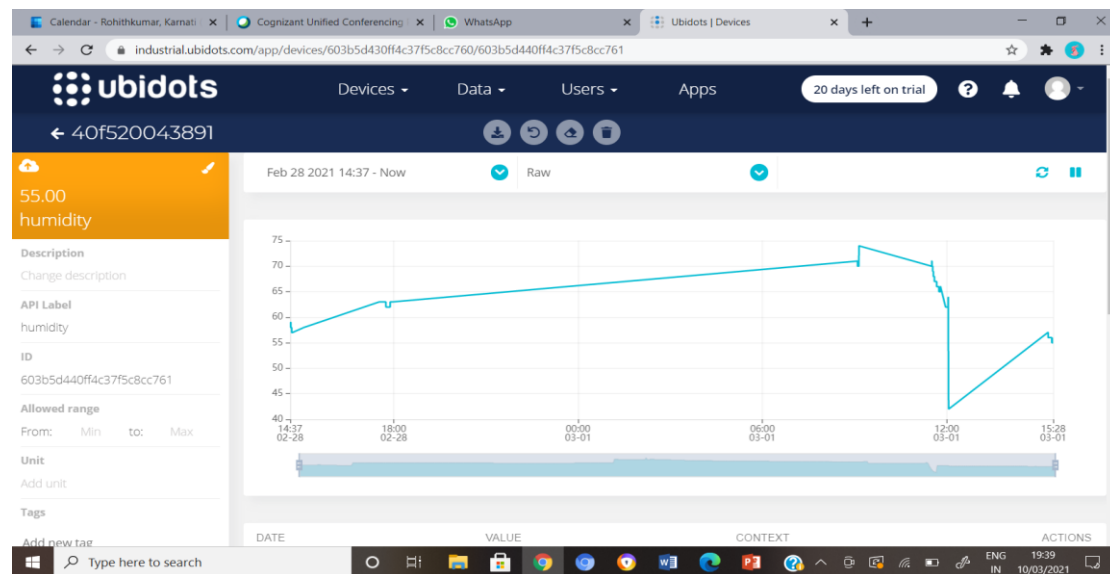


Fig.5.8 Humidity Result Graph.

Analog sensors are more complex and have precise measurements that provide constant insight into current conditions. If you attach your analogue sensor to a fine, you can see the tracked value in real time from anywhere. The digital humidity signal is reported by RTU as a binary form of data.

The collected data can be processed locally by quality RTUs against several threshold values. When a threshold is exceeded, they may also produce a numerical signal.. The most advanced RTUs even provide email and text to alert you of emergency situations.

DATE	VALUE	CONTEXT	ACTIONS
2021-03-01 15:27:22 +05:30	84.00	{}	
2021-03-01 15:27:12 +05:30	85.00	{}	
2021-03-01 15:27:00 +05:30	83.00	{}	
2021-03-01 15:26:55 +05:30	82.00	{}	
2021-03-01 15:26:50 +05:30	85.00	{}	
2021-03-01 15:26:13 +05:30	81.00	{}	
2021-03-01 15:26:02 +05:30	82.00	{}	
2021-03-01 15:25:56 +05:30	84.00	{}	
2021-03-01 15:25:50 +05:30	82.00	{}	
2021-03-01 15:25:45 +05:30	80.00	{}	

Table.5.5 Humidity Sensor Result

5.8 Temperature Sensor Results



Fig.5.9 Temperature Result Graph.

You have to pick the right alarm from the remote site to connect your sensors to your central office to obtain the temperature warning capability. Contact the central office with sensors that deal with analog or differential key closures.

DATE	VALUE	CONTEXT	ACTIONS
2021-03-01 15:27:22 +05:30	93.00	{}	
2021-03-01 15:27:12 +05:30	84.00	{}	
2021-03-01 15:27:00 +05:30	87.00	{}	
2021-03-01 15:26:55 +05:30	93.00	{}	
2021-03-01 15:26:50 +05:30	81.00	{}	
2021-03-01 15:26:13 +05:30	82.00	{}	
2021-03-01 15:26:02 +05:30	87.00	{}	
2021-03-01 15:25:56 +05:30	84.00	{}	
2021-03-01 15:25:50 +05:30	93.00	{}	
2021-03-01 15:25:45 +05:30	92.00	{}	

Table.5.6 Temperature Sensor Result

Second to second tabulation monitoring of surrounding temperature values at particular worker by a authorized person can live monitor and if any abnormal conditions like oxygen level decreases 45°C then a alert will auto generate to manager that temperature is high at working place. Through this table previous values can also be monitored

CHAPTER 6

CONCLUSION

A system was developed in real time to monitor perspective from a single vantage point of underground mine workers. It will alert mine workers working at deep places to save their lives from any disasters. In future by using more sensors such as dust, vibration, water leakage etc will get additional safety to workers. Also we can use number of slave and improve the data transmission distance. This system will detect worker's body oxygen level second to second to the particular manager or authorize because recent time many got exposed to COVID-19, So if one worker got effected whole work should be remains paused.

This which then result in the formation of a network in which the different nodeMCUs are stored. As IoT, the broker, saves the information and, in the case of a dangerous situation, sends alerts to those who need to know. This application offers excellent security for coal mining employees and decreases the risk of jobs being mismanaged or killed. The Internet of Things ideals have allowed us to generate less power and more cost-effective ways to achieve greater productivity while still saving electricity. This campaign demonstrates that IoT technology can impact companies big and small around the world, so that potential people who can learn from their advantages will reap the rewards of automation and successful communications.

6.1 FUTURE SCOPE

There are some environmental parameters in their workplace for the working citizen in coalmines. Methane, carbon monoxide, SpO₂ and temperature are dangerous. In future by using more number of slave to improve the data transmission distance. So, the rescue operation of miners can be carried out. The system can be enhanced further. The system can be enhanced by installing additional measurement equipment for blood pressure control and all potential safety challenges such as dust, vibration, water flow, fall detection etc can be tracked through additional sensors.

CHAPTER 7

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SMART HELMET

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REAL TIME MONITORING AND ANALYSIS OF HAZARDOUS PARAMETERS USING SMART HELMET

Submitted ³⁴ in partial fulfilment of requirements for the award of
Bachelor of Engineering in
Electronics and Communication Engineering

by

KARNATI ROHITH KUMAR (37130188)

GUNDA PRANAY KUMAR (37130151)



**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS**

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SATHYABAMA

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APRIL – 2021



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

30

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of KARNATI ROHITH KUMAR (Reg.No.37130188) and GUNDA PRANAY KUMAR (Reg.No.37130188) who carried out the project entitled "Real Time Monitoring And Analysis of Hazardous Parameters Using Smart Helmet" under our supervision from December 2020 to March 2021.

Internal Guide

24

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Internal Examiner

External Examiner

DECLARATION

We, KARNATI ROHITH KUMAR (Reg.No. 37130188) and GUNDA PRANAY KUMAR (Reg.No.37130151) hereby declare that the Project Report entitled “**Real Time Monitoring And Analysis of Hazardous Parameters Using Smart Helmet**” done by us under the guidance of Dr.A.SAHAYA ANSELIN NISHA M.E., Ph.D. is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

1.

2.

DATE:

PLACE:

SIGNATURE OF THE CANDIDATES

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ABSTRACT

Mining is the method of extracting precious minerals such as coal, gold, and silver etc... from the earth is. Mining ensures a steady supply of all essential natural resources such as coal and gas. Used by modern civilization. perhaps the most essential fuel sources is The coal industry and many industries, also known as black diamonds, is of vital importance. It is the world's most valuable reserve of indigenous energy. In order to satisfy India's ever-increasing demand for electricity, it has become a national necessity to dig up more and more gas.

It is, however, a dangerous and potentially lethal job for those who do this function. Coal miners will face many obstacles, including high humidity, high temperatures, and toxic gasses in their environment. These situations provide an environment in which workers are extremely dangerous and pose a serious risk to their own lives.

The basis ¹⁶ of this project is to design and Analysis of smart helmets for miners using Embedded systems. This project is used to analyse dangerous incidents that can be prior. This project is to reduce the life risk of mineworkers by implementing the smart safety helmet. This device includes a wireless network of sensors to track the real-time situation of the base station underground mines.

This project has a model that detects certain ¹⁴ environmental parameters from different mine locations and sends alerts to the mine control area so that urgent steps can be taken anywhere there appears to be a dangerous scenario. To lessen the seriousness of the issue. NodeMcu is a kind of microcontroller that is used by different sensors to monitor these parameters. Using IoT software, the mining location data was sent in real time. If those threshold values are crossed, the mine control office will be notified by e-mail, allowing the appropriate actions to be taken.

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CHAPTER - 1

INTRODUCTION

¹⁵ With 536.5 million metric tonnes of coal produced per year, India is the world's fourth-largest coal and gas producer. India has about 3,33,097 miners.. The healthy output level of coal mines is still low particularly in recent years, disasters in coal mines have occurred regularly, resulting in significant loss of property and life; as a result, coal mine safety issues have increasingly become a subject of national and societal interest. Mine injuries can be caused by a number of factors, including toxic gas leaks, roof collapses, and low oxygen levels. During mine incidents, miners who are still alive are often trapped by roof falls and die as a function of a setback of or failure in rescue operations. So It's critical to remember monitor the mine environment condition and minors health.

Since the atmosphere underneath of deep coal mines is hazardous and complicated, collisions and natural hazards are more likely. The Smart Helmet is used to identify toxic gases using various gas sensors, and there is a version that uses a heart beat tracker to determine how many miners are still alive under the mine after collisions. We create a smart helmet by combining these two elements, which constantly monitors environmental parameters such as toxic gas levels, surrounding oxygen levels, and the miner's heartbeat. It gives an early warning to ³ all miners present inside the mine, allowing them to save their lives before any casualties occur. This machine is extremely useful for miner rescue and safety. Health is the main component of some kind of business. Security and safety is a first part of everything in the mining industry.

Any mining industry follows certain simple precautions to prevent some forms of unfavourable conditions. [7] Today, communication is the most critical factor for continuous monitoring in sensors such as the LM35, MQ2 gas sensor, humidity sensor, and carbon monoxide gas in all possible parameters such as temperature, raise moisture levels. Take the necessary precautions to prevent any potentially dangerous situations. Adequate communication system between moving personnel and a fixed base station is needed to achieve safety in underground mines.

1.1 AIM OF PROJECT

The internet's perspective on things was evaluated as a result of the convergence of various technologies such as omnipresent remote correspondence, continuous analysis, AI, and so on[9]. This entails contributing to Internet of Things empowerment through the traditional fields of implant frames, remote sensor networks, control frames, mechanization, and other technology (IOT). In 1982, the idea of arranging brilliant devices was a new Coca-Cola system at Carnegie University that could check on inventories and whether freshly piled-up beverages were cold. The concept of organization was discussed. The original 1991, "the Computer of the Twenty-First Century," Weiser paper on omnipresent processing, as well as academic sceneries, presented a contemporary perspective of IoT by UbiComp and PerCom, for example. Reza Raji defined the term in IEEE Spectrum in 1994 as "[transforming] small packages of data into a vast array of hub locations, in order to coordinate and robotize everything from home machines to whole production lines". A few associations recommended arrangements like Microsoft's at his Work NEST somewhere in the range of 1993 and 1996.

In any case, the industry only began to accelerate in 1999. As a part of the "Six Webs" scheme, Bill Joy conceived Device to Device (D2D) mailing. The concept of IoT became popular in 1999 by means of the MIT University Auto Verification ID Center and associated business testing distributions. Kevin Ashton (one of the writers of the first automobile ID center), who was then an integral to the Internet of things, regarded the radio recurrence distinguishing evidence (RFID). The term "Web for Stuff" is used by Ashton. In case all articles and persons are provided with identifiers every day, they can be controlled and stored by PCs. Compared to RFID, product labeling can be performed using technology like close communication, uniform identifications, QR codes and computerized watermarking. One of the main consequences of the Internet of things by planning all posts with infinitesimal devices or machine-intelligible markers on the earth is changing every day in its special comprehension.

1.2 APPLICATIONS

As of 2020, about 20.8 billion gadgets will be available on the IoT, according to Gartner, Inc. (an software discovery and alert organization). [4] [4] [4] ABI Research estimates that by 2020 it will be connected more than 30 billion devices remotely. According to a Pew Research Internet Project overview and survey from 2014, a broad majority of tech experts and drawn in internet customers who responded, 83 percent, decided to have unmissable and advantageous impacts of the Internet/Cloud of Things embedded and wearable recordings (and different frameworks) by 2025.

The Internet of Things is unmistakably made up of various Internet computers. In its 2015 budget proposal, the UK government dedicated £40,000,000 to Internet research in an effort to accommodate new and evolving mechanical development. George Osborne, the former British chancellor of trade, said that the Internet of Things is the next step in the data revolution, pointing to the network that connects everything from metropolitan vehicles to medical equipment and home appliances. Because of its ability to arrange mounted gadgets with a small CPU, memory, and force asset, IoT finds applications almost anywhere.

These mechanisms may be in charge of data collection in environments ranging from normal biological systems to buildings and manufacturing facilities, leading to the development of technology for pollution monitoring and metropolitan planning. Again, IoT frameworks may be in charge of carrying out operations in addition to detecting objects. Smart retail frameworks, for example, can directly screen customers' shopping proclivities by tracking their cell phones. These customers will then offer special goods or items that they enjoy, such as a microwave, for their favorite brands.

Extra instances of identification and incitement are repeated in applications that regulate boards for fire, water, fuel, and electricity, as well as in transportation networks. The numerous applications that IoT can provide allow for enhanced home security highlights and home robotics. illustrating natural sensor organizations that might use cloud-based surveys to enable consumers to measure DNA or different atoms

1.3 SOCIAL INTERFACE

To sharpen the way things, media, and vast information are intertwined, a setting in the instrument used for media measurement must first be created. According to Nick Couldry and Joseph Turow, marketing professionals approach enormous sums of information as multiple prominent data marks for a wide variety of entities. [1] The company seems to be moving away from the conventional model of using simple media criteria, such as newspapers, magazines, and network shows, in order to reach audiences with progress that is preferably aimed at individuals in suitable areas.

Clearly, one distinct feature is the distribution of (measurably conversational) messages or substances based on the purchaser's conduct. For instance, the delivery conditions will increasingly adjust messages (marketing items) and substances (articles) to customers that have only been gathered from numerous information mining exercises. The media enterprises measure large information in a double, interconnected way: Targeting of buyers (for publicizing by advertisers) Data-catch. Thus, the Internet of things sets out a freedom to gauge, gather and dissect a consistently expanding assortment of social insights. Cross-connection of this information could upset the focused on showcasing.

For instance, as verified by Danny Meadows-Klue, the blend of investigation for change following conduct focusing on has opened another degree of exactness that empowers show promoting to be centered around the gadgets of individuals with significant interests. Large information and the IoT work related. From a media viewpoint, information is the critical subordinate of gadget interconnectivity, although it is important to allow for more precise emphasis. The IoT transforms the newspapers, companies and even all states, starting another era of financial growth and gravity.

CHAPTER 2

LITERATURE SURVEY

SHIRISH GAIDHANE, MAHENDRA DHAME et.al (2016) Smart Helmet is proposed, which includes two-way communications, dangerous gas warning, a helmet removal alarm, an emergency panic crash turn, constant environmental control of conditions such as mining sector temperature and pressure, and GPS tracking of a miner's position. ²² Coal meets about 30.3 percent of the world's primary energy needs and generates 42 percent of the world's electricity.

After China and ²² the United States, Indian coal mining countries are the third largest production country. India's main energy supply is coal. India's primary source of energy is coal. Coal accounts for 51% of today's total commercial energy requirements. The mining of coal from the land surface and underground mines is largely accomplished by the use of two techniques. The vast majority are surface mining with open pits or cast mines. The surface mine is open and operates entirely from the ground level. Surface mines perform well, have low maintenance costs, and have adequate safety benefits.

L. MA and H.GUO et.al (2017) Developed a [15] in a mining mask Coal mining is the most important source of fuel for many sectors, including those classified ¹⁴ as black diamonds. ³ It is the world's most significant indigenous energy source. As India strives to meet its rising energy demand, coal mining has become an increasingly significant domestic target. In mines with a poor rock structure, supported mining is often used. For unsupported mining methods, artificial supports are not usable. Unsuitable ³ methods are used in areas where solid rock structure is available. Surface coal mining has a lower chance of ventilation and loss than underground coal mining. There is a complete crash in subterranean mines.

H.M. ZHU and L. ZHANG et.al (2006) Analysed that [12]Today wellbeing of diggers is a significant test. Excavators wellbeing is in peril predominantly in light of the outflow of Toxic gases, deficiency of oxygen and mine debacles. In this plan a nonstop checking framework, which screens the ecological boundaries, for example, oxygen level and toxic gases (methane, carbon dioxide and carbon monoxide). It additionally gauges the digger's heartbeat rate, which is finished by utilizing the pulse sensor. During the mishaps, by utilizing this gadget we become acquainted with that the number of diggers are alive under the mine. This framework utilizes Zigbee innovation for remote transmission. The boundaries are recognized constantly by different sensors, if any unusual condition happens the digger will get a caution through the bell present on the head protector. The estimations of various sensors are persistently sent by remote transmitter to the distant checking unit which is put outside the mine and got by the recipient module (PC).

DAVID KOKKAN et.al (2019) Developed Helmet Device to zero in on a mine overseeing framework which depends on the practical Zigbee framework. This venture targets building up a remote sensor organizations, acknowledged ongoing observation with early-notice insight on unsafe gases, temperature, and stickiness around there and utilized zigbee correspondence to decrease potential security issues in coal creation utilizing a Zigbee remote innovation. Each of these three limits consistently identifies the temperature sensor, the gas sensor, the humidity sensor, and the pre-characterized limits. When the signal with LED signs comes on, the customer prepares. Through a zigbee wireless positioning system, the frame can be conveniently expanded. The values of various sensors are continuously transferred via Zigbee transmission to the remote monitoring unit, which is obtained via the Zigbee receiver module.

B. GE and Z. WEI et.al (2011) developed a [6] Intelligent helmet capable of identifying dangerous injuries in mining and traffic crashes. The helmets were designed with the three major hazard categories of air quality, helmet removal, and accident in mind. The intelligent helmet is often used to avoid road accidents. If the rider is involved in a collision, a warning message about the position will be sent to the contacts that are commonly used (using GSM). If there is a threat, the buzzer triggers a helmet alert and transmits information to the control unit (Ambulance) through the Zigbee trans-

receiver, giving miners/riders the chance to save their lives from unforeseen occurrences.

A. GEETHA et.al (2019) Tens of thousands of miners are analyzed every year[4] and many more injured in accidents, particularly in the processes of coal mining and rock mining. Coal or dust explosions, chemical intoxication, excessive use of explosives, electrical burns, flames, mine collapses, rock falls from roofs and side walls, floods, The most likely cause of injury was personnel stumbling/slipping/falling or mal-operated or poorly-used mining machinery. Personal safety clothing, such as a hat and shoes, is used in coal mines.

A.P. Squelch et.al (2009) Proposed to [3] address the improvement of a head protector to guarantee more wellbeing mindfulness among diggers and riders. When working with an uproarious hardware, staying alert one's environmental factors can now and again be testing. Using the cask reduces the chance of serious injuries by 79 percent and death by 43 percent. When it is too difficult, hot, or uncomfortable to work in the mining industry, miners choose to remove all of their protective gear. It can also absorb toxic gases such as CO₂, SO₂, NO₂, and particulate matter, either deliberately or unintentionally. When it comes to road injuries, the public's main concern has been their health.

2.1 SUMMARY

A coal mineshaft that employs Bluetooth radiation theft. Bluetooth's innovation is the creation of a conventional low-power, easy-to-use remote air interface and monitoring the opening mechanism for programming[3] as a standard for global short-distance communication. The only issue with this device is that Bluetooth is only a small distance away from the remote invention, and using cabling is difficult. If a normal disaster or a rooftop collapse occurs, the cabling is hazardous. As a result, standard communication is not entirely dependable and long-term. As a result, the efficiency and duration of the traditional communications scheme are poor. Because of ongoing COVID circumstances on the off chance that one got affected all out work ought to be stopped the framework doesn't distinguish oxygen level of laborer.

CHAPTER 3

AIM AND SCOPE OF THE PRESENT INVESTIGATION

3.1 INTRODUCTION

An embedded structure is a particular explanation PC system expected to perform one two or three dedicated limits, consistently with progressing enlisting necessities. It is by and large embedded as a segment of an absolute contraption including hardware and mechanical parts. Curiously, an all around valuable PC, similar to a PC, can do different endeavors depending after programming. Introduced structures have become indispensable today as they control enormous quantities of the typical contraptions.

Since the inserted structure is dedicated to specific tasks, schedule planners may improve it, reducing the item's size and cost while increasing its dependability and execution. To take advantage of economies of scale, any inserted structures are mass-produced.

[1]Physically, inserted frameworks range from versatile gadgets like advanced MP3 players and watchmakers, for large fixed institutions, such as traffic signals, plant manufacturing regulators or thermal power station control frameworks. The complexity ranges from low to extremely high with a solitary microcontroller chip with different devices, peripherals and organisations assembled in a big case or closed in areas.

When all is said and done, "implanted structure" isn't exactly a well-defined concept, since many frameworks have any level of programmability. [7]Handheld PCs, for example, share a few components with implanted frameworks, such as the operating frameworks and chip that control them, but they are not really implanted frameworks because they enable many applications to be stacked and peripherals to be associated.

Screen the climate; installed frameworks read information from input sensors. This information is then prepared and the outcomes showed in some arrangement to a client or users Transform the data; installed frameworks change the information gathered in some significant manner, like information pressure/decompression

Since sensor and actuator collaboration with the outside world is a significant part of the inserted structures, these architectures still give explicit meaning to their implementations. [9] The following are examples: [9] Formalized paraphrase Monitor law, small state processors, and sign planning calculations are popular programs that run on integrated frames. These frameworks should also be able to distinguish between the internal processing environment and the electromechanical frameworks, as well as respond to failures.

There are numerous classifications of inserted frameworks, from specialized gadgets to home apparatuses to control frameworks. Models incorporate

Communication devices

¹
e.g.: modems, cellular phones

Home Appliances

e.g.: CD player, VCR, microwave oven

Control Systems

e.g.: Automobile anti-lock braking systems, robotics, and satellite control

3.2 DETAILED EXPLANATION ¹ OF AN EMBEDDED SYSTEM

An ²⁶ inserted framework generally contains an installed processor. Numerous apparatuses that have an advanced interface - microwaves, VCRs, vehicles - use implanted frameworks. Some installed frameworks incorporate a working framework. [11] Others are exceptionally particular bringing about the whole rationale being carried out as a solitary program. These frameworks are installed into some gadget for some particular reason other than to give broadly useful figuring.

Installed frameworks are described by a remarkable arrangement of attributes. Every one of these attributes forced a particular arrangement of plan imperatives on installed frameworks originators. [13] The challenge to planning installed frameworks is to adjust to the particular arrangement of requirements for the application.

3.3 APPLICATION

Embedded devices aren't the same as regular machines. The architectures of embedded systems are tailored to a particular application. Before the hardware is built, much of the work characteristics are understood. After that, the designer should focus on the design constraints of a well-defined application. As a result, the consumer's reprogrammability is limited. Any embedded devices, on the other hand, need reprogramming versatility. Programmable DSPs are common for such applications.

3.4 REACTIVE SYSTEMS

As referenced before, a regular installed frameworks model reacts to the climate through **sensors and control the climate utilizing actuators. This requires implanted frameworks to run at the speed of the climate. This trait of implanted framework is designated "responsive". [14]Reactive calculation implies that the framework executes because of outer occasions. Outer occasions can be either intermittent or aperiodic. Occasional occasions make it simpler to plan preparing to ensure execution. Aperiodic occasions are more diligently to plan. The most extreme occasion appearance rate should be assessed in most pessimistic scenario circumstances. Most inserted frameworks have a critical responsive segment. Perhaps the greatest test.**

3.4.1 CPU ARCHITECTURE

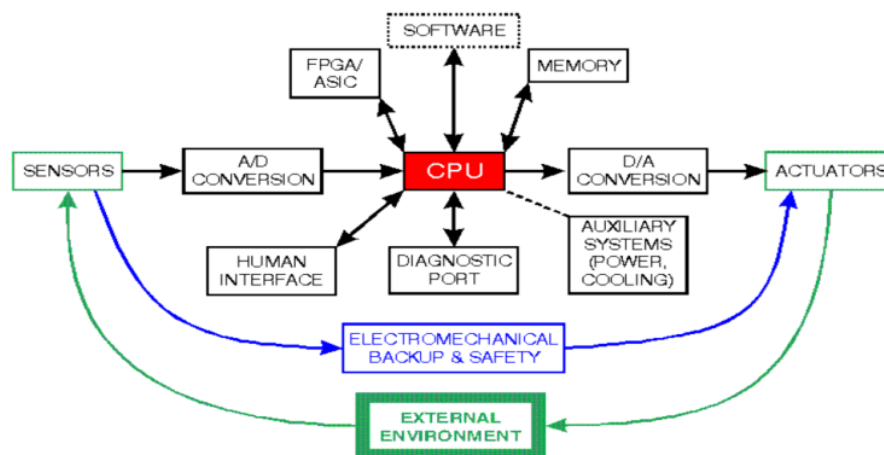


Fig.3.1. CPU Architecture.

3.5 EXISTING SYSTEM

In the current framework mining cap guarantees to shield the diggers head from a few wounds. Monitoring the natural condition turns into a difficult piece of the current framework. Since the cap is excessively substantial, awkward to work with the excavators will in general eliminate the protective cap off their head. In the event of its evacuation excavators are inclined to hazardous conditions. There is no current brilliant head protector that can consider the climate and settle on choices to support laborer security. Oxygen supply isn't accommodated the excavators if there should be an occurrence of noxious gas spillage. Building up an obstacle free correspondence climate is the greatest test the mining associations face.

Yongping Wu and Guo Feng's Bluetooth remote transmission system is used to test the charcoal mining vessel. Bluetooth engineering is the standard that connects short-distance international communication and creates a conventional low-power, short-distance air interface, as well as regulates opening programming frameworks. At the same time, May transport innovation was maturely introduced, and the combination of wired and remote communication systems was grasped.

3.5.1 EXISTING BLOCK DIAGRAM

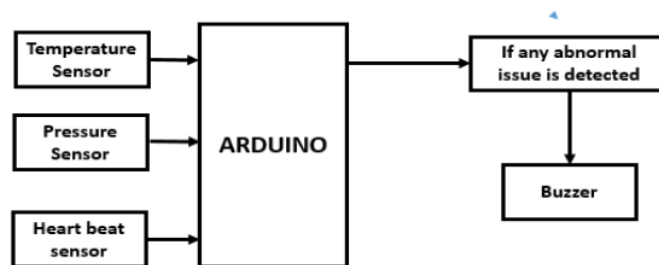


Fig.3.2 Existing block Diagram

[2] The remote correspondence module supplies the sensor array in the frame, which is estimated by the miniature regulator and monitors temperature, humidity, and different boundaries in the underground mine. The collected data is dispatched to the important distance tracking concentration by link.

The issue with this design is that if a typical cataclysm or roof collapse happens, the building will be trapped inside the coal mine shaft. The system is counterproductive. As a result, the normal communication system's unwavering stability and long existence are compromised. [16] The next issue is that the coal mining shaft is in poor condition, and the digger would not obtain an acceptable signal if the distance between the excavator and the system is too great. Pranjal Hazarika is presenting a welfare cap for coal mining employees.

In prior days, the mishap proportion was high because of the way that individuals were driving without protective cap and had absence of attention to use of head protector. Accordingly the demise rate steadily raised. The issue tended to was the improvement of a cap to guarantee more security mindfulness among diggers and riders. When working with a loud gear, staying alert one's environmental factors can now and then be testing. Wearing the cap can decrease the danger of serious injury by 79% and the danger of death by 43%.

In thought with mine enterprises, diggers will in general eliminate a portion of their security gear since it is excessively substantial, warm or awkward to work with. They additionally will devour ¹⁵ fixation level of the harmful gases, for example, CO₂, SO₂, NO₂ and particulate matter intentionally or unconsciously. With regards to street mishaps, wellbeing has become a significant danger for the residents.

In any case, individuals typically doesn't wear the protective cap while they are driving the cruisers. Along these lines, this stands as a fundamental explanation for the extraordinary addition in the demise rates in India. Building up this work comes from our social obligation from society.

The way to controlling such mishaps is the forecast of upheaval by executing sensors and microcontrollers and to create a caution framework before basic environmental level. [17]A nonstop observing is important which again requires some powerful and exact detecting framework.

3.6 PROPOSED SYSTEM

The temperature sensor, humidity sensor, and humidity monitor will all be used in the project to accurately determine the temperature. Heart-beat sensors and gas sensors to determine whether poisonous gas was emitted, as well as sensors to monitor workers' conditions in carbon mining. [5] A data is obtained, it is managed by mcu nodes, IOT, and so on.

3.6.1 HARDWARE USED

- Nodemcu
- Smoke Sensor
- Temperature Sensor
- Humidity Sensor
- Heartbeat sensor
- SpO2 Sensor
- Jumper Wires

3.6.2 BLOCK DIAGRAM

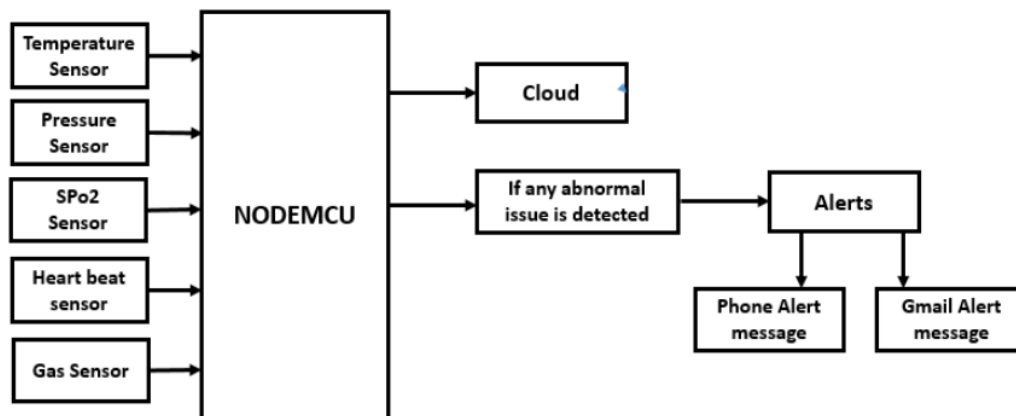


Fig. 3.3 Block Diagram of proposed system.

CHAPTER 4

HARDWARE DESCRIPTION

4.1 NODE MCU

The Espressif Systems tiny regulator is known as the ESP8266. The ESP8266 is a stand-alone Wi-Fi company that sells as a tool from an internal miniature control system to WiFi, and it is frequently suited for autonomous applications. This kit includes a USB connector as well as a comprehensive collection of pin-outs. You can attach a NodeMCU computer to your PC with a micro USB link and quickly burn it like an Arduino device. It is likewise quickly breadboard agreeable.

ESPlorer is an IDE (Integrated Development Environment) for ESP8266 gadgets. It's a multi stage IDE, can be utilized in any OS climate, this just implies that it runs on Windows, Mac OS X or Linux. Upheld stages: • Windows(x86, x86-64) • Linux(x86, x86-64, ARM delicate and hard buoy) • Solaris(x86, x86-64) • Mac OS X(x86, x86-64, PPC, PPC64) This product permits you to set up a sequential interchanges with your ESP8266 module, send orders, and transfer code and substantially more. Prerequisites: • You need to have JAVA introduced in your PC. On the off chance that you don't have, go to this site: <http://java.com/download>, download and introduce the most recent variant. It contains an introduction to JAVA (seven or more adjustments). • To finish the project example provided in this guide, you must uninstall the NodeMCU firmware from your ESP8266. This is the simplest method for stripping Node MCU firmware for Section 4 of this guide.

ESPlorer is an IDE for gadgets ESP8266 (Integrated Development Environment). It is a multi-stage IDE that can be used in any OS environment, it just means that it is running on Windows, Mac OS X or Linux. Stages of upgrading: • Windows (x86, x86-64) • Mac OS X • Mac OS X • Linux(x86, x86-64, fragile ARM, and hard boot) (x86, x86-64, PPC, PPC64) This product allows you to create, submit orders, pass code and more sequential exchange with your ESP8266 module. Preconditions: • You must add JAVA to your computer. If you have not, go this website and update, download and introduce the latest version of <http://java.com/download>. It includes introduction of JAVA (seven or more adjustments). • You must strip your ESP8266 with NodeMCU

firmware in order to conclude the sample project introduced in this Guide. Here is the easiest way to strip Node MCU firmware for Section 4 of this guide.

4.1.1 ⁷ESP8266 ARDUINO CORE

As Arduino.cc started growing new MCU sheets dependent on non-AVR processors like the ARM/SAM MCU and utilized in the Arduino Due, they expected to adjust the Arduino IDE so it would be generally simple to change the IDE to help substitute apparatus chains to permit. These new processors will be assembled using Arduino C/C++. The board manager's and SAM Core's presentations helped to do this. The programming parts used to assemble an Arduino C/C++ source grind to the machine language of the target MCU by the Board Manager and the Arduino assembled of the IDE are one of the 'centers.'

Any inventive ESP8266 fans have set up an Arduino center on the GitHub ESP8266 Core platform for WLAN ESP8266. This is the primary programming development step for the various ESP8266 modules and advancement sheets such as NodeMCUs, referred to as [1]"ESP8266 Core for Arduino IDE."

4.1.2. NODE MCU



Fig.4.1. NODE MCU(ESP 8266)

4.1.3. PIN CONFIGURATION

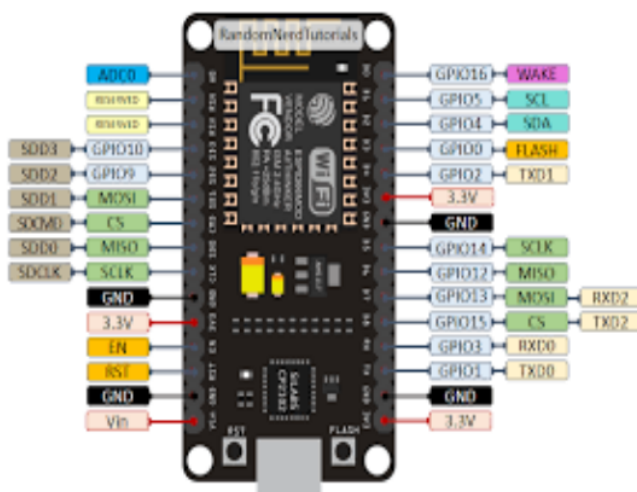


Fig. 4.2. Pin Configuration

4.1.3. PIN CONFIGURATION TABLE

Label	GPIO	Input	Output	Notes
D0	GPIO16	no interrupt	no PWM or I2C support	used to wake up from deep sleep
D1	GPIO5	OK	OK	often used as SDA(I2C)
D2	GPIO4	OK	OK	often used as SDA(I2C)
D3	GPIO0	pulled up	OK	connected to FLASH button, boot fails if pulled LOW
D4	GPIO2	pulled up	OK	connected to on-board LED, boot fails if pulled LOW
D5	GPIO14	OK	OK	(SCLK) SPI
D6	GPIO12	OK	OK	(MISO) SPI
D7	GPIO13	OK	OK	(MOSI) SPI
D8	GPIO15	pulled to GND	OK	(CS) SPI Boot fails if pulled HIGH
RX	GPIO3	OK	RXT PIN	HIGH at boot
TX	GPIO1	TXT PIN	OK	debug output at boot, boot fails if pulled LOW
A0	ADC0	Analog Input	X	

Table.4.1 PIN CONFIGURATION TABLE

4.2 TEMPERATURE SENSOR

Estimation and control of temperature and relative dampness discovers applications in various zones. Nowadays gadgets are accessible ¹² which have both temperature and stickiness sensors with signal molding, ADC, alignment and correspondence interface all worked inside them. The utilization of such brilliant sensors incredibly work on the plan and lessens the general expense. We examined in past about Humidity and temperature estimations with Sensirion's SHT1x/SHT7x sensors. These sensors are fit for estimating both temperature and relative dampness and give completely aligned computerized yields. [14]While SHT1x/SHT7x are extremely precise sensors, they are as yet costly for specialists use. This articles examines the DHT11 sensor which likewise gives adjusted computerized yields to temperature and moistness however is generally part less expensive than the Sensirion sensors. The DHT11 sensor utilizes an exclusive 1-wire convention which we will investigate here and carrying out with the PIC16F628A microcontroller that will get the temperature and moistness esteems from the sensor and show them on a 16x2 character LCD.

The DHT11 sensor is available in a four-pin single box and can supply voltages ranging from 3.5 to 5.5V. It ³¹ can measure temperatures ranging from 0 to 50 degrees Celsius with an accuracy of 2 degrees Celsius, as well as ³¹ relative humidity ranging from 20 to 95 percent with an accuracy of 5%. The sensor has completely optimized computerized rates for all calculations. The device has its own small 1-wire convention, followed by an immediate interface with all of its peripherals, which means that the sensor and a microcontroller are in sync. The convention should be carried out with the sensor precisely prepared in the MCU's firmware. The following timetables depict the MCU and the DHT11 Sensor traveling information convention. With a "Start" signal, the MCU begins transmitting data. As a result, the MCU pin is to be used as yield. Before the knowledge is discharged, the MCU first pulls down to 18 ms and then pulls up to 20-40 ms.

4.2.1. TEMPERATURE SENSOR

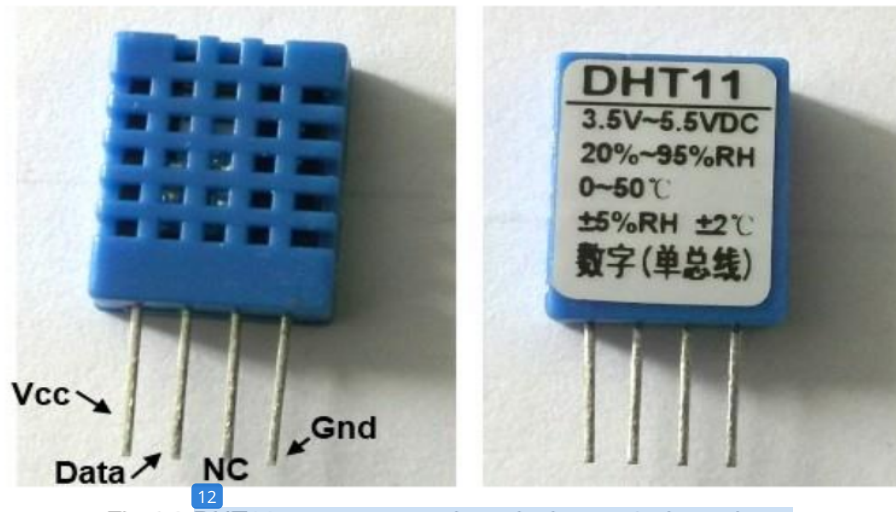


Fig.4.3 DHT11 sensor comes in a single row 4-pin package

4.3 SMOKE DETECTOR/SENSOR

A smoke detector is a smoke sensing device that is typically used as a fire alarm. Commercial protection devices deliver an alert as part of a fire alarm panel, while domestic smoke detectors, also known as smoke alarms, often send a local audible or visual alarm from the detector itself. [4] Plastic enclosures include smoke detectors, which are usually in the shape of a disk with a diameter of about 150 mm (6 in) and a thickness of 25 mm (1 in), though shape and scale vary. Smoke may be detected as a physical process, by optical (photoelectric) detectors, or by both.

Smoking detectors may be used to recognise and deter smoking in places where it is banned. In large commercial, retail, and residential buildings, smoke detectors are typically controlled by a central fire alarm system that is activated by building control and uses a battery restraint. Smoke detectors in the home vary from single battery systems to various battery-backed, interconnected battery-operated devices; and when the electricity goes out, all smoke detectors in the house are activated when one of the interconnected units detects smoke. The risk of dying in a house fire is cut in half in homes with working smoke alarms. The US National Fire Protection Association reports 0.53 deaths in 100 fires in homes with activated smoke detectors, relative to 1.18 deaths in homes without active smoke detectors.

4.3.1 Design

An ionization smoke alarm utilizes a radioisotope. ¹⁰ a distinction because of smoke is distinguished and a caution is created. Ionization indicators are more touchy to the flaring phase of flames than optical identifiers, while optical detectors are more delicate to flames in the early seething stage.

The smoke detector has two chambers, one open to the air and one that does not allow contaminants to enter. The radiation source sends alpha particles into two chambers, which are responsible for ionizing certain air atoms. [9] Formalized paraphrase The below are examples: [9] The chambers are most likely compounded by a voltage; an electric charge on the particles causes an electric current to flow. There is a high voltage present. The flows in the two chambers ought to be equivalent to they are similarly influenced via pneumatic stress, temperature, and the maturing of the source. In the event that any smoke dust particles ¹⁹ enter the open chamber, a portion of the particles will connect to the particles and not be accessible to convey the current around there. When an ebb and flow contrast between the open and set chambers is detected, an electrical circuit sounds the alarm. The hardware also monitors the battery used to supply or backup power, and sounds an unusual warning when it gets tired.

4.3.2. Smoke Sensor



Fig.4.4 Smoke Sensor

The Ionized gas alarms are usually less expensive to produce than optical locators. [14] They might be more inclined to bogus alerts set off by non-unsafe occasions than photoelectric indicators, and have been discovered to be much more slow to react to commonplace house fires. Some countries in Europe have banned the use of ionic smoke cautions as a result of concerns that they are not reliable enough as various developments have been analyzed. Where a lone-screener is an ionizing smoke detector, fires were usually not viable in the early stages.

4.3.3 Area scope Tabulation

Surface area (square metres)	Type of detector	Height (m)	Ceiling slope $\leq 20^\circ$		Ceiling slope $> 20^\circ$	
			Smax(square metres)	Rmax (m)	Smax (square metres)	Rmax(m)
SA ≤ 80	EN54-7	≤ 12	80	6,6	80	8,2
SA > 80	EN54-7	≤ 6	60	5,7	90	8,7
		$\begin{matrix} 8 \\ 6 < h \leq \\ 12 \end{matrix}$	80	6,6	110	9,6
SA ≤ 30 SA > 30	EN54-5 Clase A1	$\leq 7,5$	30	4,4	30	5,7
	EN54-5 Clase A2,B,C,D,F,G	≤ 6	30	4,4	30	5,7
		$\leq 7,5$	20	3,5	40	6,5

Table.4.2 Area Scope

4.4 SPO2 SENSOR

The Arduino Oximeter sensor can be used to monitor blood oxygen and heart rate on a 16x2 display. SpO2 (blood oxygen saturation) is measured in percent, and BPM (beats per minute) is used to quantify the rate of heart rhythm and pulse. The MAX30100 is a dual pulscreen and oximetry sensor.

Checking SpO2, the immersion level of oxygen in the blood, has gotten a norm of patient consideration across the globe. Pretty much every quiet screen has an inherent or appendable capacity to screen this essential fundamental sign. [13]SPO2 is a circuitous and non in technique for estimating oxygen immersion in blood. It ought to be tried alongside the wide range of various physiological boundaries during precaution or remedial support on a patient screen, or independent gadget.

The SpO2 technology, which is usually measured with one finger, is used to assess the health of the cardiovascular and respiratory systems. The oxygen saturation of a patient is measured non-invasively using a pulse oximeter. This system contains a red and infrared light source, image finders, and a test that allows it to relay light on a daily basis through a translucent, throbbing blood vessel bed, fingertips, or ear cartilage. Hemoglobin oxygenated (O2Hb) and hemoglobin deoxygenated (HHb) absorb red and ultraviolet radiation in unexpected forms. Calculating differences in light ingestion caused by streaming throbs of the blood vessel can be used to determine the amount of hemoglobin immersion in the blood vessel.

Specific variables such as skin types, colours, injuries, scar tissue, tattoo, smooth nail, hypothermia, faintness, prescribing, light obstruction and growth can be influenced by a variety of variables. A sensor, usually paired with the patient's finger, is calculated to use SPO2. SpO2 Creativity has two strategies: transmissive and smart. The communications technique is the most often seen of the two. As seen in Figure 1, transmitting innovations are transmitting red and infrarot light to a photo identification.

4.4.1 Transmission technology of oximeter

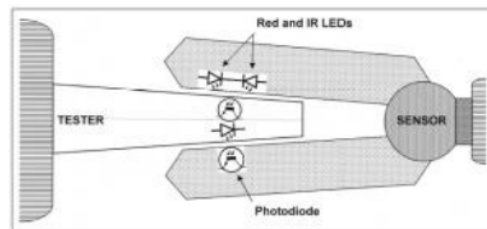


Fig.4.5. Transmission technology of oximeter

Reflective technology is used with the other process for SPO₂. The signal transmitting and the signal receiving are in the same phase in this form, as seen in Figure 2. SPO₂ sensors that reflect light can be mounted on other parts of the body besides the finger, such as the forehead.

4.4.2 Reflective technology

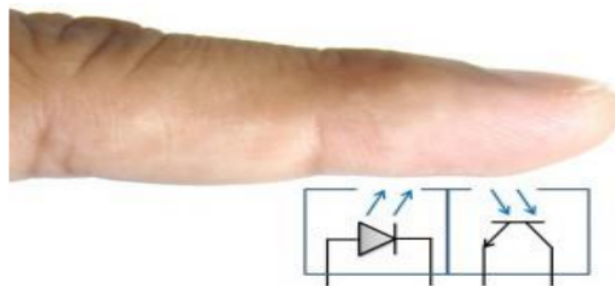


Fig.4.6. Reflective technology

Intelligent innovation, an option in contrast to transmission estimations. A schematic for the same SPO₂ sensor and display model follows this evaluation. An R-course is the name given to this scheme. Figure 3 depicts the relationship between the exact proportion of red and infrared light obtained during human experiments and the visible oxygen immersion. A R-bend is visible. The R-bend is then used in the firmware for a specific instrument and the SPO₂ analyser.

Test systems, calibrators, and practical analyzers for beat oximeters are characterized in the ISO standard 80601-2-61. In contrast to different kinds of clinical gadgets, beat oximeters are not intended to be adjusted outside of the plant. There are no acknowledged techniques for confirming the right adjustment of a heartbeat

oximeter other than human testing. Most SpO2 test gear available is in the practical analyzer class.

4.4.3 R-Curve

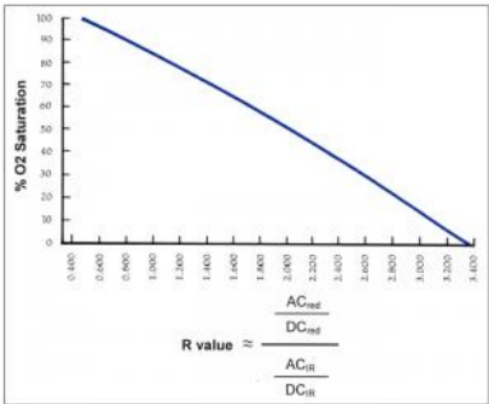


Fig.4.7. Example of R-Curve

As Tobey Clarke says in his book Quality Assurance for Medical Equipment, patient screens should be tested almost every year. 2 The SPO2 sensor is optically most useful analyzers. This takes into account the trial of the sensor, link, and screen. Some practical analyzers input a sign straightforwardly to the screen, just testing the screen. Others can test the link for congruity. Most utilitarian analyzers just test transmissive advances, not intelligent.

A common work process for testing a patient screen or independent SPO2 screen incorporates checking the state of being, performing electrical wellbeing tests, playing out any maker suggested protection upkeep, directing execution testing.

4.4.4. SpO2 Range

SpO2 Range	Condition
85% - 99%	Person was very healthy
84% or less	Person was effected by Pneumonia We have to isolate him/her.

Table.4.3 SpO2 Range

4.4.5 Area scope Tabulation

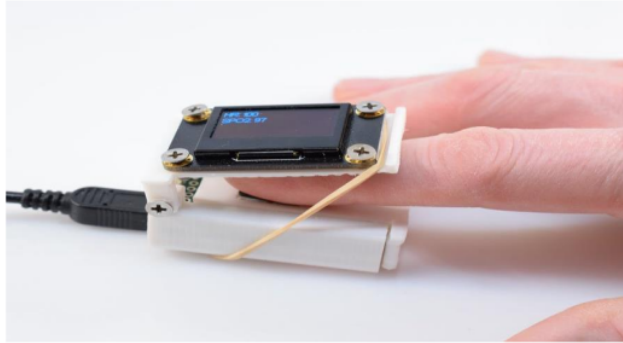


Fig.4.8 SpO2 Sensor

4.5 PRESSURE SENSOR

Barometric pressing factor or environmental pressing factor results from the load of the air on the earth. This pressing factor is around 1 kg for every square centimeter at the ocean level. There are a few units to communicate the environmental pressing factor, that can undoubtedly be changed over to one another. The SI unit for estimating the pressing factor is Pascal (Pa).

4.5.1 Pressure Range

UNIT	1hPa
Pascal(Pa)	100
Atmosphere(atm)	0.000986923
Milibar(MBR)	1
Milimeter Mercury(mmHg)	0.750063755
Inch of Mercury(inHg)	0.02953
Torr(torr)	0.750061683
Pounds per square inch(psi)	0.014503774

Table.4.4. Pressure Ranges

The barometric pressing factor has an around straight converse proportion with the elevation from the ocean level so on the off chance that we measure the barometric pressing factor of a spot, we can compute the height from the ocean level utilizing a straightforward numerical activity.

Perhaps the most widely recognized sensors for estimating the pressing factor and elevation is BOSCH BMP180. The main highlights of this module are:

- Pressure estimation scope of 300 to 1100hPa
- -0.1hPa estimating exactness for total pressing factor
- 12hPa estimating exactness for relative pressing factor
- Low power utilization (5 μ A in standard mode and one example each second).
- Internal temperature sensor with an accuracy of 0.5 °C
- Supporting I2C convention for correspondence
- Fully aligned

4.5.2 Atmospherics pressure Vs altitude

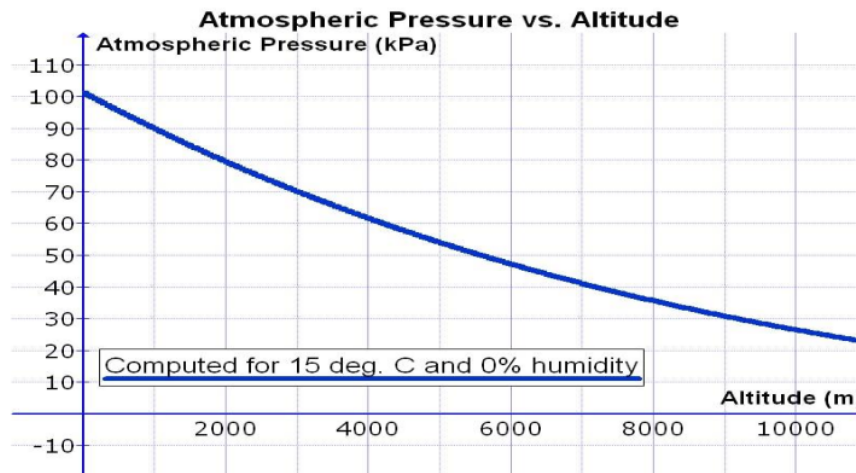


Fig.4.9 Atmospheric Pressure Vs Altitude

The barometric pressing factor has an around direct reverse proportion with the height from the ocean level so on the off chance that we measure the barometric pressing factor of a spot, we can figure the elevation from the ocean level utilizing a basic numerical activity. First we begin to ascertain the temperature utilizing start Temperature(), at that point we store the temperature in factor T utilizing get Temperature(T). From that point forward, we compute the pressing factor with startPressure(3). The number 3 is the greatest goal that can be changed somewhere in the range of 0 and 3. utilizing get Pressure (P) we store the outright pressing factor in factor P. The measure of this pressing factor is in hPa, which can be changed over to various units as indicated by the past table. The total pressing factor changes with elevation. At the point when eliminate the impact of

that esteem height on the determined pressing factor, The sealevel(P, ALTITUDE) function should be used as indicated in an altitude variable, and in a subjective variable, such as p0, we should store the deliberated value. To figure the altitude, use altitude(P, p0). The height per meter is calculated with this power.

4.5.3 Pressure Sensor

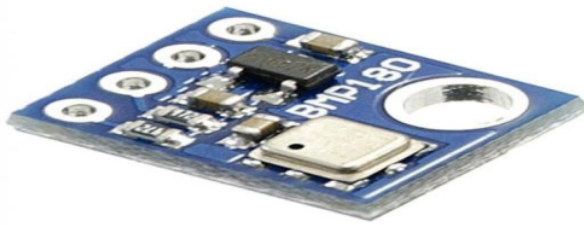


Fig.4.10 PRESSURE SENSOR (BMP 180)

4.6 HEARTBEAT SENSOR

A heartbeat sensor is an electrical instrument that, for example, measures the rate of a person's heartbeat. Internal heat, pulse, and circulatory strain are all important indicators of our stability. Thermometers and an arterial pressure or blood pressure sphygmomanometer are used to measure the internal heat level. The heart rate can be measured in two ways: one needs a physical check of the heartbeat at both wrists and the throat, and the other requires a blood test.

By using Heart Beat Rate system monitoring utilizing Arduino and Heartbeat Sensor to get time to time analysis. You will discover Heartbeat Sensor Principle, which is used by a Heartbeat Sensor and Arduino based Hair Rate Monitoring System.

For athletes, patients when deciding the status of the heart, pulse control is crucial (just pulse). The pulse of the measuring pulse is multiple and the most exact solution is an electrocardiograph. Whatever the case, a Heartbeat sensor is the simpler way to screen the pulse. It appears in different forms and calculations and allows a moment to quantify the pulse. In Wrist Watch (Smart Watches), Smart Phones, chest ties and so on Heartbeat sensors are available Per moment or bpm,

which indicates the times the cardiovascular contraction or extension occurs, is measured in pulsates.

Photoplethysmograph is the standard for the use of the Heartbeat Sensor. In accordance with this law, blood volume changes in an organ are estimated by the light force adjustments across the organ. The light source would usually be an IR LED and the photo sensor would be a photo-detector, such as the photo diode, the LDR, and a photo-transistor. The two unique types of sensors are a transmissible sensor and an intelligent sensor, for example. In a transmissive sensor, the light source and the finder face each other, and the individual's finger should be placed within the transmitter. Again, the intelligent sensor has the light source and the locator next to each other and the individual's finger must be placed in front of the sensor.

4.6.1 Heartbeat Sensor



Fig.4.11 Heartbeat Sensor

4.7 SENSOR CS

A wide variety of temperature sensor ICs are available to operate on the widest possible range of temperature control problems. These sensors of silicone temperature effectively contrast two or three significant ways with the forms previously described. The first one is the spectrum of temperatures. The ostensible IC temperature will operate in temperatures ranging between - 550°C and +150°C. Usefulness is the second important comparison.

Since a silicone temperature sensor is an integrated circuit, it can house a lot of signal processing hardware in the same box as the sensor. There is no compelling reason for the inclusion of compensation loops for the temperature sensor ICs. Some of these are simple circuits that have one of two voltages present. Others use standard detector circuits and voltage comparators to create preprogrammed power. For chip-based frameworks, other sensor ICs combine the base sensing hardware with the input/output and control registers.

Computerized yield sensors usually include a temperature sensor, a single to-advanced (ADC) converter, an advanced double-wire interface and IC operation control registers. Temperature is estimated consistently and can be read any time. The sensor can be taught to screen the temperature and receive a high or low yield pin when a temperature exceeds an adjusted breakpoint, whenever it wants. Lower edge temperature can also be adjusted and when the temperature is under this edge the host may be told. For solid temperature observation in chip-based frameworks advanced yield sensors may also be used.

4.7.1 Sensor LM35

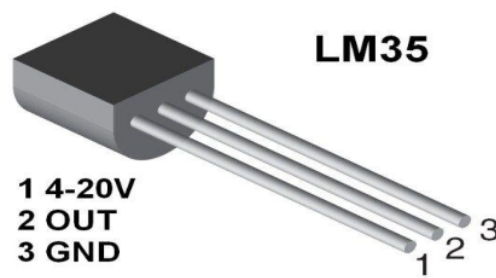


Fig.4.12 Sensor LM35

5 Above temperature sensor has three terminals and required Maximum of 5.5 V inventory. This kind of sensor comprises of a material that plays out the activity as per temperature to fluctuate the opposition. This difference in obstruction is detected by circuit and it figures temperature. At the point when the voltage builds then the temperature likewise rises. We can see this activity by utilizing a diode.

Temperature sensors straightforwardly associated with microchip information and consequently prepared to do immediate and solid correspondence with chip. The

sensor unit can discuss successfully with minimal effort processors without the need of A/D converters.

The LM35 is a temperature sensor model. The LM35 arrangement consists of precision integrated circuits for DTH11 sensors, whose yield voltage is directly proportional to the degree Celsius temperature. The LM35 operates between -55° and +120°C.

- The LM35 can be connected easily in the same way as other integrated circuit temperature sensors. It can always be a high value compared can to bestuck established to a surface and its temperature will be within around the range of 0.01 °C of the surface temperature.
- The temperature controls are well known for environmental and process control applications as well as for testing, measuring and connectivity purposes. The digital temperature is called a sensor that provides 9-bit temperature measurements. Digital temperature metres have outstanding precision and can read from 0 to 70 degrees Celsius with an accuracy of 0.5 degrees Celsius. The optical temperature measurements in degrees Celsius is perfectly matched with these sensors.
- That assumes that the atmospheric temperature of the air is about the same as that of the surfaces. The average temperature of the air supply will be at an equilibrium temperature between the air and surface temperatures, if the air temperature was either higher or lower than the surface temperature.

4.8 SOFTWARE SETUP DETAILS

4.8.1 Arduino c

- Open-source equipment shares a significant part of the standards and approach of free source programming.
- In specific, we accept that individuals ought to have the option to consider our equipment to see how it functions, make changes to it, and offer those changes. To work with this, we discharge the entirety of the first plan documents (Eagle CAD) for the Arduino equipment.

4.8.2 Arduino IDE

Get the most recent adaptation from the download page. You can pick between the Installer (.exe) and the Zip bundles. We propose you utilize the first that introduces straightforwardly all you require to utilize the Arduino Software (IDE), including the drivers. With the Zip bundle you need to introduce the drivers physically. The Zip record is additionally valuable in the event that you need to make a portable establishment.

Arduino is an apparatus for seeming well and good and control a greater amount of the actual world than your work station. It's an open-source actual figuring stage dependent on a straightforward microcontroller board, and an improvement climate for composing programming for the board.

Arduino uno can be used to produce intuitive objects, take in a range of switches and manage a variety of lighting, engines and other real results. Arduino companies should be autonomous or talk to programming on your PC (for example Streak, Processing, MaxMSP.) The sheets may be collected by hand or pre-assembled; the open-source IDE is free to download.

4.8.2 Arduino IDE

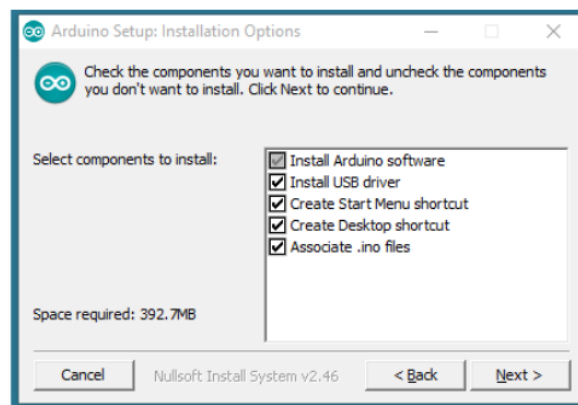


Fig. 4.13 Arduino IDE Software

The Arduino IDE is incredibly modest, but offers most Arduino-based practices a narrow, absolute climate. The top menu bar has the usual options, such as "Document (new, load save, etc.), "Change" (text type, duplicates, glue, and so on), "Device" (for organizing and programming) and "Help." The central section of IDE is a simple word

processor, where the program code can be entered. The base portion of the IDE is dedicated to a return window used to see the accumulation condition.

4.9 UBIDOTS SOFTWARE

The basic components of any ubidot-friendly internet program are: devices, variables, synthetic variables engine, dashboards and events. Within this post, each of these ideas is addressed by identifying with the ubidots of the IoT platform and how you can organize the ubidots apps to better link them to customers.

When your gadgets, factors, and general Application is gathered, give your App a few layers with to study ubidots interior design and how you can utilize Apps, Organizations, and Users to effectively associate yoAur information with the individuals who ought to utilize it.

A Ubidots' gadget is a virtual portrayal of an information source or basically, a resource taking sensor information and communicating said information through an association convention to Ubidots' cloud. for current firmware models and instructional exercises for associating your gadget to Ubidots.

All devices are different, but the standard setup on any device entails:

- A library that ought to be introduced in the gadget's IDE.
- Filling boundaries for validation and association like a TOKEN (for example extraordinary ID for each record or client), gadget and variable marks (for example gadgets and factors extraordinary identifiers in Ubidots), Wi-Fi SSID and Password, contingent upon the gadget and the prerequisites.
- Making API demand (for example a call from a gadget to the web worker). Ubidots' libraries spare the need to physically make these solicitations. In any case, in case you're working with a gadget not as of now in the rundown of upheld equipment, you can pick an availability convention, for example, MQTT or HTTP and make a solicitation utilizing the API likewise.
- Devices are made consequently in Ubidots the first run through a dab is gotten to a client's private TOKEN or an Organizational TOKEN. Tapping the "+" symbol in the upper right corner of any single gadget's screen.

4.9.1 Ubidots software

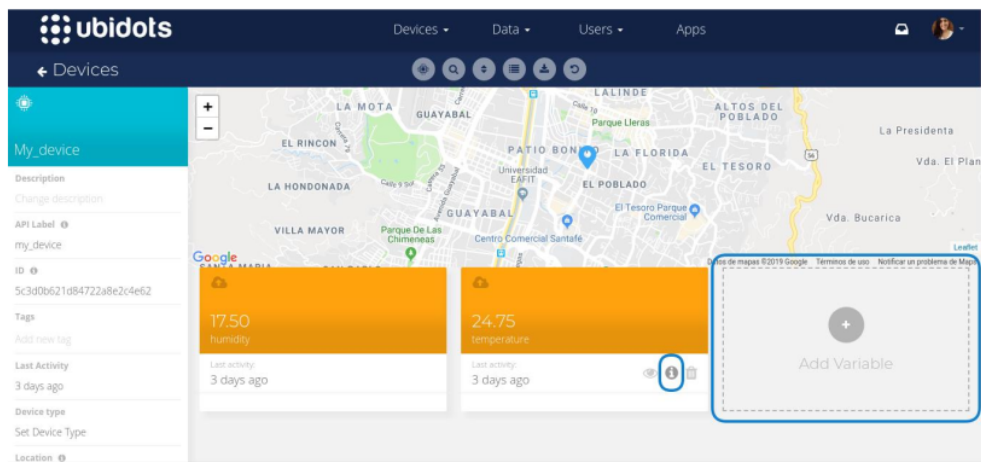


Fig.4.14 UBIDOTS Software

Once a computer is generated and data from the hardware or other data source from a third party is received.

4.9.2 Sensor Connected Information

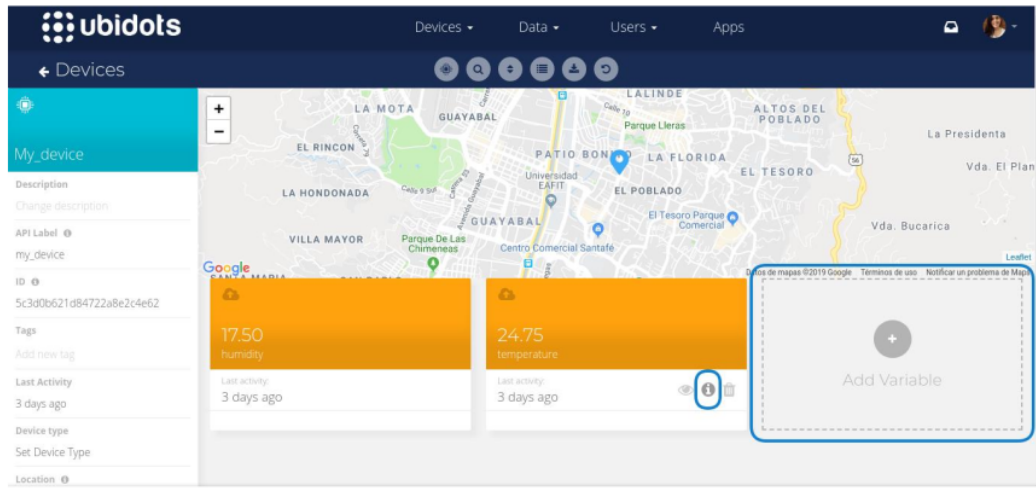


Fig.4.15 Sensors Connected Information

4.9.3 Remote Connection

Ubidots Synthetic Variables (SV) is an easy and efficient way in which raw data in Ubidots' cloud can provide insight. Users will generate synthetic variables using Ubidots SV Engine to measure and enhance data to offer users with a Ubidots controlled application data-driven decision.

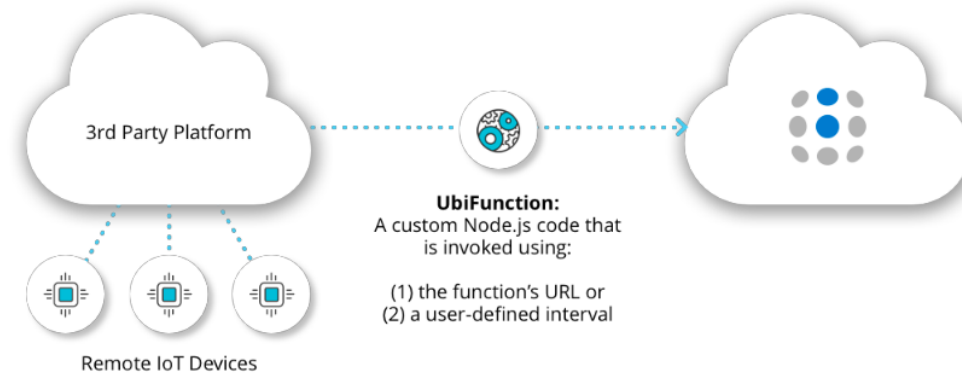


Fig.4.16 Remote Connection

CHAPTER 5

RESULTS AND DISCUSSION

The sensors mounted on the helmet are tested for their capacities for the specified limits and also for their specific work like measurement of oxygen, humidity, temperature, SpO2 level and presence of gas. Alerting system also works well on the grounds of inputs from sensors. When the limits specified to the sensors are crossed then it will automatically triggers a email and message notification to manager or an authorized person. Then he can clear the place where the danger will occur various tests concluded on the smart helmet are summarized in below.

5.1. SENSOR RANGE

Name of Sensor	Set Values
Temperature Sensor	40°C - 45°C
Humidity Sensor	65 Precipitations
SpO2 Sensor	85% - 80%
Gas Sensor	Gases like mixtures Methane
HeartBeat Sensor	72-80 BPM

Table.5.1 Sensors Range



Fig.5.1 Mining Helmet

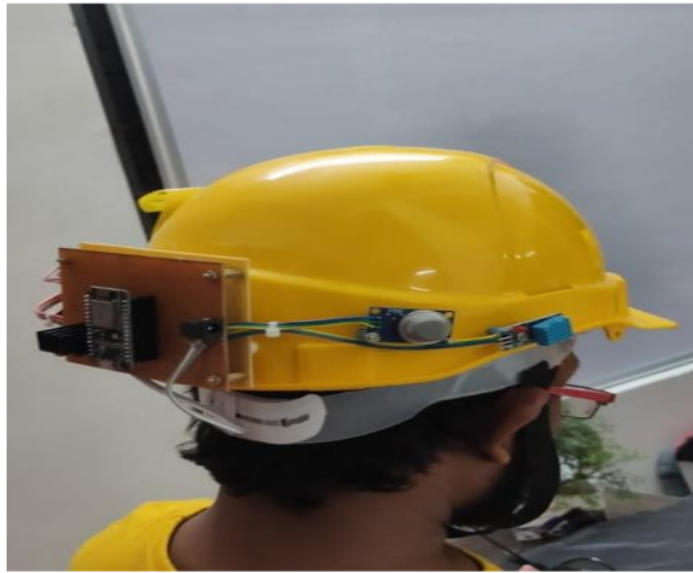


Fig.5.2. Mining Helmet

A sensor which will detect any harmful gasses around the device and alerts is gas sensor. This form of equipment tracks gas leaks or other pollutants and can communicate with a control device to shut down a process automatically. Chemical sensors include a subset of gas sensors. The concentration of gas in the vicinity to a gas sensor is measured. To measure the concentration of a chemical, a gas sensor communicates with it.

The DHT 11 thus has many benefits over a direct track of Kelvin-calibrated temperature sensors so users do not need to subtract a broad constant voltage in output form in order to achieve a comfortable degree of scaling. The DHT 11 allows no external calibrating at standard temperature, with room temperature, of any average accuracy of $\pm 1/4^{\circ}\text{C}$ and $\pm 3/4^{\circ}\text{C}$ to -55 to $+150^{\circ}\text{C}$ temperature range.

These sensors are connected to NodeMcu and Nodemcu will connect to a IoT software called Ubidots and a e-mail and a mobile number will be pre-registered if temperature sensor, gas sensor, SpO2 sensor, heartbeat sensor and humidity sensor detected any abnormal conditions it will auto sends a message alert and e-mail alert.

5.2 RECEIVING END

The helmet unit which collects the temperature, pressure, force and hazardous gas data and SpO2 level of worker has been created in order to alert the control room in case of abnormal condition. The voice transmission system has been implemented to have direct contact with miners in case of emergency situations. Then the authorised person will alerts and vacates the dangerous place to save workers.

5.2.1. Temperature Check

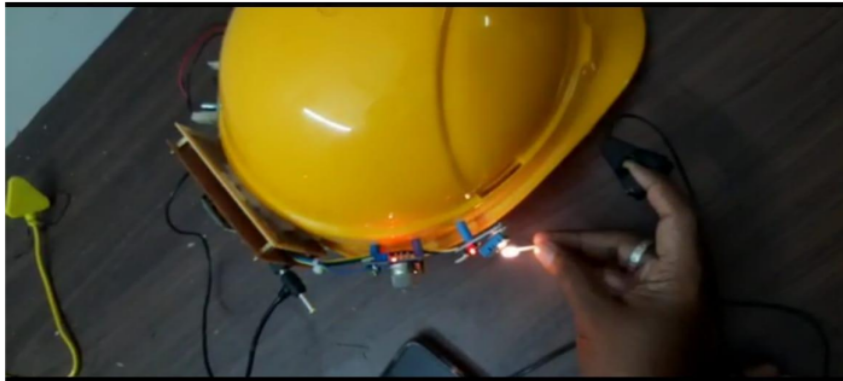


Fig.5.3. Temperature Check

In this temperature check when surroundings had any abnormal changes like increase in temperature than threshold value it will alert a message and notification to authorized number and mail-id.

5.3 ALERTING SYSTEM

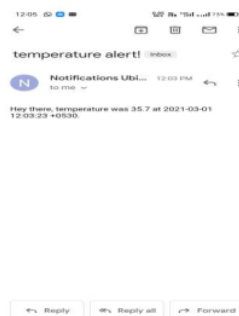


Fig.5.4 Message alert

E-mail is configured to IoT software in uidots and a mobile number is also configured to it once sensor values are exceeded then it will alert through messages.

5.4 SpO2 RESULTS

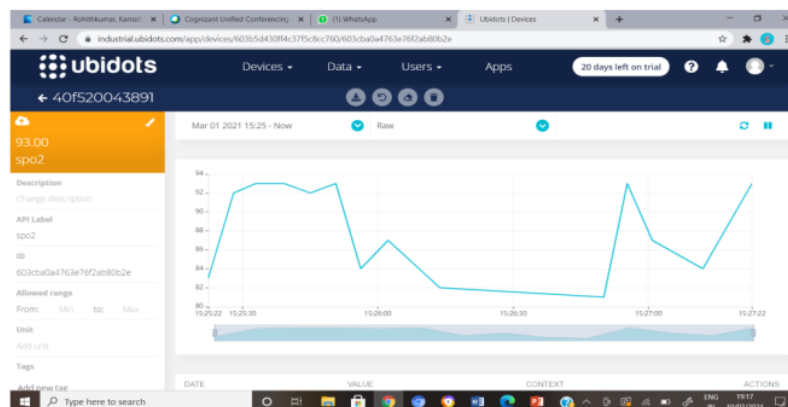


Fig.5.5. Graph of SpO2 Sensor responses.

Live graph monitoring of SpO2 values of a particular worker a authorized person can live monitor and if any abnormal conditions like if oxygen level decreases 85% then a alert will auto generate to manager that SpO2 values.

DATE	VALUE	CONTEXT	ACTIONS
2021-03-01 15:27:22 +05:30	93.00	{}	
2021-03-01 15:27:12 +05:30	84.00	{}	
2021-03-01 15:27:00 +05:30	87.00	{}	
2021-03-01 15:26:55 +05:30	93.00	{}	
2021-03-01 15:26:50 +05:30	81.00	{}	
2021-03-01 15:26:13 +05:30	82.00	{}	
2021-03-01 15:26:02 +05:30	87.00	{}	
2021-03-01 15:25:56 +05:30	84.00	{}	
2021-03-01 15:25:50 +05:30	93.00	{}	
2021-03-01 15:25:45 +05:30	92.00	{}	

Table.5.2 SpO2 Sensor Result Tabulation.

Second to second tabulation monitoring of SpO2 values of a particular worker a authorized person can live monitor and if any abnormal conditions like if oxygen level decreases 85% then a alert will auto generate to manager that SpO2 values. Through this table previous values can also be monitored.

5.5 GAS SENSOR

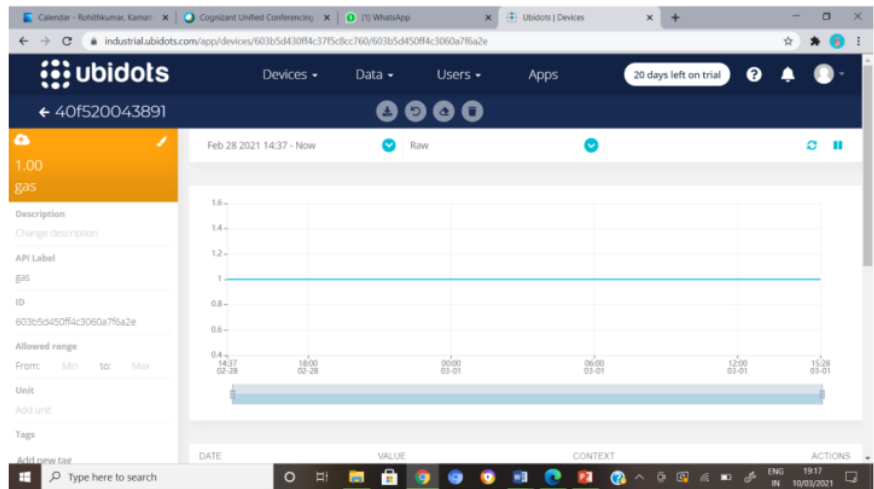


Fig.5.6 Graph of GAS Sensor responses

When a hazardous gases like methane, carbon etc., Gas sensor is a chemical sensor subclass. The gas sensor detects the nearby gas concentration. The gas sensor interfaces with a the quantity of gas concentration these are harmful to workers so if any gases detected alert will send to authorized person.

DATE	VALUE	CONTEXT	ACTIONS
2021-03-01 15:28:14 +05:30	1.00	{}	
2021-03-01 15:28:09 +05:30	1.00	{}	
2021-03-01 15:28:03 +05:30	1.00	{}	
2021-03-01 15:27:57 +05:30	1.00	{}	
2021-03-01 15:27:51 +05:30	1.00	{}	
2021-03-01 15:27:46 +05:30	1.00	{}	
2021-03-01 15:27:40 +05:30	1.00	{}	
2021-03-01 15:27:34 +05:30	1.00	{}	
2021-03-01 15:27:28 +05:30	1.00	{}	
2021-03-01 15:27:22 +05:30	1.00	{}	

Table.5.7 GAS Sensor Result Tabulation

Second to second tabulation monitoring of SpO2 values of a particular worker a authorized person can live monitor and if any abnormal conditions like oxygen level decreases 85% then a alert will auto generate to manager that SpO2 values.

5.6 Pluse Sensor

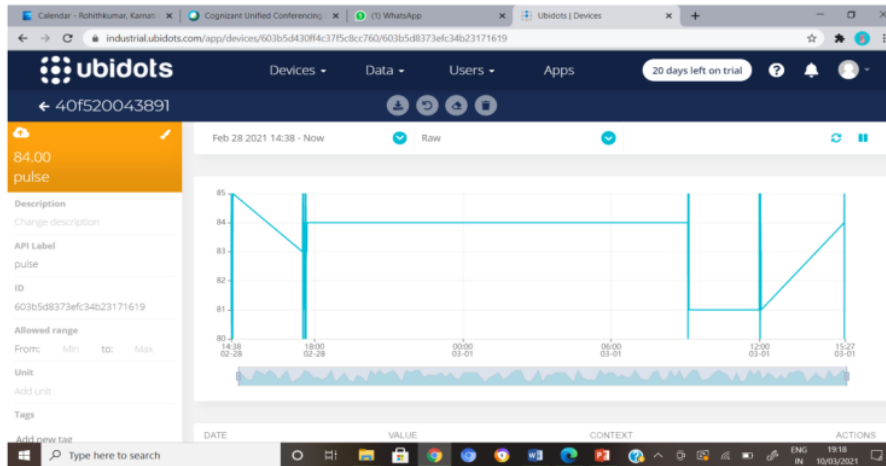


Fig.5.7 Graph of Pluse Sensor responses.

For data collection, this device makes use of the capabilities of a heart pulse sensor. The microcontroller captures and processes a human pulse as data signals. The data will be processed and submitted A more research and visualization IoT platform. The test results were found to be correct as the systems were able to senses and read the cardiac rate at >40 and <60, at >60 and <100, at >100 and <150 at medium heart beat rates.

DATE	VALUE	CONTEXT	ACTIONS
2021-03-01 15:27:22 +05:30	84.00	{}	
2021-03-01 15:27:12 +05:30	85.00	{}	
2021-03-01 15:27:00 +05:30	83.00	{}	
2021-03-01 15:26:55 +05:30	82.00	{}	
2021-03-01 15:26:50 +05:30	85.00	{}	
2021-03-01 15:26:13 +05:30	81.00	{}	
2021-03-01 15:26:02 +05:30	82.00	{}	
2021-03-01 15:25:56 +05:30	84.00	{}	
2021-03-01 15:25:50 +05:30	82.00	{}	
2021-03-01 15:25:45 +05:30	80.00	{}	

Table.5.4 Pluse Sensor Result Tabulation

5.7 Humidity Sensor Results

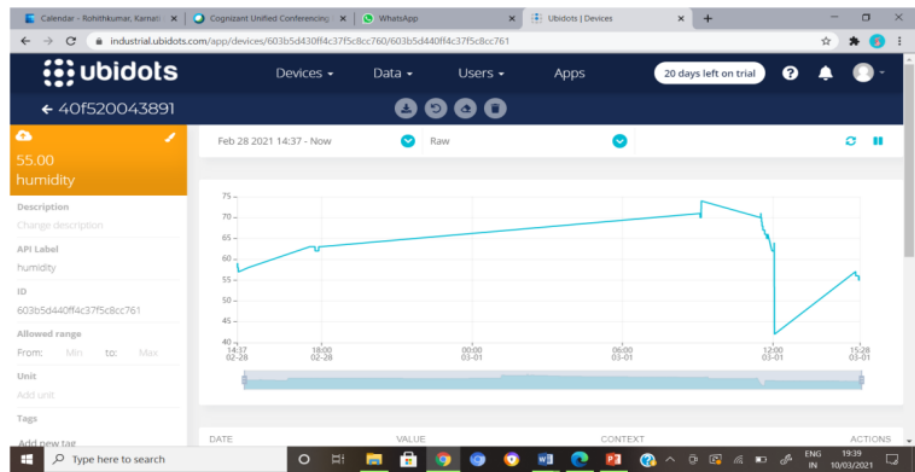


Fig.5.8 Graph of Humidity Sensor responses.

Analog sensors are more complex and have precise measurements that provide constant insight into current conditions. If you attach your analogue sensor to a fine, you can see the tracked value in real time from anywhere. The digital humidity signal is reported by RTU as a binary form of data.

The collected data can be processed locally by quality RTUs against several threshold values. When a threshold is exceeded, they may also produce a numerical signal.. The most advanced RTUs even provide email and text to alert you of emergency situations.

DATE	VALUE	CONTEXT	ACTIONS
2021-03-01 15:27:22 +05:30	84.00	{}	
2021-03-01 15:27:12 +05:30	85.00	{}	
2021-03-01 15:27:00 +05:30	83.00	{}	
2021-03-01 15:26:55 +05:30	82.00	{}	
2021-03-01 15:26:50 +05:30	85.00	{}	
2021-03-01 15:26:13 +05:30	81.00	{}	
2021-03-01 15:26:02 +05:30	82.00	{}	
2021-03-01 15:25:56 +05:30	84.00	{}	
2021-03-01 15:25:50 +05:30	82.00	{}	
2021-03-01 15:25:45 +05:30	80.00	{}	

Table.5.5 Humidity Sensor Result Tabulation

5.8 Temperature Sensor Results

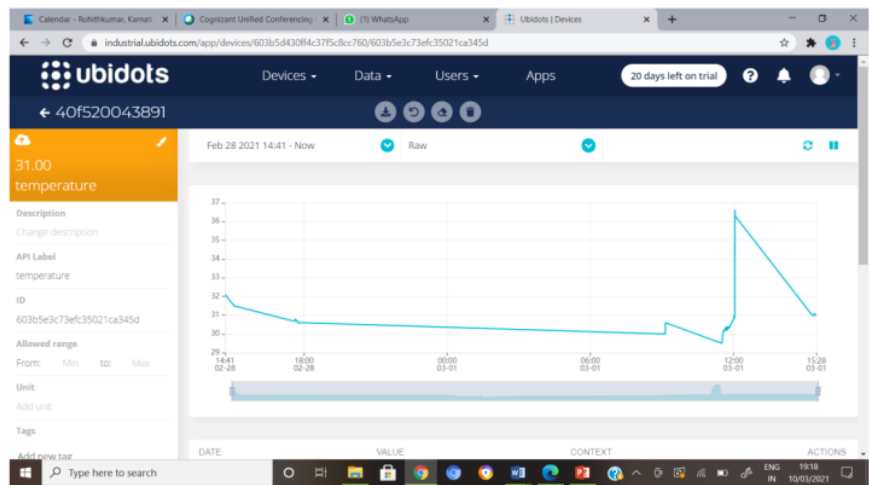


Fig.5.9 Graph of Temperature Sensor responses.

You have to pick the right alarm from the remote site to connect your sensors to your central office to obtain the temperature warning capability Contact the central office with sensors that deal with analog or differential key closures.

DATE	VALUE	CONTEXT	ACTIONS
2021-03-01 15:27:22 +05:30	93.00	{}	
2021-03-01 15:27:12 +05:30	84.00	{}	
2021-03-01 15:27:00 +05:30	87.00	{}	
2021-03-01 15:26:55 +05:30	93.00	{}	
2021-03-01 15:26:50 +05:30	81.00	{}	
2021-03-01 15:26:13 +05:30	82.00	{}	
2021-03-01 15:28:02 +05:30	87.00	{}	
2021-03-01 15:25:56 +05:30	84.00	{}	
2021-03-01 15:25:50 +05:30	93.00	{}	
2021-03-01 15:25:45 +05:30	92.00	{}	

Table.5.6 Temperature Sensor Result Tabulation

Second to second tabulation monitoring of surrounding temperature values at particular worker by a authorized person can live monitor and if any abnormal conditions like oxygen level decreases 45°C then a alert will auto generate to manager

that temperature is high at working place. Through this table previous values can also be monitored

CHAPTER 6

CONCLUSION

A system was developed in real time to monitor perspective from a single vantage point of underground mine workers. It will alert mine workers working at deep places to save their lives from any disasters. In future by using more sensors such as dust, vibration, water leakage etc will get additional safety to workers. Also we can use number of slave and improve the data transmission distance. This system will detect worker's body oxygen level second to second to the particular manager or authorize because recent time many got exposed to COVID-19, So if one worker got effected whole work should be remains paused.

This which then result in the formation of a network in which the different nodeMCUs are stored. As lot, the broker, saves the information and, in the case of a dangerous situation, sends alerts to those who need to know. This application offers excellent security for coal mining employees and decreases the risk of jobs being mismanaged or killed. The Internet of Things ideals have allowed us to generate less power and more cost-effective ways to achieve greater productivity while still saving electricity. This campaign demonstrates that IoT technology can impact companies big and small around the world, so that potential people who can learn from their advantages will reap the rewards of automation and successful communications.

6.1 FUTURE SCOPE

There are some environmental parameters in their workplace for the working citizen in coalmines. Methane, carbon monoxycarbon, SpO2 and temperature are dangerous. In future by using more number of slave to improve the data transmission distance. So, the rescue operation of miners can be carried out. The system can be enhanced further. The system can be enhanced by installing additional measurement equipment for blood pressure control and all potential safety challenges such as dust, vibration, water flow, fall detection etc can be tracked through additional sensors.

CHAPTER 7

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SMART HELMET

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