SMART HELMET USING IOT

A FINAL YEAR PROJECT REPORT

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ABSTRACT

An area of concern in construction is safety. The intention of this project is to design a smart helmet that has an array of sensors to track health and safety parameters. Falls of workers are able to be detected by IoT devices and SMS messages are sent to permit prompt action. Other crucial health indicators like temperature and heart rate are also monitored and any deviation requiring attention is reported to the employers. An Internet of Things (IoT) device is implemented in this project to design a Safety Helmet for Construction Workers which enables remote monitoring of health indicators using real time data. This project consists of two parts. First the health and secondly the safety part. In the health area, the sensors will measure more environmental variables such as humidity and pollution, to enhance the wearer's capability. The worker's heart is monitored by a sensor that measures their heartbeat, and a thermistor measures their body temperature, making them these kinds of wearables. Each of these features is first collected by the Arduino microcontroller and then transmitted to an IOT server. Using IoT connectivity along with a medical signal sensing network, various topics of conversation can be had and data can be transmitted to a server. A dangerous situation will be notified, warned and provided to the users from the sensor node as soon as it is deemed detrimental. The smart IoT gateway provides an invaluable service of offering cloud access alongside a local web server and doing the needed calculations on the information. After obtaining the data, it will be forwarded to the IoT cloud for safekeeping, as well as Android applications along with additional data.

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ABBREVIATIONS

IoT	Internet of Things
GSM	Global System for Mobile Communication
LCD	Liquid Crystal Display
LED	Light Emitting Diode
USB	Universal Serial Bus
TX	Transmitter
RX	Receiver
PWM	Pulse Width Modulation
ADC	Analog to Digital Converter
RTD	Resistance Temperature Detector
BPM	Beats Per Minute
ECG	Electrocardiogram
D2D	Device to Device
TOA	Time of Arrival
AOA	Angle of Arrival
DRL	Direct Radio Link
IVU	In Vehicle Unit
RFID	Radio Frequency Identification

CHAPTER 1
INTRODUCTION

Construction work involves considerable safety risks with threats such as falls, heat exhaustion, exposure to poisonous gases, and physical strain, making the safety of workers a major concern. In order to deal with these dangers ahead of time, this project presents a Smart Helmet that uses IoT technology to monitor health and environment in real-time. The helmet is coupled with the set of sensors such as accelerometers, gyroscopes, gas sensors, temperature and humidity sensors, heart rate sensors, and GPS modules—all interfaced to a microcontroller like the ESP32 or Arduino Nano IoT.

These devices are integrated to gather the real-time data through Wi-Fi or GSM. On the occurrence of anomalies like a fall, gas leak, or abnormal vital signs, the system automatically provides alerts with relevant information (worker ID, location, event type) to supervisors via a web or mobile dashboard. The interface also shows real-time metrics, alert logs, worker movement heatmaps, and multi-helmet management tools, greatly improving situational awareness and emergency response.

This predictive function enables site managers to anticipate and avoid incidents instead of simply responding to them. The user-friendly interface of the system facilitates rapid and informed decision-making, leading to better site management. Future upgrades can even further boost its abilities by integrating edge computing for rapid on-device processing, supplementary biosensors such as EEGs and air quality detectors, helmet-to-helmet communication via mesh networking, and voice-activated emergency capabilities. With explainable and self-learning AI models, the Smart Helmet becomes an ever-changing, intelligent safety solution that not only shortens response time but also learns to respond differently in changing environments beyond transforming traditional protective gear into an all-encompassing worker safety system.

CHAPTER 2

LITERATURE REVIEW

2.1 K.L.Nishitha, R. Ravi Kumar. Health Monitoring System (2020) intelligent health monitoring system of the long-span railway stayed requires the comprehensive knowledge of instrumentation, analytical and information processing technologies with the knowledge and experiences in design, construction, operation and maintenance of railway equipment for long-term monitoring the performance throughout its lifecycle. It is necessary to perform sensor-based structural monitoring for identifying the conditions in order to assure the structural safety and to evaluate the operational performance. The considerations for deploying a proper monitoring system are appropriate sensor instrumentation, robust signal acquisition, reliable signal processing, and intelligent signal and information processing. Sensor and hardware instrumentation, signal transmission, signal acquisition and analysis are schematically described mainly. Fire and gas sensors are used to protect entire train system. And for passenger safety, we are attaching a wireless RF system. With this advanced equipment, the exact dangerous spot is known with in less time.

2.2 Premalatha1, R.P. Keerthana, R. Abarna Human Health Monitoring System (2021) moving into a new era of healthcare, new tools and devices are developed to extend and improve health services, such as remote patient monitoring and risk prevention. In this concept, Internet of Things (IoT) and Cloud Computing present great advantages by providing remote and efficient services. In India many patients are dying because of heart attacks and reason behind that they are not getting timely and proper help. To give them timely and proper help first we want to continuous monitoring of patient health. The fixed monitoring system can be used only when the patient is on the bed and this system is only available in hospitals. The system is developed for home use by patients that are not in critical condition but need to be constant or periodically monitored by clinician or family. In any critical condition the SMS is send to doctor or any family member.

2.3 C.Senthamilarasi, J.Jansi Rani, B.Vidhya , H.Aritha. A Smart Patient Health Monitoring System Using Iot (2022) the healthcare monitoring systems has emerged as one of the most vital system and became technology oriented from the past decade. Humans are facing a problem of unexpected death due to various illness which is because of lack of medical care to the patients at right time. The primary goal was to develop a reliable patient monitoring system using IoT so that the healthcare professionals can monitor their patients, who are either hospitalized or at home using an IoT based integrated healthcare system with the view of ensuring patients are cared for better.

2.4 S. J. Jung and W. Y. Chung studied the Flexible and scalable patient's health monitoring system in 6LoWPAN (2007) the advantage of this enabling factor is the combination of some technologies and communications solution. The results of Internet of Things are synergetic activities gathered in various fields of knowledge like telecommunications, informatics and electronics.

2.5 K. S. Shin and M. J. Mao Kaiver studied a cell phone based health monitoring system(2009) with self-analysis which incorporates IoT a new paradigm that uses smart objects which are not only capable of collecting the information from the environment and interacting the physical world, but also to be interconnected with each other through internet to exchange data as well as information.

2.6 Hadi Supriyanto, Ismail Rokhim, Vincent Eliezer "Smart Helmet for Monitoring Construction Workers Using IoT-based ESP32 and LoRa"(2024) this study introduces a smart helmet equipped with an Inertial Measurement Unit (IMU) sensor to detect falls and monitor worker orientation and movement in real-time. Utilizing ESP32 and HELTEC LoRa32 V2 for signal transmission, the system employs MongoDB for data storage and Real-Time Locating System (RTLS) for positioning. The MPU9250 9DOF sensor, combined with Sensor Fusion and Kalman Filter algorithms, enhances the accuracy of sensor data measurements. The research demonstrates the helmet's capability to monitor workers' movements and detect work accidents in the construction sector.

2.7 Manar Al Naabi, Dr. Khoula Al Harthi "Developing a Smart Hard Hat for Employees Who Work on Construction Sites"(2023) this project focuses on proposing an IoT-based solution—a wireless sensor network (WSN)—to develop a smart hard hat aimed at monitoring workers' health conditions, safety, and location on construction sites. The study investigates the challenges and risks associated with hard hats in construction environments and analyzes current solutions to enhance smart hard hat functionality, thereby improving overall employee safety.

2.8 B. Kartik, Manimaran P "IoT-Based Smart Helmet for Hazard Detection in Mining Industry" (2023) addressing safety in the mining sector, this research presents a smart helmet system that offers real-time monitoring of temperature and hazardous gases like CO, CH_4, and LPG. The system includes features such as fall detection, helmet removal alerts using a limit switch, and emergency notifications to supervisors. The wireless sensor network enables base stations to monitor underground mine conditions effectively, enhancing worker safety.

2.9 Sapna Patel, Ayush Goyani, Risit Dhameliya, Bhavik Naiya "Smart Helmet for Mining Workers"(2023) this study presents a smart helmet designed for miners, incorporating features like two-way communication, hazardous gas detection, helmet removal notifications, collision detection, a panic switch for emergencies, and continuous monitoring of environmental conditions such as temperature and pressure. Additionally, GPS functionality is integrated to track the miner's location, aiming to enhance safety in the mining industry.

2.10 Yogya Indupuru, K. Venkatasubramanian, V. Umamaheswari "Design and Implementation of Smart Helmet Using Low Power MSP430 Platform" (2018) this research focuses on the design and implementation of a smart helmet utilizing the low-power MSP430 microcontroller platform. The helmet is equipped with various sensors to monitor environmental and physiological parameters, aiming to enhance worker safety in hazardous environments. The study emphasizes the importance of low power consumption and efficient data processing in wearable safety devices.

CHAPTER 3

EXISTING SYSTEM

3.1 BLOCK DIAGRAM FOR EXISTING SYSTEM

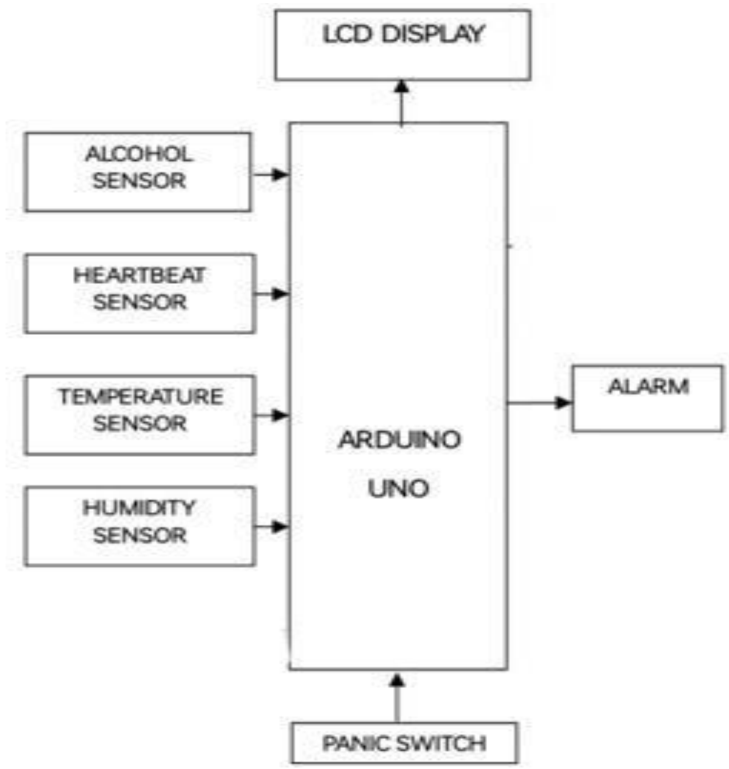

Fig.3.1 Block diagram of Existing System

3.1.1 Challenges in existing system

Fig.3.1 shows,the system revealed in the diagram is confronted with a number of technical as well as practical challenges that may influence the performance and reliability. One of the most severe challenges is sensor precision and reliability since the alcohol sensor, heartbeat sensor, temperature sensor, and humidity sensor may all register noisy, unstable, or imprecise readings, particularly under changing environmental conditions. This may result in false alarm or missed crucial detections. Another important challenge is the small processing and memory capacity of the Arduino Uno, which might not be able to cope with multiple sensor inputs, real-time LCD refreshes and alarm triggers concurrently, with the result being slow response time or even system crash. Power management is also challenging, especially if the system is battery powered, since there are sensors (most notably gas sensors) that draw large currents, leading to abrupt shutdowns if power management is not executed properly. Further challenges come from human factors though the panic switch is essential during emergency conditions it can be activated unintentionally, leading to inappropriate alarms and desensitization to real notifications. The standard LCD display may not sufficiently show all vital information due to restricted size and low visibility under certain conditions. With time, environmental factors such as dust, humidity and very high or very low temperatures may also damage sensors and render the system less dependable. The system's utility for monitoring and analysis is also hindered by its inability to record events or provide remote alerts in the lack of data storage or communication modules. All these problems indicate that in order to make the system more reliable and effective, cautious design modifications, improved hardware choices, robust software handling and enhanced user interface planning are needed.

3.1.2 Potential Issues Detection:

The System can detect potential issues. For instance, if alcohol, heartbeat, temperature and humidity sensors are poorly maintained or not calibrated, they might produce unstable or faulty measurements, which can lead to missed detection or false alarms. Other issues that might degrade sensor accuracy are electrical noise, sensor drift, and environmental fluctuations such as dust and humidity. Being a low-performance microcontroller with small memory, the Arduino Uno can struggle to process the panic switch, refresh the LCD, handle multiple sensors' inputs, and trigger alerts simultaneously. This can lead to system delays, loss of data, or freezing. Furthermore, the alarm system can also suffer from spurious triggering, which will trigger unnecessary interruptions and reduce user trust if the right signal filtering and checking are not applied. Unless the panic switch is designed with proper debounce logic or confirmation mechanisms, it can be pressed unintentionally, leading to false emergency alerts. Because the LCD display is too small and has poor legibility, especially in low lighting conditions, vital information can be missed during emergencies. A potential issue is power consumption since sensors like the alcohol sensor can draw high current, and if not managed with proper power management, could cause battery drain or system failure. In addition, the system's ability to monitor long-term and respond to emergencies is constrained since it does not have a means of data logging or remote communication, which would enable it to neither retain past data nor alert external parties in cases of emergencies. Generally, these are problems that necessitate enhanced sensor management, increased system stability, effective power management and better communication.

CHAPTER 4

PROPOSED SYSTEM

4.1 Block Diagram Proposed system

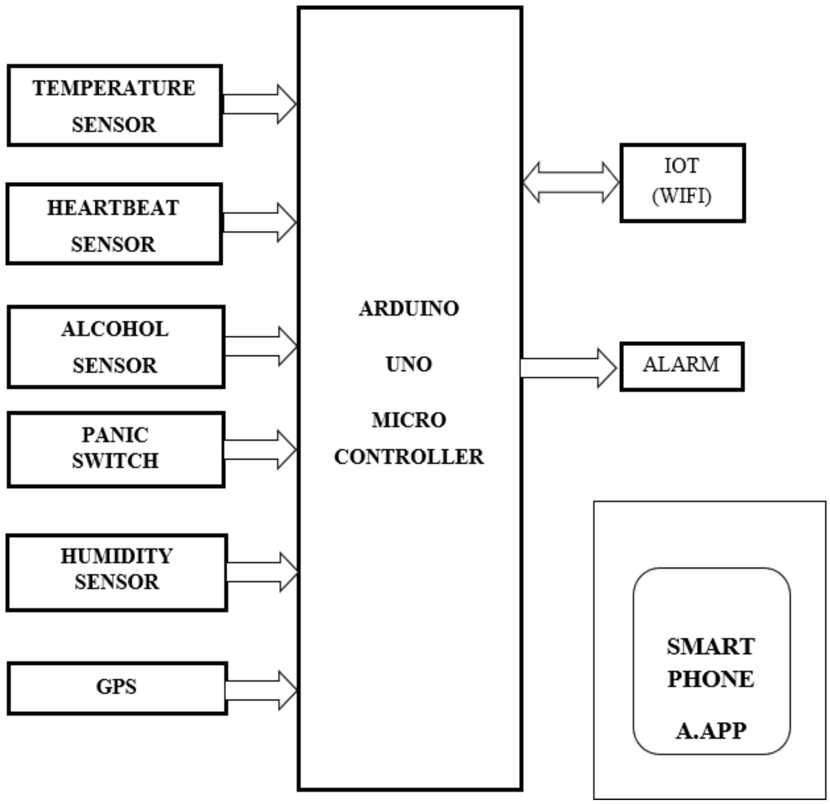

Fig.4.1 Block diagram of Proposed System

4.2 Construction of the proposed system

The project's aim is to develop a smart helmet track the health and safety system for employees based on(IOT). We are continuously tracking a worker's full time with IOT via various patient health level parameters. For every parameter different sensors are utilized to track health level and surroundings in real time we are utilizing IOT. Body temperature is tracked using temperature. Patient heart sensor employed heart beat level monitoring, thermistors employed body temperature level monitoring panic switch employed emergency alerting alcohol sensor employed worker is drinking find system. Emergency message intimated in case of abnormal status of patient through IOT server or android app to the doctor and its relatives with in GPS location. All parameters are saved in Arduino microcontroller and then it will be transferred in IOT server in the case of emergency IOT server is monitored by doctor he will stop the treatment for the respective workers.

Thus efficient monitor workers real time system. The objective of the proposed IoT-based smart helmet system is to provide the most safety to workers in hazardous environments. The sensors and wireless communication technologies are embedded in this system to offer real-time environmental and worker health monitoring. The helmet includes gas sensors to detect hazardous gasses, a heart rate sensor to monitor employees' health.

In case of an emergency, GPS tracking ensures the current location of the workers is traced. In order to recognize trends and predict potential risks the helmet transmits data to a cloud-based platform. The objective of the proposed IoT enabled smart helmet system is to provide workers in risky situations with the utmost safety.

There are several sensors and wireless communication technologies are implemented in this system to offer real-time environmental and worker health monitoring. The helmet includes gas sensors to detect harmful gasses, a heart rate sensor to check employees' health, and an accelerometer and gyroscope for fall detection. GPS tracking ensures the worker's location is monitored in case of emergency.

4.3 Flow Chart for Proposed System

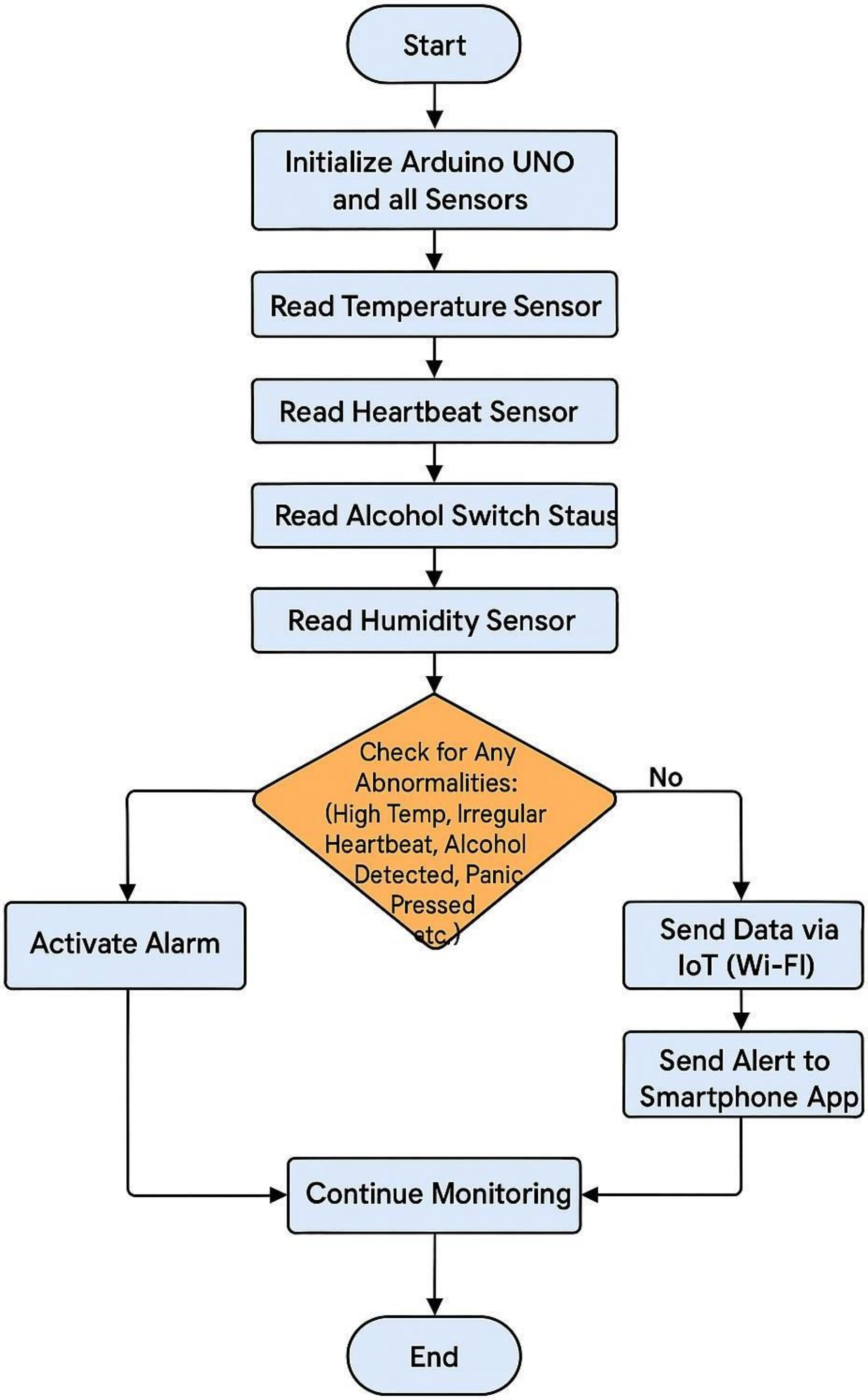

Fig.4.3 Flow chart

Fig.4.3 the Flow chart of health monitoring and safety system starts by resetting Arduino UNO microcontroller as well as all the sensors coupled with it like temperature, heartbeat, alcohol, humidity and GPS modules. As soon as initialized, the system reads data in sequence from each sensor. Starting with the body temperature measurement then monitoring the user's heartbeat in order to spot any abnormalities. Then, it scans for alcohol using a sensor, which may be important in the case of applications like driver monitoring or safety in the workplace. It also takes humidity from the surroundings which could be useful towards situational awareness or health-oriented analysis.

Upon capturing all the sensor data, the system processes the data to check for any anomaly like increased body temperature, unusual heart rate, presence of alcohol or triggering a panic switch. In case an anomaly is identified, an alarm is instantly generated to inform the environment. At the same time, the information is communicated using IoT through a Wi-Fi module and an alert is sent to a connected smart phone application to inform guardians, medical staff or emergency contacts.

If no serious problems are encountered or following notification handling, the system keeps going in a loop to maintain real-time health and safety monitoring. This ongoing procedure allows the system to respond instantaneously during crisis situations, thereby making it perfect for personal care, worker protection and driver surveillance applications.

CHAPTER 5

HARDWARE DESCRIPTION

5.1 Hardware requirements:

1. Arduino Uno
2. Temperature Sensor
3. Heartbeat Sensor
4. Alcohol Sensor
5. Panic Switch
6. Humidity Sensor
7. Wifi (IoT)
8. Alarm

5.1 Arduino Uno

Fig.5.1 Arduino/Genuino Uno is an ATmega328P-based microcontroller board. It consists of 14 digital input/output pins (6 of which are PWM capable), 6 analog inputs, a 16 MHz quartz crystal, a USB port, a power jack, an ICSP header and a reset button. It has all the necessary components to supply the microcontroller; just plug it into a computer via a USB cable or supply it with an AC-to-DC adapter or battery and you are ready to go. You can experiment with your UNO without worrying too much about messing up, worst case you can replace the chip for a few dollars and start over.

"Uno" is one in Italian and was selected to commemorate the launch of Arduino Software (IDE) 1.0. The Uno board and Arduino Software (IDE) version 1.0 were the reference Arduino versions, now advanced to later releases. The Uno board is the first among a series of USB Arduino boards, and the reference model for the Arduino platform for a very large list of current, previous or obsolete boards see the Arduino index of boards.

Fig.5.1 Arduino Uno Board

Specifications:

Power – The Arduino/Genuino Uno board can be powered through the USB connector or some external supply through mechanical means. The power source is selectable automatically. The power source may be external (not through USB) from an AC-to-DC adapter (wall-wart) or battery. The adapter connection can be accomplished by inserting a 2.1mm center-positive plug into the board power jack and battery leads can be plugged into the POWER connector GND and Vin pin headers. The board can process an external supply voltage of 6 to 20 volts. Note that powering under 7 volts may cause the 5 volt pin to grow less than five volts, and the board may fail or become unstable. Powering above 12 volts may cause the voltage regulator to overheat, and destroy the board. Anywhere from 7 to 12 volts is acceptable and recommended.

The pins for power are as follows

•Vin - The voltage input to the Arduino/Genuino board when powered from an external source (as opposed to 5 volts from the USB port or other regulated power source). Supply voltage in through this pin, or, if supplying voltage through the power jack, access it via this pin.

•5V - This pin provides a 5V regulated output from the board's regulator. The board can be powered through the DC power jack (7 - 12V), the USB connector (5V), or the board's VIN pin (7-12V). Providing voltage through the 5V or 3.3V pins skips the regulator and will ruin your board. Don't do it.

•3V3 - 3.3 volt supply, provided by the on-board regulator. The maximum current draw is 50 mA.

•GND - Ground pins.

•IOREF - This pin on the Arduino/Genuino board supplies the voltage reference with which the microcontroller runs. A properly engineered shield can read the voltage at this IOREF pin, and can determine which power supply to for power, or enable voltage translators at the outputs to function with 5V or 3.3V.

Memory - The ATmega328 has 32 KB (0.5 KB of which is used by the bootloader). It has 2 KB of SRAM and 1 KB (1 million read and write cycles) of EEPROM (could be read and written with the EEPROM library).

Input and Output - Check the mapping of Arduino pins to ATmega328P ports, as the mapping for the Atmega8, 168, and 328 is the same as well.

Any of the 14 digital pins of the Uno can be used by providing input or output for a pin using the pinMode(),digitalWrite(), and digitalRead() functions. They all operate at 5 volts. Each pin can source or sink 20 mA as a recommended operating condition, and have an internal pull-up resistor (which is off by default) of 20-50k ohm. The I/O pin specification states that no more than 40mA should flow through any I/O pin at any time.

functionalities by means of the SPI library.

• LED: 13. Onboard LED is controlled by digital pin 13. When the pin is set to a HIGH value, the LED is turned ON; and when the pin is set to a LOW value, the LED is turned OFF.

• Analog A4 or SDA pin and Analog A5 or SCL pin. Used to initiate TWI communication by means of the Wire library.

The Uno has 6 analog inputs, A0 to A5, each providing 10 bits of resolution (i.e. 1024 values). They default to measuring a range from ground to 5 volts; although it is possible to modify the top of their range via the AREF pin.

A few other pins are also available to you on the board:

• AREF - The analog input reference voltage. Used in conjunction with analogReference().

• Reset - Pull this line LOW to reset the microcontroller. This is typically used to create a reset button on shields to enable the one on the board.

Communications - The Arduino/Genuino Uno has a variety of capabilities to communicate with a computer, another Arduino/Genuino, or other micro-controller. The ATmega328 provides UART TTL (5V) serial communication available through digital pins 0 (RX) and 1 (TX). The board features an ATmega16U2 that bridges this serial communication to USB and appears as a virtual com port to software on the computer.
For more details, please refer to the documentation. As for SPI communications, employ the 1 SPI library.

Also know as Software Reset, Automatic Reset means that there's no need for a physical button to be pressed prior to the reset for the Arduino/Genuino Uno board. It is designed to automatically reset courtesy of the software running on the computer it is connected to. One of the flow control lines DTR of the ATmega8U2/16U2 is bound to the reset line of the ATmega328 which triggers a reset through a 100 nanofarad capacitor. This line when asserted (driven low) causes the reset line to drop long enough to reset the chip. Through this, the Arduino Software (IDE) can use this ability and allows users to upload code merely by pressing the upload button in the interface toolbar. This means that the boot loader can have a shorter timeout, since the dropping of DTR is well timed with the start of the upload.

This configuration is able to achieve other effects as well. If the Uno is plugged into a computer that uses either Mac OS X or Linux, it resets on every connection into it from programs (through USB). For then next half a second or so, the bootloader is executing on the Uno. Even though it is designed to ignore broken data, that is, anything other than a new code upload`, it will receive the first few bytes of data sent to the board once a connection is established. If a drawing on the board gets one-time custom configuration.

compatible with both the board that employs the AVR, which works with 5V and with the Arduino Due that works with 3.3V. The second one is a not connected pin, reserved for future use.

•Stronger RESET circuit.

•Atmega 16U2 replace the 8U2.

Working of Arduino Uno:

The Arduino Uno runs on the ATmega328P microcontroller as its central element, serving as the board's brain. Upon turning on the Arduino, the ATmega328P begins compatible with both the 5V board that works with the AVR and the Arduino Due which works with 3.3V. The second one is a not connected pin, reserved future use. Stronger RESET circuit. Atmega 16U2 replace the 8U2.

The Arduino Uno contains an ATmega328P microcontroller and that microcontroller is the "brain" of the board. Once powered on, the ATmega328P begins executing the program you have loaded into flash memory . Programmers write programs (called sketches) using the Arduino IDE, then compile the program and upload them to the microcontroller through the USB port. The ATmega328P includes a 16 MHz crystal oscillator to run synchronous operations with clock signals. The ATmega328P has 32 KB of flash code storage, 2 KB of SRAM to execute programs, and 1 KB of EEPROM for non-volatile data. The Arduino Uno has 14 digital input/output pins (6 of these can be used as PWM outputs) and 6 analog input pins to allow the board to connect to many sensors, actuators, and other electronic devices. It can read an input(s) (like temperature input from a sensor or a button pressed) and based on the user programmed program it will alter some data.

5.2 Temperature Sensor:

Fig. 5.2 Temperature Sensor, is a type of resistor whose resistance varies with temperature. The word is a portmanteau of thermal and resistor. Thermistors are widely used as inrush current limiters, temperature sensors, self-resetting overcurrent protectors, and self-regulating heating elements. Thermistors differ from resistance temperature detectors (RTD) in that the material used in a thermistor is generally a ceramic or polymer, while RTDs use pure metals. The temperature response is also different; RTDs are useful over larger temperature ranges, while thermistors typically achieve a higher precision within a limited temperature range [usually −90 °C to 130 °C].

Fig.5.2.1 Temperature Sensor

Basic operation:

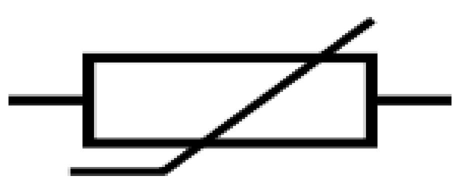

Fig.5.2.2 Thermistor symbol

The resistance of the majority of ordinary types of thermistor decreases as the temperature increases. They are referred to as negative temperature coefficient, or thermistors. Observe the -t° beside the circuit symbol. A typical thermistor is constructed using semiconductor metal oxide materials. (Semiconductors possess resistance characteristics between that of conductors and insulators.) As temperature increases, an increasing number of charge carriers become available and the resistance decreases.

Although less often used, it is possible to manufacture positive temperature coefficient, or ptc, thermistors. These are made of different materials and show an increase in resistance with temperature.

5.3 Heart Beat Sensor:

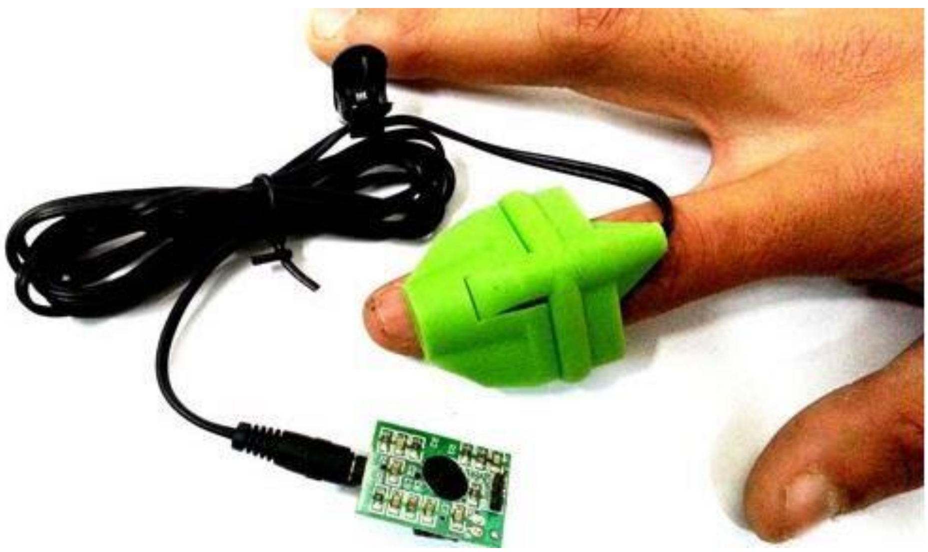

Fig.5.3.1 Heart Beat Sensor

Fig.5.3 is a Heartbeat sensor it is used to make comparatively stable relation with respect to the tip of a user's fingertip. More precisely, a gadget is disclosed that comprises three elastic bands extending upward from one piece of elastic material that constitutes the base portion for supporting the heartbeat sensor. In order to fit the user's fingertip, the bands have been shaped. A U-shaped channel with a uniform cross-sectional area is established by the bands and base portion in one embodiment of the invention. In this embodiment, a wedge-shaped holding structure for the heartbeat sensor is configured to be supported by the base portion, creating a reduction in the cross-sectional area established by each band and the wedge-shaped holding structure along the longitudinal length of the base portion. Each band establishes a smaller cross-sectional area relative to the base section in one form of the invention.

The invention offers an apparatus for positioning a heartbeat sensor in a comparatively fixed relationship to a user's fingertip. The apparatus comprises a base section for supporting the heartbeat sensor, and a pressure generating means attached to the base section for supporting the fingertip of the user against the heartbeat sensor, the pressure generating means having means for making pressure between the heartbeat sensor and the fingertip of the user greater at the tip end of the user's fingertip than at the base end of the user's fingertip. A base portion and three flexible bands that go up and above the base section are formed from a single sheet of elastic material in one embodiment of the invention. Each band is configured to hold a portion of the user's fingertip and partially forms an arch with respect to the base area. Furthermore, there is a retaining structure for retaining the heartbeat sensor, which is in the form of a wedge whose thickest end is positioned closer to the user's fingertip. The base component is meant to support the holding framework.

One strip of material is again split into a base section and three upward-reaching bands in another embodiment of the invention. Each band forms a smaller cross-sectional area along the length of a base section. The base portion is altered to accommodate a holding structure for the heartbeat sensor. So that the band can hold the fingertip end and establish the minimum cross-sectional area, the user's fingertip is held between the base portion and the bands. Therefore, the aforementioned two embodiments press most on the portion of the fingertip nearest to its end as opposed to the one that is farthest from it.

Heart Beat Sensor Circuit:

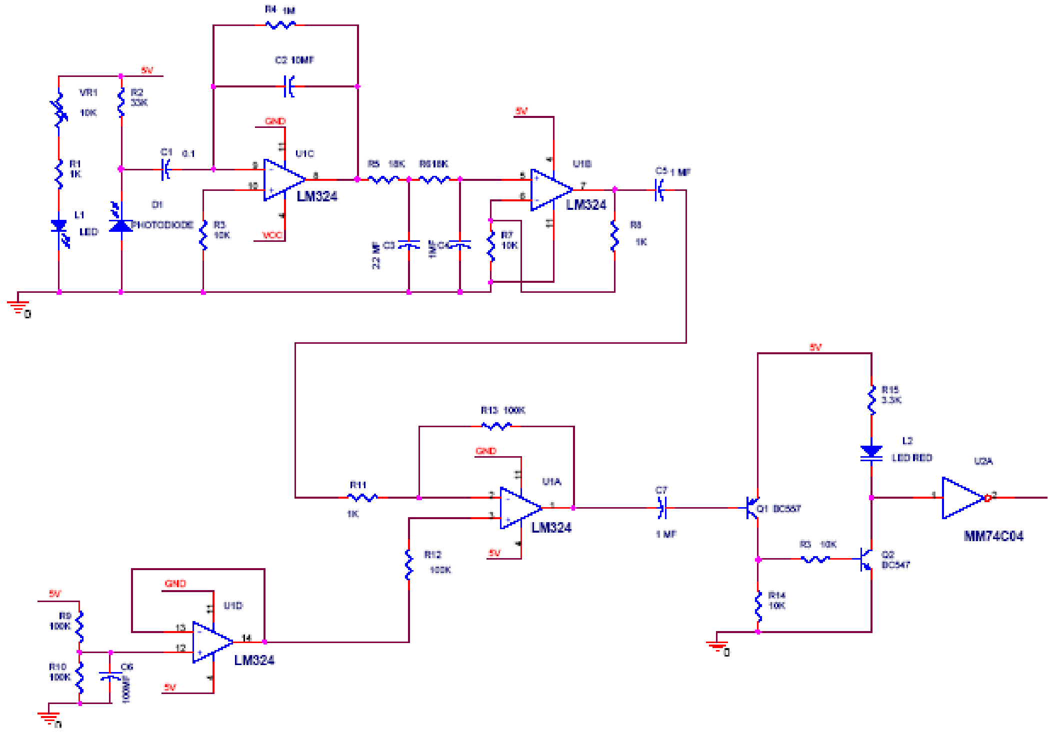

Fig.5.3.2 Heart Beat Sensor Circuit

Heart Rate:

Heart rate is a term to refer to the rate of the cardiac cycle. It is one of the four vital signs. Typically, it is determined as the number of heart contractions (beats) in one minute and given as "beats per minute" (bpm). For information on embryofetal heart rates, see "Heart". The heart beats up to 120 times a minute during childhood. When at rest, the adult human heart rates approximately 70 bpm (men) and 75 bpm (women) but the rate is different among the individuals. The reference range is usually between 60 bpm (if less referred to as bradycardia) and 100 bpm (if more, referred to as tachycardia). Athletes may have resting heart rates that are considerably lower. The pulse is the easiest way to estimate heart rate, but it will be deceptive when cardiac output is low in some of the heart beats (as is the case in some of the arrhythmias) since the heart rate can be much higher than the rate of the pulse.

Measuring of Heart Rate:

- Pulse rate (which in the majority of individuals is the same as heart rate) can be taken anywhere on the body where an artery is near the surface. These locations are wrist (radial artery), neck (carotid artery), elbow (brachial artery), and groin (femoral artery). Pulse can also be taken directly over the heart. NOTE: Do not use the thumb for taking heart rate.
- Producing an electrocardiogram, or ECG is among the most accurate ways of measuring heart rate. Continuous electrocardiographic monitoring of the heart is commonly performed in most clinical environments, particularly in critical care medicine. Commercial heart rate monitors also exist, which include a chest strap with electrodes. The signal is received by a wrist receiver for display. Heart rate monitors allow precise measurement to be made continuously and can be applied during activity when measurement by hand would be impossible or would prove difficult (e.g., when the hands are engaged).
- It is also common to find heart rate by listening, via a stethoscope, to the movement created by the heart as it contracts within the chest.

Circuit Working Description:

This circuit is programmed to monitor the heart rate. Heart rate is monitored by IR transmitter and receiver.

Infrared transmitter is a kind of LED which radiates infrared rays usually referred to as IR Transmitter. Likewise, IR Receiver is used to capture the IR rays being transmitted by IR transmitter. A very crucial note is that IR transmitter and receiver must be set in straight line to one another. IR receiver and IR transmitter are mounted on the pulse rate sensor. You clip the pulse rate sensor on the finger, when you are willing to take the pulse rate measurement.

IR receiver is connected to the Vcc with the help of resistor which performs as potential divider. The potential divider output is fed to the amplifier section.

When power supply is ON, IR transmitter sends the rays to the IR receiver. Based on the blood flow, the IR rays are broken. Because of that IR receiver conduction is broken so variable pulse signals are produced in the potential divider point which is fed to the A1 amplifier via the capacitor C1. The coupling capacitor C1 is employed to prevent the DC component since the capacitor reactance is function of the frequency. For DC component the frequency is zero hence the reactance is infinity now capacitor behaves as open circuit for DC component. The amplifier section is built by the LM 324 quad operational amplifier.

It has four independent, high gains and internally frequency compensated operational amplifiers designated as A1, A2, A3 and A4 amplifiers. The pulse varying from the potential divider is amplified by the A1 amplifier. In this amplifier capacitor C2 is coupled in parallel with feedback resistor to filter out any DC component in the amplified signal. If there is any spike in the amplified signals, they are filtered by the C3 and C4 capacitors. The signal after filtration is again amplified by the A2 amplifier. Then amplified signal is provided to inverting input terminal of comparator. The comparator is built by the A4 amplifier where reference voltage is provided to non-inverting input terminal. The reference voltage is provided by the A3 amplifier. Then the comparator compares the two signal and delivered the +12v to -12v square wave pulse at its output. Then the square wave signal is provided to base of the BC 557 and BC547 switching transistors in order to convert the TTL voltage 0 to 5v level. Lastly the TTL output is provided to MM 74C04 inverter to invert the square pulse. Then the final square wave signal is provided to microcontroller or other interfacing circuit in order to monitor the heart rate.

5.4 Alcohol Sensor

Fig. 5.4 is a Blood alcohol content (BAC), also called blood alcohol concentration, blood ethanol concentration, or blood alcohol level is most commonly used as a metric of alcohol intoxication for legal or medical purposes.

Blood alcohol content is usually expressed as a percentage of alcohol (generally in the sense of ethanol) in the blood. For instance, a BAC of 0.10 means that 0.10% (one tenth of one percent) of a person's blood, by volume (usually, but in some countries by mass), is alcohol.

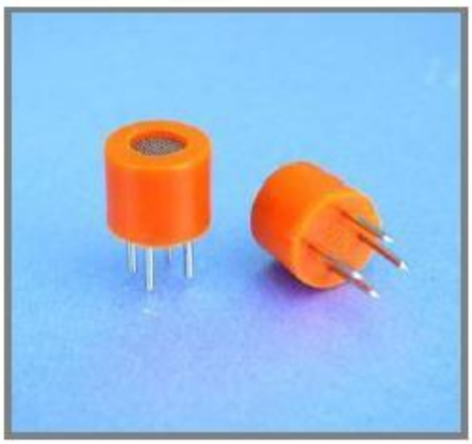

Fig.5.4.1 Alcohol Sensor

This alcohol sensor is suitable for detecting alcohol concentration on your breath, just like your common breathalyzer. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration.

Alcohol Gas Sensor MQ-3 Features:

- 5V DC or 5V AC
- Requires heater voltage
- Operation Temperature: -10 to 70 degrees C
- Heater consumption: less than 750mW

Dimensions:

- 16.8mm diameter
- 9.3 mm height without the pin

Alcohol Sensor Circuit:

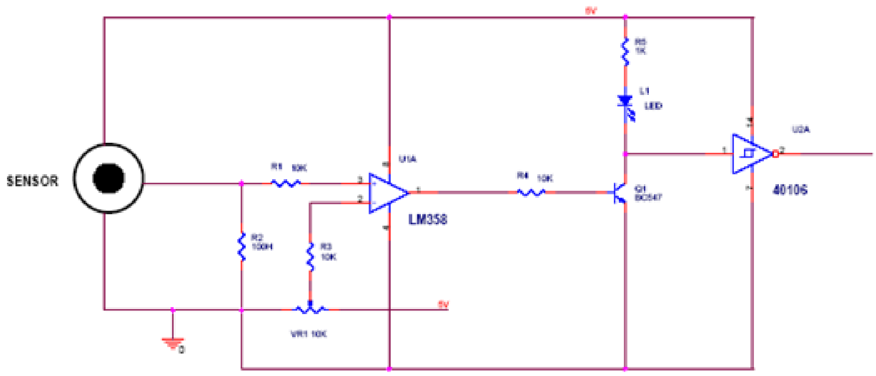

Fig.5.4.2 Alcohol Sensor Circuit

Alcohol Sensor:

Perfect sensor to use to sense the presence of a hazardous alcohol drive or in a service station, storage tank setting. This sensor can be simply integrated into an alarm unit, to ring an alarm or provide a visual signal of the LPG level. The sensor has great sensitivity along with a fast response time. The sensor also senses iso-butane, propane, LNG and cigarette smoke.

Features:

- High Sensitivity
- Detection Range: 100 - 10,000 ppm iso-butane propane
- Fast Response Time: <10s
- Heater Voltage: 5.0V
- Dimensions: 18mm Diameter, 17mm High excluding pins, Pins - 6mm High

Circuit Description:

The gas sensor is the unique sensor which is designed to sense the gas leakage. In the gas sensor, the supply voltage is provided to input terminal. The output terminals of the gas sensor are connected to non-inverting input terminal of the comparator. Here the comparator is built using operational amplifier LM 358. The reference voltage is provided to inverting input terminal. The reference voltage is based on the intensity of the desired gas. When there is no leakage the non-inverting input is greater than inverting input so the output of the comparator is positive voltage which is applied to the base of the switching transistor BC 547. Thus the transistor is in conducting state. Here the transistor is working as switch so the collector and emitter will be closed. The output is drawn from collector terminal. Now the output is zero which is fed to hex inverter 40106. When there is leakage of gas the inverting input voltage is greater than non-inverting input. Now the comparator output is -12V so the transistor is cutoff region. The 5v is fed to hex inverter 40106 IC. Finally, the final output data is fed directly to microcontroller to decide the gas leakage.

5.5 Humidity Sensor:

Fig.5.5.1 Humidity Sensor

Fig. 5.5.1 the humidity sensor, also called a hygrometer, measures and regularly reports the relative humidity in the air. They can be utilized in humidors or wine cellars, as well as in houses for those with humidity-related ailments and as a component of HVAC systems. Moreover, autos, office and industrial HVAC systems, and weather reporting and forecasting stations can all employ humidity sensors. Relative humidity is sensed through a humidity sensor. That is, it records both the air's moisture content and its temperature. The ratio of air's actual moisture content to its capacity for containing moisture at the temperature is relative humidity, which is expressed in terms of a percentage. Changes in relative humidity result from temperature changes since more moist air exists when air is warm.

The most widely used type of humidity sensor employs so-called "capacitive measurement." This type is based on electrical capacitance, or the fact that two closely located electrical conductors can produce an electrical field between them. The sensor consists of two metal plates with a non-conductive polymer film sandwiched between them. The film absorbs moisture from the air, and the moisture causes slight changes in the voltage difference between the two plates. These changes are interpreted into digital readings of the level of moisture in the air.

Humidity Sensor Circuit

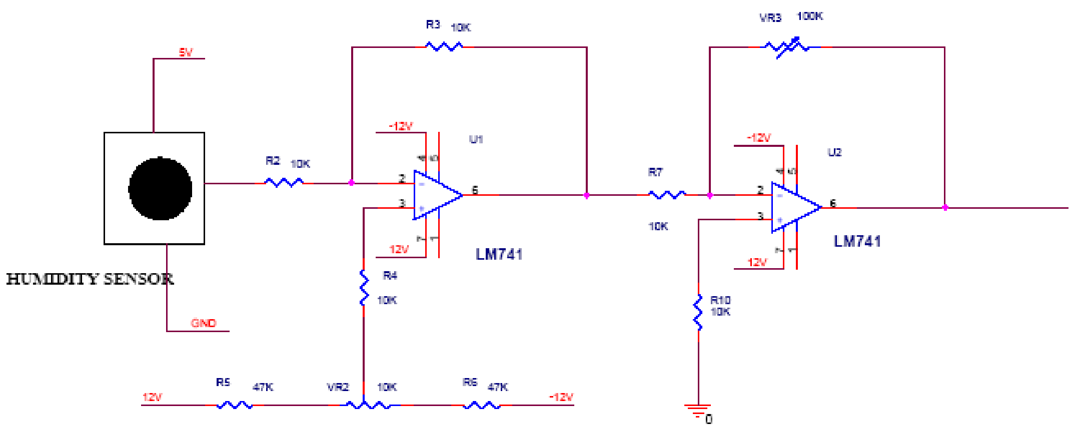

Fig.5.5.2 Humidity Sensor Circuit

Humidity:

Humidity is the quantity of water vapor present in a sample of air. There are three methods of measuring humidity: absolute humidity, relative humidity, and specific humidity. Relative humidity is the most common measurement of humidity since it is used on a regular basis in weather forecasts. It's a crucial component of weather forecasts since it tells us the probability of precipitation, dew, or fog. Greater relative humidity also makes it warmer outside during summer because it lessens the body's ability to cool itself using sweating by preventing evaporation of perspiration on the skin. This effect is quantified in a heat index table. Warmer air contains more thermal energy than cold air; therefore, more water molecules evaporate and remain suspended in the air as a vapour instead of a liquid. This is perhaps why it is said that warmer air "holds" more water in warmer air, there is more energy available for more water molecules to hold themselves suspended in the air (and break hydrogen bonds which tend to draw water molecules together).

Circuit description:

This circuit is employed to measure humidity level in the atmosphere air. The humidity sensor is employed for the measurement device. The humidity sensor is made up of astable mulitivibrator where the capacitance is changed depends on the humidity level. So the multivibrator generate the changing pulse signal which gets converted into corresponding voltage signal. The voltage signal is provided to invering input terminal of the comparator. The reference voltage is supplied to non invering input terminal. The comparator is designed by the LM 741 operational amplifier.Comparator is compared with the reference humidity level and provided the corresponding error voltage at its output which is passed to next stage of gain amplifier where the variable resistor is connected in the feedback path by adjusting the resistor we can achieve the desired gain. Then the end voltage is passed to microcontroller or other circuit in order to determine the humidity level in the atmosphere.

5.6 Global Positioning System:

The vehicle tracking and navigation systems have introduced this technology into the daily life of the ordinary man. Nowadays, GPS-enabled cars, ambulances, fleets, and police vehicles are common on the roads of developed countries. These systems, also known by a variety of names such as Automatic Vehicle Locating System (AVLS), Vehicle Tracking and Information System (VTIS), and Mobile Asset Management System (MAMS), offer a useful tool.

With SA turned off, GPS accuracy has increased to over 30 meters, making it the perfect location sensor for car tracking systems without the DGPS overhead.

GPS is used in vehicles for both tracking and navigation. Tracking systems allow a base station to monitor the vehicles without the driver's involvement where, as navigation system assists the driver to arrive at the destination. Be it navigation system or tracking system, the architecture is more or less the same. The navigation system will have convenient, typically a graphic, display to the driver that is not required for a tracking system. Vehicle Tracking Systems integrate several well-established technologies. Regardless of the technology employed, VTS comprise three subsystems: a) In-vehicle unit (IVU), b) Base station and c) Communication link. The IVU comprises a responsive position sensor and an intelligent controller along with the proper interface to the communication link. Due to the US Government announcement of the 911E regulation, radio based position technology.

Network Overlay Systems utilize cell phone infrastructure to locate vehicles. The cell centers with added hardware and software measure the time of arrival (TOA) and angle of arrival (AOA) of radio signals from the vehicles to calculate the position of the vehicles. The information is transferred to the tracking centre via the cell link or the conventional link. The other method employed for vehicle location calculates the difference in time for signals from two cell centers to be received by the vehicle.

The IVU performs this calculation and sends the position details to the tracking center via the cell phone link. More prevalent is the method utilized of direct radio link (DRL). Dedicated radio infrastructure and special IVU are utilized in this system to calculate the vehicle location. But all these methods place restriction on the working area. Embedded receivers with GPS give absolute co-ordinates of position at any location, with no restriction on areas.

The most expensive part of a VTIS is the data link. The data link along with an appropriate communication protocol must be chosen following an extensive study of numerous parameters like the bandwidth requirement, number of vehicles to track, expandability, terrain, coverage area etc. Advanced VTIS are connected with data bases having the capability to store information regarding the vehicles like the cargo, storage temperature of perishable commodities, fuel consumption rate etc. Such systems obviously require data link with higher bandwidth. UHF links are ideal for short range without shadow region, as line of sight is required. Cell phone-based systems require minimal investment in infrastructure, but has limited coverage. LEO based systems, on the other hand, are costly and provide largest coverage. The new WAP and GPRS technologies introduced recently promise a lot to VTIS.

5.7 INTERNET OF THINGS (IOT):

The network of physical items, cars, home appliances, and other things embedded with electronics, software, sensors, actuators, and connectivity that enable them to talk, collect, and exchange data is referred to as (IoT).

IoT means the extension of Internet connectivity to a wide range of traditionally dumb or non-internet-connected physical devices and everyday objects, as well as everyday devices such as desktops, laptops, smartphones, and tablets. These devices are fitted with technology that makes them remote-controllable and monitorable, with Internet-based communication and interaction. The Internet of Vehicles, a part of the Internet of Things, is starting to receive more and more attention as autonomous vehicles become increasingly prevalent. Due to the convergence of numerous technologies, machine learning, real-time analytics, commodity sensors, and embedded systems, the Internet of things has evolved in concept.

The Internet of things is facilitated by a variety of conventional areas, such as automation (home and building automation), wireless sensor networks, control systems, and embedded systems.

SMART HOME - IoT devices are part of the broader vision of home automation, which can involve lighting, heating and cooling, media and security systems. Long term benefits might include energy conservation by automatically ensuring lights.

A home automation system or smart home might be built on top of a platform or hubs that manage smart appliances and devices. For example, through Apple's HomeKit, product and accessory makers can make their home products and accessories controlled by an app in iOS products like the iPhone and the Apple Watch. This may be a specific app or iOS native apps like Siri. This can be illustrated in the example of Lenovo's Smart Home Essentials, which is a collection of smart home devices controlled through Apple's Home app or Siri without the existence of a Wi-Fi bridge. There are also smart home hubs specifically marketed as standalone platforms to link various smart home products and these are the Amazon Echo, Apple's HomePod and Samsung's SmartThings Hub.

Medical and healthcare - The Internet of Medical Things or the internet of health things is the use of the IoT for the sake of medical and health purposes, data gathering and analysis for research, and monitoring. This so-called Smart Healthcare created a digitized healthcare system, with available medical resources and healthcare services brought together.

IoT devices can be utilized to facilitate remote health monitoring and emergency notification systems. The health monitoring devices can vary from blood pressure and heart rate monitors to sophisticated devices that can monitor specialized implants, like pacemakers, Fitbit electronic wristbands, or sophisticated hearing aids. Some hospitals have started using "smart beds" that can sense whether they are in use and whether a patient is trying to get up. It is also capable of adapting itself so that proper pressure and support are provided to the patient without involving the nurses in manual interaction. A Goldman Sachs report in 2015 stated that healthcare IoT devices "can save the United States over $300 billion in healthcare spending annually by generating revenue and reducing cost." Further, the application of mobile devices to aid medical follow-up resulted in the development of 'm-health', utilized "to analyze, capture, transmit and store health statistics from multiple resources, including sensors and other biomedical acquisition systems".

Specialized sensors may also be installed in homes to track the health and overall well-being of elderly citizens, as well as to ensure that they are receiving the correct treatment and helping individuals restore lost mobility through therapy too. These sensors form an array of smart sensors that can gather, process, transfer and analyze precious information across various environments, including linking in-home monitoring equipment with hospital-based systems. Other consumer electronics to promote healthy living, including connected weighing scales or wearable heart rate monitors, are possible with the IoT. End-to-end health monitoring IoT platforms also exist for antenatal and chronic patient care, enabling one to monitor health vitals and regular medication needs.

Through 2018, IoMT was not only utilized in the clinical laboratory market but also in healthcare and health insurance markets. IoMT in the health sector is now allowing doctors, patients and others who are involved (i.e. patient guardians, nurses, families, etc.) to be members of a system, where patient records are stored in a database, in which doctors and the rest of the medical team can access the information of the patient. In addition, IoT-based systems are patient adaptable, which means being adaptable to the medical conditions of the patient.

5.8 WIFI

A Wi-Fi enabled device (such as a laptop, game console, smartphone or digital audio player) can connect to the internet when within range of an Internet connected, wireless network. The reach of one or more (networked)access points referred to as hotspots can be as small as a few rooms or as big as several square miles. Coverage in the wider area can rely on a cluster of access points with overlapping coverage. Wi-Fi technology has been successfully employed in wireless mesh networks in London, UK, for Wi-Fi offers service within private homes and offices, too, as well as within public areas at Wi-Fi hotspots established either gratuitously or for commercial purposes. Businesses and companies, like airports, hotels, and restaurants, frequently offer free-use hotspots to attract or serve clients. Hobbyists or authorities who desire to offer services or even advertise business within targeted areas sometimes offer free access to Wi-Fi. By 2008 over 300 city-wide Wi-Fi (Muni-Fi) initiatives had been established. By 2010 the Czech Republic had 1150 Wi-Fi based wireless Internet service providers. Routers that integrate a digital subscriber line modem or a cable modem and a Wi-Fi access point, usually installed in homes and other structures, offer Internet and internetworking to all equipment tuned into them, wirelessly or through cable. With the advent of MiFi and WiBro (portable Wi-Fi router) individuals can easily set up their own Wi-Fi hotspots that tap into Internet over cellular networks.

CHAPTER 6
SOFTWARE DESCRIPTION

6.1 Software Application

- Arduino IDE
- Android Studio

6.2 Arduino IDE

Fig. 6.1 the Arduino IDE is an open-source code editor used to write sketches for Arduino boards. It supports programming languages C and C++ and is supported on Windows, Mac OS X, and Linux operating systems. The Genuino and Arduino board can be connected to the Arduino IDE to upload a sketch saved with the extension. Sketching is an operation performed frequently in the Arduino IDE. Code compilation is simplified by Arduino software that even non-technical individuals can utilize. Each board contains a code-accepting microcontroller that has already been programmed. The main code, or sketch, on the IDE platform creates a Hex File that is sent to the controller in the board. This simplifies learning code compilation for beginners. To insert or modify code, use the five main menus of Arduino software: File, Edit, Sketch, Tools, and Help. The toolbar containing actions such as Verify, Upload, New, Open, Save, and Serial Monitor is vital for ongoing programming.Code is checked using Verify to ensure it's free from errors. Save is utilized to save the present sketch, Open is utilized to open the sketch in the sketchbook, New is utilized to open a new project or sketch, and Upload is utilized to upload code onto the Arduino board. The code editor of the program is an empty space where the code is generated and written. The status of the completion of the operation is shown in the Status bar. Program notifications indicate errors and problems that have arisen during the process of programming and provide explanations and instruction on how to deal with them. While the board options section indicates the type of Arduino board, the program indicates the type of serial ports used to connect the Arduino to a computer. The Tools panel contains a distinct pop-up window called the Serial Monitor, which functions as a stand-alone terminal for sending and receiving serial data. To access it, simultaneously press Ctrl+Shift+M. By helping you debug written sketches, the Serial Monitor enables you to comprehend how your application functions.

Fig.6.2 Arduino IDE logo

To enable the Serial Monitor, your Arduino Module should be plugged into the computer using a USB cable. The following steps can be employed to program an Arduino board: Using the input/output pins of the Arduino board, place electronic components. Connect the Arduino board to a computer using a USB cable. Click "Tools" and then "Board" and "Port" to open the Arduino software. Select the serial port to which the Arduino board is connected. Employ the "Code editor" to compose the programming code, verify it, and then transfer it to the Arduino board. This process ensures that the programming and code are correct.

6.3 Visual Studio Code

Android Studio displays only a fraction of windows available at a time to take full advantage of the limited screen space and avoid frustration. Context-sensitive windows refer to those which appear only when the context demands, while others remain hidden until you decide to show them or, conversely, remain open until you decide to hide them. Knowing the uses of these windows and when and how to show them is critical to getting the most out of Android Studio. We will guide you through handling the windows in Android Studio.

Navigation is probably the most vital aspect of any integrated development environment (IDE). There are hundreds of these assets in an Android project of even medium complexity. Android projects typically comprise many packages, directories, and files. Whether you can easily move around and between these assets will be a considerable influence on how effective you are with Android Studio. We will also show you how to navigate Android Studio in this chapter. Finally, we'll guide you through utilizing Android Studio's help system. Open the HelloWorld project that we created.

CHAPTER 7

RESULT AND DISCUSSION

7.1 Signature analysis of Smart Helmet using IoT

The suggested system, which effectively combines several sensors and communication modules to provide better safety and real-time monitoring. The Central Processing Unit is the Arduino Uno microcontroller, which gathers data from some sensors like temperature, heartbeat, alcohol, panic switch, humidity, and GPS. Every sensor tracks some parameters essential for personal health and safety.

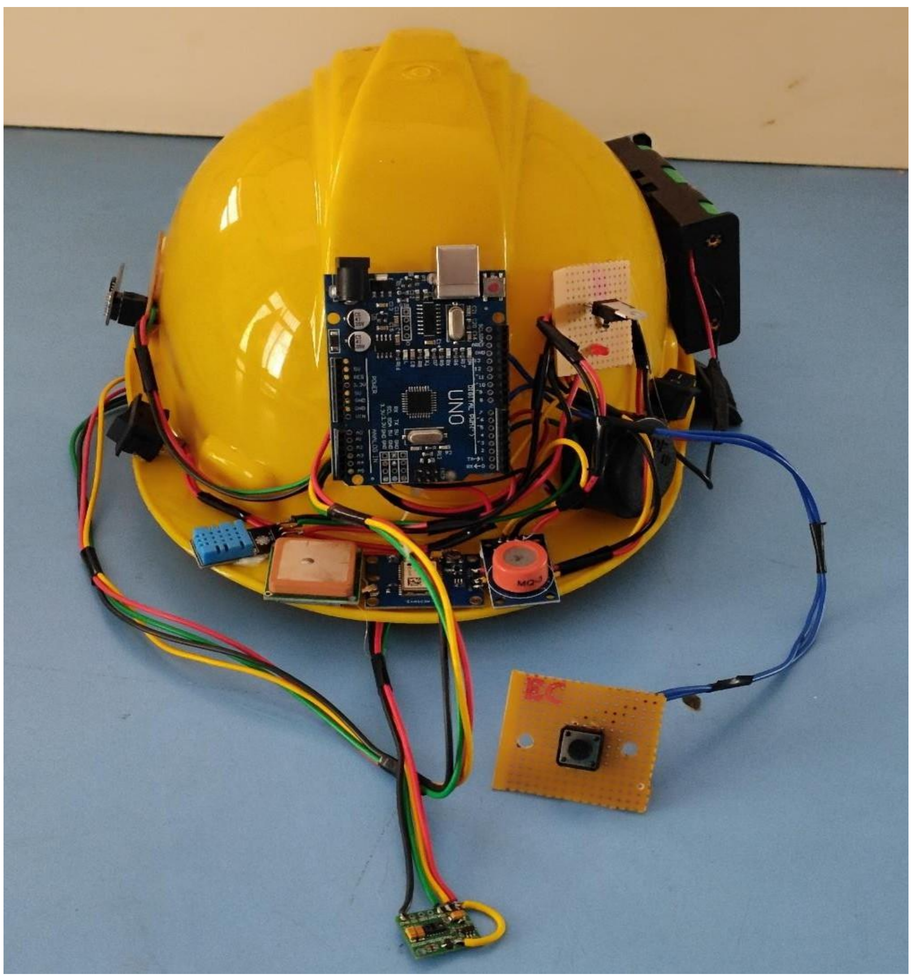

Fig.7.1.1 SMART HELMET

Fig.7.1.2 OUTPUT IN ANDROID APPLICATION

The suggested system brings together multiple sensors and modules for communication so as to achieve better safety and real-time observation. Arduino Uno microcontroller acts as the Central Processing Unit and data collection from several sensors including temperature, heartbeat, alcohol, panic switch, humidity, and GPS. Each sensor actively tracks certain parameters essential to individual health and safety.

The humidity sensor supports environmental monitoring by reporting on atmospheric moisture, which can influence comfort and health, while the panic switch enables the user to trigger an alert manually in case of an emergency or threat. The GPS module is necessary as it follows the location of the user in real time, so that the system can send coordinates to emergency services or guardians when needed.

Arduino Uno is responsible for processing all sensor readings and can also trigger an alarm in case of abnormal readings or panic alarms. The system also includes a Wi-Fi or GSM-based Internet of Things module that sends data directly to a smartphone application or to a cloud platform. The mobile application gets real-time updates and alarms, allowing remote monitoring and faster emergency response times. The system illustrates how to track health and personal safety in a reliable, cost-effective, and efficient way. It particularly assists in cases of women's safety, single workers in risky environments, and elderly care.

IoT integration ensures scalability and remote access which are crucial to make a viable application. In total, the experimental realization of the suggested system proves that it continuously tracks several parameters and quickly reacts to vital conditions by sending alarms and real-time notifications.

CHAPTER 8

CONCLUSION

The use of an IoT system with an Arduino Uno integrated into a smart helmet is an invention that improves the safety of riders and protects industrial workers. It combines drunk driving, accident detection, real-time emergency response, health monitoring, and other relevant problems into one cohesive solution utilizing IoT, GPS, GSM, and smart sensors. This type of technology ensures riders do not only comply with safety regulations but also actively prevents accidents from happening. Emergency contacts and services have access to real time monitoring and cloud systems which allow them to be notified immediately, allowing for faster medical aid and prevention of serious injuries. In construction, mining, and logistics, the implementation of smart helmets can improve the safety of workers by providing real-time hazard notifications, navigation assistance, and health monitoring. While there are some concerns in implementation such as power consumption and cost, it's only a matter of time until advancements in sensor technologies and renewable energy resources make things more efficient and affordable. The future of smart helmets is bright with the potential of AI-powered predictive analytics systems, voice command technology, and integration with traffic management systems. With the implementation of these technological innovations, we can create a safer and more effective space for industrial workers and riders, which will greatly reduce accidents, save lives and enhance productivity.

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APPENDIX I

```
#include <Wire.h>
#include "MAX30100_PulseOximeter.h"
#include<EEPROM.h>
#include "DHT.h"

#define DHTPIN 2
#define DHTTYPE DHT11

#define REPORTING_PERIOD_MS       1000
uint32_t tsLastReport = 0;
int set = 6;
int set1 = 7;
int alco = A0;
//int inc=7;
//int dec=A3;
int alm = 5;
int rly = 3;
int rly1 = 4;
int sensorValue = 0;
int Temp;
//int Moisture=A1;

char j = 0, jj = 0;
int q = 0, w = 0,  set2, set3, one = 0, two = 0, k, pre,sou,gas,bat,solar,temp;
int b[10], c[10], m[5], n[5], o[5],at=0;
char a[60], lat[25], lon[25];
char gps[100],g;
PulseOximeter pox;
DHT dht(DHTPIN, DHTTYPE);
float h,t;
unsigned char xq = 0;
volatile int IRQcount;
int hb, sec, hset, hbb, hq, hqq, Acc,Acc1,aq;
void(* resetFunc) (void) = 0;
String inputString = "";          // a String to hold incoming data
boolean stringComplete = false;   // whether the string is complete

unsigned long previousMillis = 0;          // will store last time LED was updated
const long interval = 1000;
int cnt, thval = 450;
void onBeatDetected()
{
  //Serial.println("Beat!");
```

```
}

void setup()
{
  pinMode(alm, OUTPUT);
  pinMode(rly, OUTPUT);
  pinMode(rly1, OUTPUT);
  pinMode(set, INPUT_PULLUP); //inc
  pinMode(alco, INPUT); //inc
	pinMode(set1,INPUT_PULLUP);   //Ent
  digitalWrite(rly, LOW);
  digitalWrite(rly1,  LOW);
  digitalWrite(alm,   LOW);
  dht.begin();
  lcd.begin(16, 2);
  Serial.begin(9600);
  //mySerial.begin(9600);
  delay(1000);
  lcd.setCursor(0, 0);
  lcd.print("------------------");
  lcd.setCursor(0, 1);
  lcd.print("------------------");
  // delay(1000);
  lcd.clear();
  //gsm_init();

  set2 = EEPROM.read(105);
  set3 = EEPROM.read(110);
  IRQcount = 0; sec = 0; hbb = hqq = 0; cnt = 0;

  if (!pox.begin()) {
    Serial.println("FAILED");
    for (;;);
  } else {
Serial.println("SUCCESS");
  }
  pox.setOnBeatDetectedCallback(onBeatDetected);

}

void loop()
{
//
  while (Serial.available()) {
    gps[g] = (char)Serial.read();
    if (gps[0] != '$') {
```

```
      g = 0;
      goto last;
    }
    else if (gps[0] == '$' && gps[1] != 'G') {
      g = 1;
      goto last;
    }
    else if (gps[0] == '$' && gps[1] == 'G' && gps[2] != 'P') {
      g = 2;
      goto last;
    }
    else if (gps[0] == '$' && gps[1] == 'G' && gps[2] == 'P' && gps[3] != 'R') {
      g = 3;
      goto last;
    }
    else if (gps[0] == '$' && gps[1] == 'G' && gps[2] == 'P' && gps[3] == 'R' && gps[4] != 'M')
{
      g = 4;
      goto last;
    }
    else if (gps[0] == '$' && gps[1] == 'G' && gps[2] == 'P' && gps[3] == 'R' && gps[4] == 'M'
&& gps[5] != 'C') {
      if (g < 50)g++;
      goto last;
    }

  last:;
  }
//    Serial.print(lat);
//  Serial.println(lat);
  if (g > 48)
  {
    strncpy(lat, gps + 18, 11);
    strncpy(lon, gps + 32, 9);
    g = 0; //delay(500);
  }

  unsigned long currentMillis = millis();
  pox.update();

  if (currentMillis - previousMillis >= interval) {
    previousMillis = currentMillis;
    sec++;
  }
  if (sec > 7)
  {
```

```
    http_send1();
    sec = 0;
  }

  if (millis() - tsLastReport > REPORTING_PERIOD_MS) {

    hb = pox.getHeartRate();
    hbb = pox.getSpO2();
    tsLastReport = millis();
  }
  h = dht.readHumidity();
   t = dht.readTemperature();

  lcd.setCursor(0, 0);
  lcd.print("H.B:");
  Lcd_Decimal3(4,0,hb);
// Serial.print(hb); Serial.println(hbb);
  //Res=analogRead(A3)>>2;
 if (digitalRead(set) == LOW)
  {
  aq=1;
  }
  else{aq=0;}

  if (hb > 130)
  {
    one = 1; xq = 3;
    digitalWrite(alm, HIGH);
    lcd.setCursor(12, 1);
    lcd.print("HB A");
    if(at==1){http_send1();at=0;}
  }
  else if (t > 40)
  {
    one = 1; xq = 1;
   digitalWrite(alm, HIGH);
   lcd.setCursor(12, 1);
   lcd.print("TE A");
   if(at==1){http_send1();at=0;}
  }
   else if (digitalRead(alco) == LOW)
  {
    one = 1; xq = 4;
    digitalWrite(alm, HIGH);
    lcd.setCursor(12, 1);
    lcd.print("AL A");
```

```
 if(at==1){http_send1();at=0;}
 }
 else if (digitalRead(set1) == LOW)
 {
  one = 1; xq = 2;
  digitalWrite(alm, HIGH);
  lcd.setCursor(12, 1);
  lcd.print("HELP");
  if(at==1){http_send1();at=0;}
 }
 else
 { one = 0; xq = 0;
  digitalWrite(alm, LOW);at=1;
  lcd.setCursor(12, 1);
  lcd.print("NRML");
   }
}
void http_send1()
{
 Serial.print("http://mangocy.appblocky.com/webdb/storeavalue.php?tag=nsh0260&value=");
 if(aq==1){Serial.print("1133.26227,7801.1351");}
 else{Serial.print(lat);
 Serial.print(lon);}
 Serial.print(",");
 Serial.print(hb);
 Serial.print(",");
 // Serial.print(hbb);
 // Serial.print(",");
 Serial.print(t);
 Serial.print(",");
 Serial.print(h);
 Serial.print(",");
 if (xq == 1)Serial.println("HIGH_TEMPERATURE");
 else if (xq == 2)Serial.println("I_NEED_HELP");
 else if (xq == 3)Serial.println("HEARTBEAT_ABNORMAL");
 else if (xq == 4)Serial.println("ALCOHOL_DETECT");
 //else if (xq == 5)Serial.println("OBJECT_DETECT_FRONT");
 else Serial.println("NORMAL");
 //delay(2000);
}

void Lcd_Decimal3(unsigned char com,unsigned char com1,unsigned int val)
 {
   unsigned int Lcd_h,Lcd_hr,Lcd_t,Lcd_o;
   lcd.setCursor(com,com1);
   Lcd_h=val/100;
```

```
  Lcd_hr=val%100;
  Lcd_t=Lcd_hr/10;
  Lcd_o=Lcd_hr%10;

  lcd.setCursor(com,com1);
  lcd.write(Lcd_h+0x30);
  lcd.setCursor(com+1,com1);
  lcd.write(Lcd_t+0x30);
  lcd.setCursor(com+2,com1);
  lcd.write(Lcd_o+0x30);
}
```

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(MRIET-2025)

CERTIFICATE

of

PARTICIPATION

This is to certify that Mr./~~Ms~~. Sujith G of Final Year ECE, Knowledge Institute of Technology, Salem has presented a paper entitled Smart Helmet Using Iot in the Second National conference on **"Multidisciplinary Research and Innovations in Engineering and Technology(MRIET-2025)"** on 4th **April 2025.**

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