QUICK WITTED SHIELDING SYSTEM FOR OFFSCUM LABOURS USING IOT WITH SENSORS

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this project report "QUICK WITTED SHIELDING SYSTEM FOR OFFSCUM LABOURS USING IOT WITH SENSORS" is the bonafide work of "R.SNEHA (927621BEC204), S.SHALINI (927621BEC194), P.VASUNTHRA (927621BEC237), R.SNEHA (927621BEC203) " who carried out the project work under my supervision in the academic year 2021-2022.

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This project report has been submitted for the 18ECP107L-Project Work Viva Voce Examination held at M.Kumarasamy College of Engineering, Karur on ______________.

PROJECT COORDINATOR

INSTITUTION VISION AND MISSION

Vision

To emerge as a leader among the top institutions in the field of technical education.

Mission

M1: Produce smart technocrats with empirical knowledge who can surmount the global challenges.

M2: Create a diverse, fully -engaged, learner -centric campus environment to provide quality education to the students.

M3: Maintain mutually beneficial partnerships with our alumni, industry and professional associations

DEPARTMENT VISION, MISSION, PEO, PO AND PSO

Vision

To empower the Electronics and Communication Engineering students with emerging technologies, professionalism, innovative research and social responsibility.

Mission

M1: Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.

M2: Inculcate the students in problem solving and lifelong learning ability.

M3: Provide entrepreneurial skills and leadership qualities.

M4: Render the technical knowledge and skills of faculty members.

Program Educational Objectives

PEO1: Core Competence: Graduates will have a successful career in academia or industry associated with Electronics and Communication Engineering

PEO2: Professionalism: Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of Electronics and Communication Engineering.

PEO3: Lifelong Learning: Graduates will contribute to the social needs through lifelong learning, practicing professional ethics and leadership quality

Program Outcomes

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.

PSO2: Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to fulfil the industrial expectations.

Abstract	Matching with POs, PSOs
Panic Button Ultasonic Sensor Temperature Sensor Toxic Gas Sensor Arduino Atmega 328P	PO1, PO2, PO3, PO4,PO5, PO6,PO7,PO8,PO9,PO10,PO11, PO12, PSO1, PSO2

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ABSTRACT

Many sanitary labors die each year due to irregularities, unavailability of equipment, and harmful toxic gases released during sewage treatment. Actual well-being health observing system for such labors would be useful. This real-time health monitor acts as a safety device in the sewage. In this post, the featured device is intended to use temperature sensors and toxic gas sensor to alert workers and field services. If the parameter is out of the safe area. These real-time parameters ensure safety before harming workers and immediately warn them to detect toxic gases. The main component of this system is Arduino controller. Various sensors are used for the proposed system. (Toxic Gas Sensor, Temperature Senr, Ultrasonic Sensor and Panic Button). If sensor level exceeds the limit, Vibrator will be ON. The readings of the sensor will be displayed on LCD at receiver with help of IOT.

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LIST OF ABBREVIATIONS

HRM	Heart Rate Measuring Device
IOT	Internet Of Things
LCD	Liquid Crystal Display
UNO	Universal Network Objects
WSN	Wireless Sensor Network
RTOS	Real Time Operating System
SASC	System application specific circuits
ASIP	Application Specific Instruction Set Processor
ARM	Advanced RISC Machines
RISC	Reduced Instruction Set Computer

CHAPTER 1

INTRODUCTION

A large number of sanitation workers die every year due to erratic and lack of facilities available, and harmful toxic gases released while cleaning the sewage. Manholes are not designed for someone to work in regularly, but workers may need to enter inside the manhole to complete their jobs such as cleaning, repair, inspection etc. A better knowledge related to hazards in the surroundings is necessary for the prevention of poisoning of gases. These gases have to be keep on track so that enormous rise in the normal level of effluents should be known and corrective measures can be taken. If the drainage system is not properly managed then pure water gets contaminate with drainage water and infectious diseases may get spread.

1.1 EMBEDDED SYSTEM

An embedded system is one kind of a computer system mainly designed to perform several tasks like to access, process, store and also control the data in various electronics-based systems. Embedded systems are a combination of hardware and software where software is usually known as firmware that is embedded into the hardware. One of its most important characteristics of these systems is, it gives the o/p within the time limits. Embedded systems support to make the work more perfect and convenient. So, we frequently use embedded systems in simple and complex devices too. The applications of embedded systems mainly involve in our real life for several devices like microwave, calculators, TV remote control, home security and neighborhood traffic control systems.

An embedded system is integration of hardware and software, the software used in the embedded system is set of instructions which are termed as a program. The microprocessors or microcontrollers used in the hardware circuits of embedded systems are programmed to perform specific tasks by following the set of instructions. These programs are primarily written using any programming software like Proteus or Labview using any programming languages such as C or C++ or embedded C. Then, the program is dumped into the microprocessors or microcontrollers that are used in the embedded system circuits.

Embedded System Classification

Embedded systems are primarily classified into different types based on complexity of hardware & software and microcontroller (8 or 16 or 32bit). Thus, based on the performance of the microcontroller, embedded systems are classified into three types such as:

Small scale embedded systems

Medium scale embedded systems

Sophisticated embedded systems

Further, based on performance and functional requirements of the system embedded system classified into four types such as:

Real time embedded systems

Stand alone embedded systems

Networked embedded systems

Embedded System Hardware

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An embedded system uses a hardware platform to perform the operation. Hardware of the embedded system is assembled with a microprocessor/microcontroller. It has the elements such as input/output interfaces, memory, user interface and the display unit. Generally, an embedded system comprises of the following

Power Supply

Memory

Processor

Timers

Output/Output circuits

Serial communication ports

SASC (System application specific circuits)

Embedded System Software

The software of an embedded system is written to execute a particular function. It is normally written in a high-level setup and then compiled down to offer code that can be stuck within a non-volatile memory in the hardware. An embedded system software is intended to keep in view of the following three limitsConvenience of system memory the convenience of processor's speed when the embedded system runs constantly, there is a necessity to limit power dissipation for actions like run, stop and wake up.

RTOS (Real Time Operating System)

A system which is essential to finish its task and send its service on time, then only it said to be a real time operating system. RTOS controls the application software and affords a device to allow the processor run. It is responsible for managing the different hardware resources of a personal computer and also host applications which run on the PC.

This operating system is specially designed to run various applications with an exact timing and a huge amount of consistency.

Particularly, this can be significant in measurement & industrial automation systems where a delay of a program could cause a safety hazard.

Memory and Processors

RTOS controls the application software and affords a device to allow the processor run. It is responsible for managing the different hardware resources of a personal computer and also host applications which run on the PC.

The different kinds of processors used in an embedded system include Digital Signal Processor (DSP), microprocessor, RISC processor, microcontroller, ASSP processor, ASIP processor, and ARM processor.

Embedded System Characteristics

Generally, an embedded system executes a particular operation and does the similar continually. For instance: A pager is constantly functioning as a pager. All the computing systems have limitations on design metrics, but those can be especially tight. Design metric is a measure of an execution features like size, power, cost and also performance.

It must perform fast enough and consume less power to increase battery life. Several embedded systems should constantly react to changes in the system and also calculate particular results in real time without any delay. For instance, a car cruise controller; it continuously displays and responds to speed & brake sensors. It must calculate acceleration/deaccelerations frequently in a limited time; a delayed computation can consequence in letdown to control the car.It must be based on a microcontroller or microprocessor based.It must require a memory, as its software generally inserts in ROM. It does not require any secondary memories in the PC.It must need connected peripherals to attach input & output devices.An Embedded system is inbuilt with hardware and software where the hardware is used for security and performance and Software is used for more flexibility and features.

Embedded System Applications

The applications of an embedded system basics include smart cards, computer networking, satellites, telecommunications, digital consumer electronics, missiles, etc. Embedded systems in automobiles include motor control, cruise control, body safety, engine safety, robotics in an assembly line, car multimedia, car entertainment, E-com access, mobiles etc.

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Embedded systems in smart cards include banking, telephone and security systems.Embedded Systems in satellites and missiles include defense, communication, and aerospaceEmbedded systems in computer networking & peripherals include image processing, networking systems, printers, network cards, monitors and displays. Embedded Systems in digital consumer electronics include set-top boxes, DVDs, high definition
TVs and digital cameras

1.2 INTERNET OF THINGS

The Internet of Things (IoT) is the network of devices such as vehicles, home appliances that contain electronics, software, actuators, and connectivity which allows these things to connect, interact and exchange data. The IoT involves extending Internet connectivity beyond standard devices, such as desktops, laptops, smartphones and tablets, to any range of traditionally dumb or non-internet-enabled physical devices and everyday objects. Embedded with technology, these devices can communicate and interact over the Internet, and they can be remotely monitored and controlled.

The definition of the Internet of things has evolved due to convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems. Traditional fields of embedded systems, wireless sensor system and the wireless networks, control systems, automation (including home and building automation), and others all contribute to enabling the Internet of things.

How IoT Works

An IoT ecosystem consists of web-enabled smart devices that use embedded processors, sensors and communication hardware to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the devices for instance, to set them up, give them instructions or access the data. The connectivity, networking and communication protocols used with these web-enabled devices largely depend on the specific IoT applications deployed.

Benefits of IoT

IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the devices -- for instance, to set them up, give them instructions or access the data. The connectivity, networking and communication protocols used with these web-enabled devices largely depend on the specific IoT applications deployed.The internet of things offers a number of benefits to organizations, enabling them to Monitor their overall business processes Improve the customer experience Save time and money Enhance employee productivity Integrate and adapt business models Make better business decisions Generate more revenue.

IoT encourages companies to rethink the ways they approach their businesses, industries and markets and gives them the tools to improve their business strategies.

IoT security and privacy issues

The internet of things connects billions of devices to the internet and involves the use of billions of data points, all of which need to be secured. Due to its expanded attack surface, IoT security and IoT privacy are cited as major concerns.

One of the most notorious recent IoT attacks was Mirai, a botnet that infiltrated domain name server provider Dyn and took down many websites for an extended period of time in one of the biggest distributed denialofservice (DDoS) attacks ever seen. Attackers gained access to the network by exploiting poorly secured IoT devices.

Because IoT devices are closely connected, all a hacker has to do is exploit one vulnerability to manipulate all the data, rendering it unusable. And manufacturers that don't update their devices regularly -- or at all -- leave them vulnerable to cybercriminals.Additionally, connected devices often ask users to input their personal information, including names, ages, addresses, phone numbers and even social media accounts -- information that's invaluable to hackers.

However, hackers aren't the only threat to the internet of things; privacy is another major concern for IoT users. For instance, companies that make and distribute consumer IoT devices could use those devices to obtain and sell users' personal data. Beyond leaking personal data, IoT poses a risk to critical infrastructure, including electricity, transportation and financial services.

IoT Application areas

Near Field Communication (NFC), Radio frequency Identification (RFID), Machine-to-Machine Communication (M2M) & VehicletoVehicle Communication (V2V) are the technologies by which IoT is being implemented exponentially. It is assumed that more than 50 billion IoT devices will be connected through internet. It is going to change human life, working style, entertaining ways and many more. IoT have many Applications Areas and domain of these application are increasing day by day.

There are sample of applications of IoT as follow:

Smart Cities

Building & Home automation

Environmental Monitoring

Automotive Industry

Smart Retail

CHAPTER 2

LITERATURE SURVEY

2.1 TITLE: Photoplethysmography-Based Heart Rate Monitoring in Physical Activities via Joint Sparse Spectrum Reconstruction

AUTHOR : Zhilin Zhang

YEAR : 2019

DESCRIPTION: A new method for heart rate monitoring using photo plethysmography (PPG) during physical activities is proposed. Methods: It jointly estimates spectra of PPG signals and simultaneous acceleration signals, utilizing the multiple measurement vector model in sparse signal recovery. Due to a common sparsity constraint on spectral coefficients, the method can easily identify and remove spectral peaks of motion artifact (MA) in PPG spectra. Thus, it does not need any extra signal processing modular to remove MA as in some other algorithms. Furthermore, seeking spectral peaks associated with heart rate is simplified. Results: Experimental results on 12 PPG datasets sampled at 25 Hz and recorded during subjects' fast running showed that it had high performance.

2.2 TITLE: A low power miniaturized monitoring system of six human physiological parameters based on wearable body sensor network

AUTHOR : Congcong Zhou, ChunlongTu

YEAR : 2019

DESCRIPTION: Health monitoring systems have drawn more and more attention, as people suffering from age-related diseases are increasing and the aging process is speeding up in many countries. And the cost of hospitalization and patient care continuously rises worldwide. Health monitoring system which works out of hospitals may assist residents and caregivers by providing non-invasive or invasive continuous health monitoring with minimum interaction of doctors and patients, and thus helps to reduce hospitalization and healthcare costs This work contributes in state of the art of wearable physiological parameters monitoring. Different physiological parameters were classified into subsystems based on the detection principles and system resources for power consumption management. Distributed and flat design methods were applied here to miniaturize the monitoring system. Algorithms were developed to monitor six vital physiological parameters, and reliable results were estimated by Fluke Prosim8 Vital Signs Simulators (produced by Fluke Corp. USA).

2.3 TITLE: A Health-IoT Platform Based on the Integration of Intelligent Packaging, Unobtrusive Bio-Sensor and Intelligent Medicine Box

AUTHOR : Geng Yang, Li Xie, MattiMäntysalo

YEAR: 2018

DESCRIPTION: In-home healthcare services based on the InternetofThings (IoT) have great business potential; however, a comprehensive platform is still missing. In this paper, an intelligent home-based platform, the iHome Health-IoT, is proposed and implemented. In particular, the platform involves 1) an open-platform-based intelligent medicine box (iMedBox) with enhanced connectivity and interchangeability for the integration of devices and services, 2) intelligent pharmaceutical packaging (iMedPack) with communication capability enabled by passive radiofrequency identification (RFID) and actuation capability enabled by functional materials, and 3) flexible and wearable bio-medical sensor device (Bio-Patch) enabled by the state-of-the-art inkjet printing technology and system-on-chip. The proposed platform seamlessly fuses IoT devices (e.g., wearable sensors, intelligent medicine packages, etc.) with in-home healthcare services (e.g., telemedicine) for an improved user experience and service efficiency.

2.4 TITLE: Smart homes and home health monitoring technologies for older adults: A systematic review

AUTHOR : Lili Liu, IoanisNikolaidis

YEAR : 2019

DESCRIPTION: Around the world, populations are aging and there is a growing concern about ways that older adults can maintain their health and well-being while living in their homes. The aim of this paper was to conduct a systematic literature review to determine: the levels of technology readiness among older adults and, evidence for smart homes and home-based health-monitoring technologies that support aging in place for older adults who have complex needs. Results: We identified and analyzed 48 of 1863 relevant papers. Our analyses found that: technologyreadiness level for smart homes and home health monitoring technologies is low; the highest level of evidence is 1b (i.e., one randomized controlled trial with a Pedro score ≥6); smart homes and home health monitoring technologies are used to monitor activities of daily living, cognitive decline and mental health, and heart conditions in older adults with complex needs; There is no evidence that smart homes and home health monitoring technologies help address disability prediction and health-related quality of life, or fall prevention; and there is conflicting evidence that smart homes and home health monitoring technologies help address chronic obstructive pulmonary disease.

2.5 TITLE: Wearable Sensors in Health Monitoring Systems

AUTHOR : S.Sivasakthi, A.Rajeswari

YEAR : 2019

DESCRIPTION: Recent years have perceived an increase in the progress of wearable sensors for health monitoring systems. This increase has been due to several issues such as development in sensor technology as well as focused efforts on political and investor levels to promote projects which address the need for providing new methods for care given increasing challenges with an aging population. In this system is about study of how the data is treated and processed. This paper provides latest methods and algorithms used to analyze data from wearable sensors used for physiological monitoring of vital symbols in healthcare services. This paper outlines the data mining tasks that have been applied such as prediction, anomaly detection and decision making when considering in particular continuous time series measurements and detailed about the suitability of particular data mining and machine learning methods used to process the physiological data and provides an overview of the properties of the data sets used in experimental support. This paper includes datamining tasks for wearable sensors data mining approach and data sets and their properties and outlined the more common data mining tasks that have been applied.

2.6 TITLE: A Review Paper on I2C Communication Protocol

AUTHOR: Vivek Kumar Pandey

YEAR:2018

DESCRIPTION: The I2C communication protocol is a well known and famous serial communication protocol developed by Philips Semiconductor (now NXP Semiconductor) in the 1980s (nearly 25 years ago) to exchange information specially between slow and fast devices. It consists of only two wires SDA and SCL and its ability to transmit data without loss makes it simpler and cheaper than other protocols. This paper is focused and aimed to present the valuable research work about I2C protocol by different researchers over the years.

2.7 TITLE: A Wireless Monitoring System for Pulse-oximetry Sensors

AUTHOR: María J. Morón 1, Eduardo Casilari

YEAR: 2020

DESCRIPTION: This paper presents a wireless medical monitoring system. The system permits to receive and process in a single concentrator node (e.g. a laptop or a simple handheld device) the pulse-oximetry signals from one ore several monitored patients without using any wired infrastructure. The system, which is based on a piconet of Bluetooth sensors, can retransmit the medical signals by WLAN and GPRS. The paper describes the practical application scenarios in which this type of systems could be of great utility.

2.8 TITLE: Migration of a SCADA system to IaaSclouds – a case study

AUTHOR: Philip Church1 , Harald Mueller

YEAR: 2019

DESCRIPTION: SCADA systems allow users to monitor and/or control physical devices, processes, and events remotely and in real-time. As these systems are critical to industrial processes, they are often run on highly reliable and dedicated hardware. Moving these SCADA systems to an Infrastructure as a Service (IaaS) cloud allows for: cheaper deployments, system redundancy support, and increased uptime. The goal of this work was to present the results of our experimental study of moving/migrating a selected SCADA system to a cloud environment and present major lessons learned. To this end, EclipseSCADA was deployed to the NeCTAR research cloud using the "lift and shift" approach. Performance metrics of a unique nature and large scale of experimentation were collected from the deployed EclipseSCADA system under different loads to examine the effects cloud resources and public networks have on SCADA behavior.

2.9 TITLE: OPOGEE INSTRUMENT A OXYGEN SENSOR

AUTHOR: Bruce Bugbee

YEAR: 2019

DESCRIPTION: Oxygen (O2) is the second most abundant gas in the atmosphere and is essential to life on Earth. Oxygen availability determines the rate of many biological and chemical processes and is required for aerobic respiration. As described in this manual, it is the absolute amount of oxygen (measured as partial pressure in kilopascals) that nearly always determines oxygen availability, but we think of oxygen as a percent of the total number of molecules in the air (20.95 %). The best example of this is the oxygen on top of Mount Everest, which is 20.95 %, but most climbers need supplemental oxygen to get to the top.

2.10 TITLE: Metagenomics for the study of viruses in urban sewage as a tool for public health surveillance

AUTHOR: X. Fernandez-Cassi a , N. Timoneda

YEAR: 2019

DESCRIPTION: The application of next-generation sequencing (NGS) techniques for the identification of viruses present in urban sewage has not been fully explored. This is partially due to a lack of reliable and sensitive protocols for studying viral diversity and to the highly complex analysis required for NGS data processing. One important step towards this goal is finding methods that can efficiently concentrate viruses from sewage samples. Here the application of a virus concentration method based on skimmed milk organic flocculation (SMF) using 10 L of sewage collected in different seasons enabled the detection of many viruses. However, some viruses, such as human adenoviruses, could not always be detected using meta genomics, even when quantitative PCR (qPCR) assessments were positive. A targeted metagenomic assay for adenoviruses was conducted and 59.41% of the obtained reads were assigned to murine adenoviruses. However, up to 20 different human adenoviruses (HAdV) were detected by this targeted assay being the most abundant HAdV-41 (29.24%) and HAdV-51 (1.63%)

CHAPTER 3

METHODOLOGY

3.1 EXISTING SYSTEM

The working starts from the sensor unit. This sensors when placed in sewage gas prone areas, monitors the level of individual gases present and send this data to the Arduino Mega. The sampled data is viewed on the LCD Display and also on the serial monitor of Arduino IDE. When the presence of sewage gas levels are more than that of the set threshold the system sends an alert message to the mobile. This system also offers a depth measurement option. The depth can be seen on the serial monitor when placed inside a manhole

Initially when the system is powered, Gas sensors monitor the gases in air and send the values to the Arduino Mega. The Arduino then display this values on LCD and also compare them with the threshold set. When the content of gases is more than set threshold an SMS alert is sent to registered number as "Hazardous Gas Present". The circuit in the Fig 4 portrays the connections of the gas sensors, GSM module and Ultrasonic sensor with the Arduino Mega. The power supply to the circuit is given from an external battery source of 12 VDC. The LCD display uses an I2C configuration in order to send the serial data which is obtained from the sensors to be displayed. The output from the sensors is analog hence we used Analog pins of the Arduino to read the data. Ultrasonic sensor has 2 pins Echo and Trig both of which are digital hence used the digital pins of
the Arduino. GSM module uses simple serial communication by connecting its Rx, Tx to the Tx and Rx of arduino respectively. The power to arduino mega can be given from USB cable from PC.

Drawbacks

No way for the sewage worker to get help from exterior unit in case of emergency conditions or panic situations

There is a need of multiple toxic gas sensors to analyse the toxic values.

3.2 PROPOSED SYSTEM

The main component of this system is Arduino controller. The sensors like Gas, temperature sensor and water level indicator are used for the proposed system. With the use of an ultrasonic sensor, the water level is indicated to determine when drainage is full. It is alerted by the buzzer. The information is shown on the LCD. When the methane and Toxic gas level is high, it is sensed by the methane sensor and gas sensor. The increase in the temperature is detected by the temperature sensor. The buzzer will be ON and the informations are updated on the IOT automatically.

BLOCK DIAGRAM

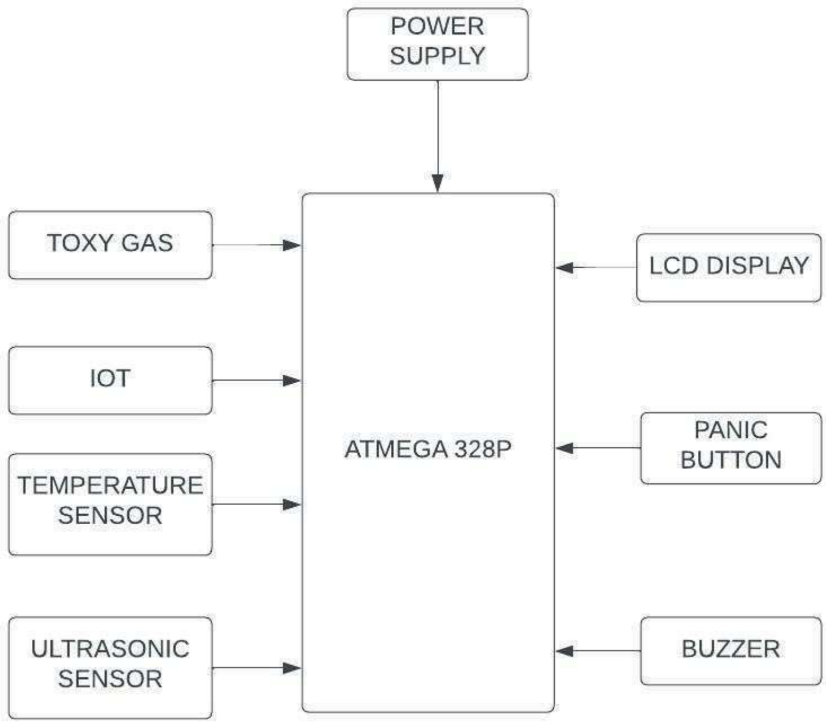

Fig 3.1 Monitoring system for sewage workers

FLOW DIAGRAM

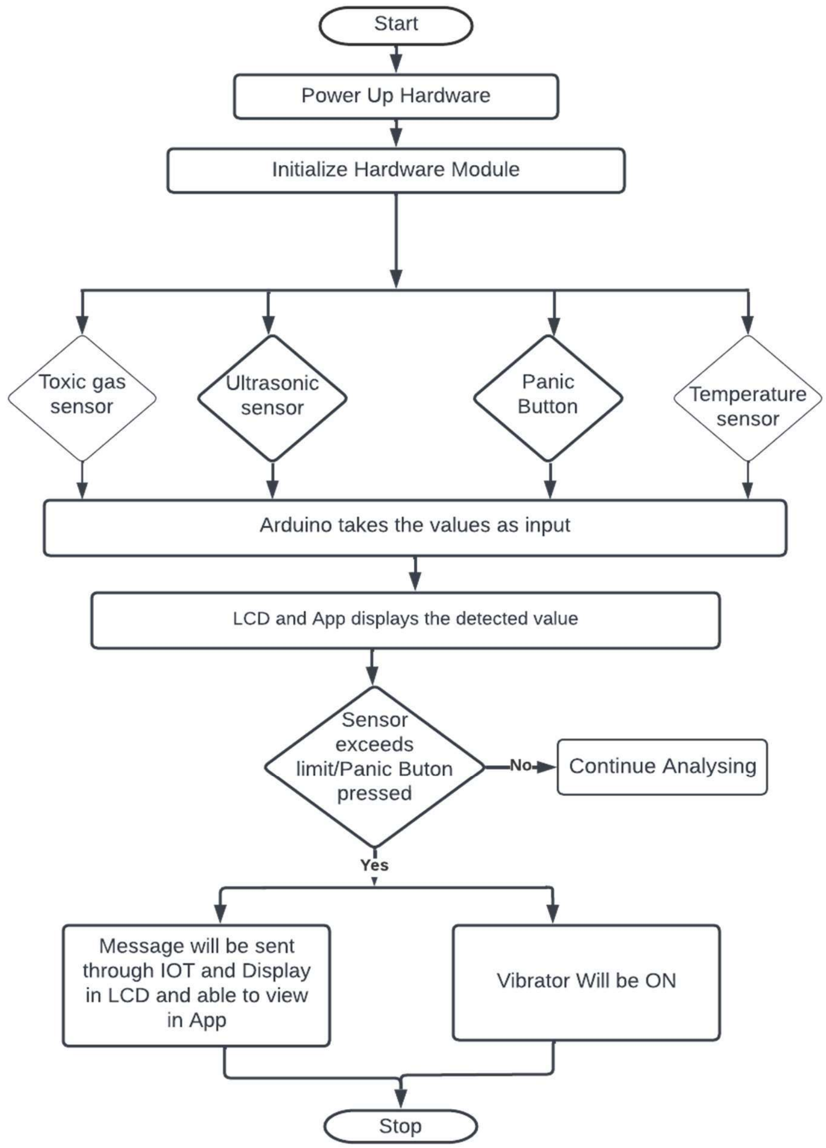

Fig 3.2 Work flow of the monitoring system

CHAPTER 4

HARDWARE REQUIREMENTS

4.1 POWER SUPPLY CIRCUIT

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

Power supplies for electronic devices can be broadly divided into linear and switching power supplies. The linear supply is a relatively simple design that becomes increasingly bulky and heavy for high current devices; voltage regulation in a linear supply can result in low efficiency. A switched-mode supply of the same rating as a linear supply will be smaller, is usually more efficient, but will be more complex.

Linear Power supply

An AC powered linear power supply usually uses a transformer to convert the voltage from the wall outlet (mains) to a different, usually a lower voltage. If it is used to produce DC, a rectifier is used. A capacitor is used to smooth the pulsating current from the rectifier. Some small periodic deviations from smooth direct current will remain, which is known as ripple. The linear supply is a relatively simple design that becomes increasingly bulky and heavy for high current devices; voltage regulation in a linear supply can result in low efficiency. A switched-mode supply of the same rating as a linear supply will be smaller, is usually more efficient, but will be more complex. These pulsations occur at a frequency

Transformer

Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC.Step-up transformers increase voltage, step-down transformers reduce voltage. Most power supplies use a step-down transformer to reduce the dangerously high mains voltage (230V in UK) to a safer low voltage.

The input coil is called the primary and the output coil is called the secondary. There is no electrical connection between the two coils; instead they are linked by an alternating magnetic field created in the soft-iron core of the transformer. The two lines in the middle of the circuit symbol represent the core. Transformers waste very little power so the power out is (almost) equal to the power in. Note that as voltage is stepped down current is stepped up.The ratio of the number of turns on each coil, called the turn's ratio, determines the ratio of the voltages. A step-down transformer has a large number of turns on its primary (input) coil which is connected to the high voltage mains supply, and a small number of turns on its secondary (output) coil to give a low output voltage.

Transformers change voltage through electromagnetic induction; i.e., as the magnetic lines of force (flux lines) build up and collapse with the changes in current passing through the primary coil, current is induced in another coil, called the secondary. The secondary voltage is calculated by multiplying the primary voltage by the ratio of the number of turns in the secondary coil to the number of turns in the primary coil, a quantity called the turns ratio Transformers hange voltage through electromagnetic induction; i.e., as the magnetic lines of force (flux lines) build up and collapse with the changes in current passing through the primary coil, coil current is induced in another coil, called the secondary. The secondary voltage is calculated by multiplying the primary voltage by the ratio of the number of turns in the secondary coil to the number of turns in the primary coil, a quantity called the turns ratio

Bridge rectifier

A bridge rectifier can be made using four individual diodes, but it is also available in special packages containing the four diodes required. It is called a full-wave rectifier because it uses the entire AC wave (both positive and negative sections). 1.4V is used up in the bridge rectifier because each diode uses 0.7V when conducting and there are always two diodes conducting, as shown in the diagram below. Bridge rectifiers are rated by the maximum current they can pass and the maximum reverse voltage they can withstand (this must be at least three times the supply RMS voltage so the rectifier can withstand the peak voltages). Most power supplies use a step-down transformer to reduce the dangerously high mains voltage (230V in UK) to a safer low voltage.

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Rectifiers waste very little power so the power out is (almost) equal to the power in. Note that as voltage is stepped down current is stepped up. Alternate pairs of diodes conduct, changing over the connections so the alternating directions of AC are converted to the one direction of DC.

Smoothing

Smoothing is performed by a large value electrolytic capacitor connected across the DC supply to act as a reservoir, supplying current to the output when the varying DC voltage from the rectifier is falling. The diagram shows the unsmoothed varying DC (dotted line) and the smoothed DC (solid line). The capacitor charges quickly near the peak of the varying DC, and then discharges as it supplies current to the output.

Note that smoothing significantly increases the average DC voltage to almost the peak value (1.4 × RMS value). For example 6V RMS AC is rectified to full wave DC of about 4.6V RMS (1.4V is lost in the bridge rectifier), with smoothing this increases to almost the peak value giving 1.4 × 4.6 = 6.4V smooth DC.

Smoothing is not perfect due to the capacitor voltage falling a little as it discharges, giving a small ripple voltage. For many circuits a ripple which is 10% of the supply voltage is satisfactory and the equation below gives the required value for the smoothing capacitor. A larger capacitor will give fewer ripples. The capacitor value must be doubled when smoothing half-wave DC.

Smoothing Capacitor for 10% ripple, C=5*10/vs.*f

C = smoothing capacitance in farads (F)

Io = output current from the supply in amps (A)

Vs = supply voltage in volts (V), this is the peak value of unsmoothed DC f

= frequency of the AC supply in hertz (Hz), 50Hz in the UK.

The smooth DC output has a small ripple. It is suitable for most electronic circuits.

Regulator

Voltage regulator ICs are available with fixed (typically 5, 12 and 15V) or variable output voltages. They are also rated by the maximum current they can pass. Negative voltage regulators are available, mainly for use in dual supplies. Most regulators include some automatic protection from excessive current ('overload protection') and overheating ('thermal protection').

The LM78XX series of three terminal regulators is available with several fixed output voltages making them useful in a wide range of applications. One of these is local on card regulation, eliminating the distribution problems associated with single point regulation. The voltages available allow these regulators to be used in logic systems, instrumentation, Hi-Fi, and other solid state electronic equipment. Although designed primarily as fixed voltage regulators these devices can be used with external components to obtain adjustablevoltages and current.

Many of the fixed voltage regulator ICs has 3 leads and look like power transistors, such as the 7805 +5V 1A regulator shown on the right. They include a hole for attaching a heat sink if necessary.

Positive regulator

Input pin

Ground pin

Output pin

It regulates the positive voltage

Negative regulator

Ground pin

Input pin

Output pin

It regulate the negative voltage

The regulated DC output is very smooth with no ripple. It is suitable for all electronic circuits.

4.2 ARDUINO UNO

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable.

AC voltage makes them oscillate at the same frequency and produce ultrasonic sound. Capacitive transducers use electrostatic fields between a conductive diaphragm and a backing plate. The beam pattern of a transducer can be determined by the active transducer area and shape, the ultrasound wavelength, and the sound velocity of the propagation medium.

The diagrams show the sound fields of an unfocused and a focusing ultrasonic transducer in water, plainly at differing energy levels. Since piezoelectric materials generate a voltage when force is applied to them, they can also work as ultrasonic detectors. Some systems use separate transmitters and receivers, while others combine both functions into a single piezoelectric transceiver.

Ultrasound transmitters can also use non-piezoelectric principles. such as magnetostriction. Materials with this property change size slightly

when exposed to a magnetic field, and make practical transducers. A capacitor ("condenser") microphone has a thin diaphragm that responds to ultrasound waves. Changes in the electric field between the diaphragm and a closely spaced backing plate convert sound signals to electric currents, which can be amplified. One of these is local on card regulation, eliminating the distribution problems associated with single point
regulation.

The voltages available allow these regulators to be used in logic systems, instrumentation, Hi-Fi, and other solid state electronic equipment. Although designed primarily as fixed voltage regulators these devices can be used with external components to obtain adjustablevoltages and current. Many of the fixed voltage regulator ICs has 3 leads and look like power transistors, such as the 7805 +5V 1A regulator shown on the right. They include a hole for attaching a heat sink if necessary. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available. Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your Uno without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

Uno means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform.

The ATmega328 on the Arduino Uno comes preprogrammed with a boot loader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. The Uno also differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-toserial converter

The Arduino project started at the Interaction Design Institute Ivrea (IDII) in Ivrea, Italy. At that time, the students used a BASIC Stamp microcontroller at a cost of $100, a considerable expense for many students. In 2003 Hernando Barragán created the development platform Wiring as a Master's thesis project at IDII, under the supervision of Massimo Banzi and Casey Reas, who are known for work on the
Processing language. The project goal was to create simple, low-cost tools for creating digital projects by non-engineers.

The Wiring platform consisted of a printed circuit board (PCB) with an ATmega168 microcontroller, an IDE based on Processing and library functions to easily program the microcontroller. In 2003, Massimo Banzi, with David Mellis, another IDII student, and David Cuartielles, added support for the cheaper ATmega8 microcontroller to Wiring. But instead of continuing the work on Wiring, they forked the project and renamed it Arduino. Early arduino boards used the FTDI USB-to-serial driver chip and an ATmega168. The Uno differed from all preceding boards by featuring the ATmega328P microcontroller and an ATmega16U2

(Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Specification

Microcontroller: Microchip ATmega328P

Operating Voltage: 5 Volt

Input Voltage: 7 to 20 Volts

Digital I/O Pins: 14 (of which 6 provide PWM output)

Analog Input Pins: 6

DC Current per I/O Pin: 20 mA

DC Current for 3.3V Pin: 50 mA

Flash Memory: 32 KB of which 0.5 KB used by bootloader

SRAM: 2 KB

EEPROM: 1 KB

Clock Speed: 16 MHz

Length: 68.6 mm

Width: 53.4 mm

Communication

The Arduino/Genuino Uno has a number of facilities for communicating with a computer, another Arduino/Genuino board, or other microcontrollers. At that time, the students used a BASIC
Stamp microcontroller at a cost of $100, a considerable expense for many students. In 2003 Hernando Barragán created the development platform Wiring as a Master's thesis project at IDII, under the supervision of Massimo Banzi and Casey Reas, who are known for work on the

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Early arduino boards used the FTDI USB-to-serial driver chip and an ATmega168. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The Arduino project started at the Interaction Design Institute Ivrea (IDII) in Ivrea, Italy. At that time, the students used a BASIC Stamp microcontroller at a cost of $100, a considerable expense for many students.

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The Arduino Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A SoftwareSerial library allows serial communication on any of the Uno's digital pins

PINS General Pin functions

LED: There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

VIN: The input voltage to the Arduino/Genuino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

5V: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.

3V3: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

GND: Ground pins.

IOREF: This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.

Reset: Typically used to add a reset button to shields which block the one on the board.

Special Pin Functions

Each of the 14 digital pins and 6 Analog pins on the Uno can be used as an input or output, using pinMode (), digitalWrite(), and digitalRead() functions. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller. The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analogReference() function. In addition, some pins have specialized functions:

Serial / UART: pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

External Interrupts: pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.

PWM (Pulse Width Modulation): 3, 5, 6, 9, 10, and 11 Can provide 8bit PWM output with the analogWrite () function.

SPI (Serial Peripheral Interface): 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.

TWI (Two Wire Interface) / I²C: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.

AREF (Analog REFerence): Reference voltage for the analog inputs

4.3 LIQUID CRYSTAL DISPLAY

A liquid crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

The Arduino project started at the Interaction Design Institute Ivrea (IDII) in Ivrea, Italy. An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The Arduino project started at the Interaction Design Institute Ivrea (IDII) in Ivrea, Italy.

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In 2003, Massimo Banzi, with David Mellis, another IDII student, and David Cuartielles, added support for the cheaper ATmega8 microcontroller to Wiring. But instead of continuing the work on Wiring, they forked the project and renamed it Arduino. Early arduino boards used the FTDI USB-to-serial driver chip and an ATmega168 An LCD is a small low cost display. It is easy to interface with a micro-controller because of an embedded controller (the black blob on the back of the board). This controller is standard across many displays (HD 44780) which means many micro-controllers (including the Arduino) have libraries that make displaying messages as easy as a single line of code.

LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and signage. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones, and have replaced cathode ray tube (CRT) displays in most applications. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they do not suffer image burn-in.

LCDs are, however, susceptible to image persistence.

4.4 INTERNET OF THINGS (IoT)

The Internet of Things may be a hot topic in the industry but it's not a new concept. In the early 2000's, Kevin Ashton was laying the groundwork for what would become the Internet of Things (IoT) at MIT's AutoID lab.The voltages available allow these regulators to be used in logic systems, instrumentation, Hi-Fi, and other solid state electronic equipment. Although designed primarily as fixed voltage regulators these devices can be used with external components to obtain adjustablevoltages and current.

Many of the fixed voltage regulator ICs has 3 leads and look like power transistors, such as the 7805 +5V 1A regulator shown on the right. They include a hole for attaching a heat sink if necessary. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo.

The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website.

Layout and production files for some versions of the hardware are also available. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform.

The ATmega328 on the Arduino Uno comes preprogrammed with a boot loader that allows uploading new code to it without the use of an external hardware programmer. An IoT ecosystem consists of web-enabled smart devices that use embedded processors, sensors and communication hardware to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally.

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IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the devices -- for instance, to set them up, give them instructions or access the data. The connectivity, networking and communication protocols used with these web-enabled devices largely depend on the specific IoT applications deployed.

The internet of things offers a number of benefits to organizations, enabling them to:

Monitor their overall business processes

Improve the customer experience

Save time and money

Enhance employee productivity

Integrate and adapt business models

Make better business decisions

IoT encourages companies to rethink the ways they approach their businesses, industries and markets and gives them the tools to improve their business strategies. Ashton was one of the pioneers who conceived this notion as he searched for ways that Proctor & Gamble could improve its business by linking RFID information to the Internet. The concept was simple but powerful. If all objects in daily life were equipped with identifiers and wireless connectivity, these objects could be communicate with each other and be managed by computers.

In a 1999 article for the RFID Journal Ashton wrote: “If we had computers that knew everything there was to know about things—using data they gathered without any help from us -- we would be able to track and count everything, and greatly reduce waste, loss and cost. We would know when things needed replacing, repairing or recalling, and whether they were fresh or past their best. We need to empower computers with their own means of gathering information, so they can see, hear and smell the world for themselves, in all its random glory. RFID and sensor technology enable computers to observe, identify and understand the world—without the limitations of human-entered data.”1 At the time, this vision required major technology improvements.

There were more questions than answers to the IoT concepts in 1999. Today, many of these obstacles have been solved. The size and cost of wireless radios has dropped tremendously. IPv6 allows us to assign a communications address to billions of devices. Electronics companies are building Wi-Fi and cellular wireless connectivity into a wide range of devices. ABI Research estimates over five billion wireless chips will ship in 2013.2 Mobile data coverage has improved significantly with many networks offering broadband speeds.

While not perfect, battery technology has improved and solar recharging has been built into numerous devices. There will be billions of objects connecting to the network with the next several years. For example,Cisco’s Internet of Things Group (IOTG) predicts there will be over 50 billion connected devices by 2020.3

IoT describes a system where items in the physical world, and sensors within or attached to these items, are connected to the Internet via wireless and wired Internet connections. These sensors can use various types of local area connections such as RFID, NFC, Wi-Fi, Bluetooth, and Zigbee. Sensors can also have wide area connectivity such as GSM, GPRS, 3G, and LTE.

The Internet of Things will: Connect both inanimate and living things. Early trials and deployments of Internet of Things networks began with connecting industrial equipment. Today, the vision of IoT has expanded to connect everything from industrial equipment to everyday objects. The types of items range from gas turbines to automobiles to utility meters. It can also include living organisms such as plants, farm animals and people. For example, the Cow Tracking Project in Essex uses data collected from radio positioning tags to monitor cows for illness and track behavior in the herd.

Wearable computing and digital health devices, such as Nike+ Fuel band and Fitbit, are examples of how people are connecting in the Internet of Things landscape. Cisco has expanded the definition of IoT to the Internet of Everything (IoE), which includes people, places, objects and things. Basically anything you can attach a sensor and connectivity to can participate in the new connected ecosystems. Use sensors for data collection.

The physical objects that are being connected will possess one or more sensors. Each sensor will monitor a specific condition such as location, vibration, motion and temperature. In IoT, these sensors will connect to each other and to systems that can understand or present information from the sensor's data feeds. These sensors will provide new information to a company's systems and to people.

The Internet of Things can enable the next wave of life-enhancing services across several fundamental sectors of the economy. As the Internet of Things evolves, the proliferation of smart connected devices supported by mobile networks, providing pervasive and seamless connectivity, will unlock opportunities to provide life-enhancing services for consumers while boosting productivity for enterprises.

4.5 BUZZER

A buzzer or beeper is a signalling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise). Often these units were anchored to a wall or ceiling and used the ceiling or wall as a sounding board.

A buzzer is an efficient component to include the features of sound in our system or project. It is an extremely small & solid two-pin device thus it can be simply utilized on breadboard or PCB. So in most applications, this component is widely used. How do you know what frequency to use? Young people can generally hear frequencies between about 20 Hz and 20,000 Hz; older people lose the high frequencies and may not be able to hear all the way up to 20,000. Of course it varies from person to person.

Also, your buzzer may not be able to reproduce the whole rang especially the very high and If you like, you can leave off the duration. In that case, it will keep making a tone until you tell it to stop by calling noTone(pin) or by calling tone() with a different frequency.

There are two kinds of buzzers commonly available like simple and readymade. Once a simple type is power-driven then it will generate a beep sound continuously. A readymade type looks heavier & generates a Beep.

Beep. Beep. This sound is because of the internal oscillating circuit within a circuit.

This buzzer uses a DC power supply that ranges from 4V – 9V. To operate this, a 9V battery is used but it is suggested to utilize a regulated +5V/+6V DC supply. Generally, it is connected through a switching circuit to switch ON/OFF the buzzer at the necessary time interval.

The working principle of a buzzer depends on the theory that, once the voltage is given across a piezoelectric material, then a pressure difference is produced. A piezo type includes piezo crystals among two conductors. Once a potential disparity is given across these crystals, then they thrust one conductor & drag the additional conductor through their internal property. So this continuous action will produce a sharp sound signal.

Electromagnetic buzzer is composed of oscillator, solenoid coil, magnet, vibration diaphragm, housing, etc. When the power supply is switched on, the audio signal current generated by the oscillator passes through the solenoid coil, which generates a magnetic field. The vibration diaphragm periodically vibrates and sounds under the interaction of the solenoid coil and the magnet. The frequency of the general electromagnetic buzzer is 2-4 kHz.

Another implementation with some AC-connected devices was to implement a circuit to make the AC current into a noise loud enough to drive a loudspeaker and hook this circuit up to a cheap 8-ohm speaker. Nowadays, it is more popular to use a ceramic-based piezoelectric sounder like a Sonalert which makes a high-pitched tone.

Usually these were hooked up to "driver" circuits which varied the pitch of the sound or pulsed the sound on and off. In game shows it is also known as a "lockout system," because when one person signals ("buzzes in"), all others are locked out from signalling. Several game shows have large buzzer buttons which are identified as "plungers".

The word "buzzer" comes from the rasping noise that buzzers made when they were electromechanical devices, operated from stepped-down AC line voltage at 50 or 60 cycles. Other sounds commonly used to indicate that a button has been pressed are a ring or a beep.

Specifications

The specifications of the buzzer include the following.

Color is black

The frequency range is 3,300Hz

Operating Temperature ranges from – 20° C to +60°C

Operating voltage ranges from 3V to 24V DC

The sound pressure level is 85dBA or 10cm

The supply current is below 15mA

4.6 TOXIC GAS SENSOR (MQ6)

A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. This type of equipment is used to detect a gas leak and interface with a control system so a process can be automatically shut down. A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals. Gas detectors can be used to detect combustible, flammable and toxic gases, and oxygen depletion. This type of device is used widely in industry and can be found in locations, such as on oil rigs, to monitor manufacture processes and emerging technologies such as photovoltaic. They may be used in firefighting. Gas leak detection is the process of identifying potentially hazardous gas leaks by sensors. These sensors usually employ an audible alarm to alert people when a dangerous gas has been detected. Common sensors include infrared point sensors, ultrasonic sensors, electrochemical gas sensors, and semiconductor sensors. More recently, infrared imaging sensors have come into use. All of these sensors are used for a wide range of applications and can be found in industrial plants, refineries, wastewater treatment facilities, vehicles, and homes.

Features

5V DC or AC circuit

Requires heater voltage

Operation Temperature: -10 to 70 degrees C

Heater consumption: less than 750mW

Character Configuration

Good sensitivity to Combustible gas in wide range

High sensitivity to LPG, Propane and Hydrogen

Long life and low cost

Simple drive circuit

Application

Domestic gas leakage detector

Industrial Combustible gas detector

4.7 TEMPERATURE SENSOR (DHT11)

The basic principle of working of the temperature sensors is the voltage across the diode terminals. If the voltage increases, the temperature also rises, followed by a voltage drop between the transistor terminals of base and emitter in a diode.

Besides this, Encardio-Rite has a vibrating wire temperature sensor that works on the principle of stress change due to temperature change. The vibrating wire temperature meter is designed on the principle that dissimilar metals have a different linear coefficient of expansion with temperature variation.

It primarily consists of a magnetic, high tensile strength stretched wire, the two ends of which are fixed to any dissimilar metal in a manner that any change in temperature directly affects the tension in the wire and, thus, its natural frequency of vibration.

The dissimilar metal, in the case of the Encardio-Rite temperature meter, is aluminium (Aluminum has a larger coefficient of thermal expansion than steel.) As the temperature signal is converted into frequency, the same read-out unit which is used for other vibrating wire sensors can also be used for monitoring temperature also.

The change in temperature is sensed by the specially built Encardiorite vibrating wire sensor and is converted to an electrical signal which is transmitted as a frequency to the read-out unit. DHT11 is a

Humidity and Temperature Sensor, which generates calibrated digital output. DHT11 can be interface with any microcontroller like Arduino, Raspberry Pi, etc. and get instantaneous results. DHT11 is a low cost humidity and temperature sensor which provides high reliability and long term stability.

It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and outputs a digital signal on the data pin (no analog input pins needed). Its very simple to use, and libraries and sample codes are available for Arduino and Raspberry Pi.this module makes is easy to connect the DHT11 sensor to an Arduino or microcontroller as includes the pull up resistor required to use the sensor. Only three connections are required to be made to use the sensor - Vcc, Gnd and Output.it has high reliability and excellent long-term stability, thanks to the exclusive digital signal acquisition technique and temperature & humidity sensing technology.

Specifications

3 to 5V power and I/O

2.5mA max current use during conversion (while requesting data)

Good for 20-80% humidity readings with 5% accuracy

Good for 0-50 °C temperature readings +-2 °C accuracy

No more than 1 Hz sampling rate (once every second)

Body size 15.5mm x 12mm x 5.5mm

4 pins with 0.1" spacing

4.8 ULTRASONIC SENSOR

Our ultrasonic distance, level, and proximity sensors are commonly used with microcontroller platforms like Raspberry Pi, ARM, PIC, Arduino, Beagle Board, and more. Ultrasonic sensors transmit sound waves toward a target and will determine its distance by measuring the time it took for the reflected waves to return to the receiver. The HC-SR04 ultrasonic sensor uses SONAR to determine the distance of an object just like the bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package from 2 cm to 400 cm or 1" to 13 feet.

The operation is not affected by sunlight or black material, although acoustically, soft materials like cloth can be difficult to detect. It comes complete with ultrasonic transmitter and receiver module.this sensor is an electronic device that will measure the distance of a target by transmitting ultrasonic sound waves, and then will convert the reflected sound into an electrical signal.Our sensors are often used as proximity sensors. Ultrasonic sensors are also used in obstacle avoidance systems, as well as in manufacturing.

Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our like many others, use a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse.

Our ShortRange sensors offer the opportunity for closer range detection where you may need a sensor that ranges objects as close to 2cm.

These are also built with very low power requirements in mind, as well as environments where noise rejection is necessary. An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves.An ultrasonic sensor uses a transducer to send and receive a signal.

Ultrasonic transducers are transducers that convert ultrasound waves to electrical signals or vice versa. Those that both transmit and receive may also be called ultrasound transceivers; many ultrasound sensors besides being sensors are indeed transceivers because they can both sense and transmit.

It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and outputs a digital signal on the data pin (no analog input pins needed). Its very simple to use, and libraries and sample codes are available for Arduino and Raspberry Pi.

This module makes is easy to connect the sensor to an Arduino or microcontroller as includes the pull up resistor required to use the sensor. Only three connections are required to be made to use the sensor - Vcc, Gnd and Output These devices work on a principle similar to that of transducers used in radar and sonar systems, which evaluate attributes of a target by interpreting the echoes from radio or sound waves, respectively. Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing.

The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse. Active ultrasonic sensors generate highfrequency sound waves and evaluate the echo which is received back by the sensor, measuring the time interval between sending the signal and receiving the echo to determine the distance to an object. Passive ultrasonic sensors are basically microphones that detect ultrasonic noise that is present under certain conditions, convert it to an electrical signal, and report it to a computer.

This technology can be used for measuring wind speed and direction (anemometer), tank or channel fluid level, and speed through air or water. For measuring speed or direction, a device uses multiple detectors and calculates the speed from the relative distances to particulates in the air or water. Adafruit Learning Documentation for DHTxx Sensors.

To measure tank or channel level, the sensor measures the distance to the surface of the fluid. Further applications include: humidifiers, sonar, medical ultrasonography, burglar alarms, non-destructive testing and wireless charging. Systems typically use a transducer which generates sound waves in the ultrasonic range, above 18 kHz, by turning electrical energy into sound, then upon receiving the echo turn the sound waves into electrical energy which can be measured and displayed. The technology is limited by the shapes of surfaces and the density or consistency of the material. Foam, in particular, can distort surface level readings. This technology, as well, can detect approaching objects and track their positions.

Transducer

An ultrasonic transducer is a device that converts AC into ultrasound, as well as the reverse, sound into AC. In ultrasonics, the term typically refers to piezoelectric transducers or capacitive transducers. Piezoelectric crystals change size and shape when a voltage is applied; AC voltage makes them oscillate at the same frequency and produce ultrasonic sound. A transducer is an electronic device that converts energy from one form to another. Common examples include microphones, loudspeakers, thermometers, position and pressure sensors, and antenna. Although not generally thought of as transducers, photocells, LEDs (light-emitting diodes), and even common light bulbs are transducers.

Efficiency is an important consideration in any transducer. Transducer efficiency is defined as the ratio of the power output in the desired form to the total power input. No transducer is 100 percent efficient; some power is always lost in the conversion process. Usually this loss is manifested in the form of heat. Some antennas approach 100-percent efficiency. A well-designed antenna supplied with 100 watts of radio frequency (RF) power radiates 80 or 90 watts in the form of an electromagnetic field. A few watts are dissipated as heat in the antenna conductors, the feed line conductors and dielectric, and in objects near the antenna. Among the worst transducers, in terms of efficiency, are incandescent lamps. A 100-watt bulb radiates only a few watts in the form of visible light. Most of the power is dissipated as heat; a small amount is radiated in the UV (ultraviolet) spectrum. Capacitive transducers use electrostatic fields between a conductive diaphragm and a backing plate. To determine the exact magnitude of physical forces such as temperature and pressure is difficult. But, if these physical forces are converted into an electrical signal, then their values can be easily determined using a meter. The primary function of transducers is to convert a physical force into an electrical signal so that it can be easily handled and transmitted for measurement.

The beam pattern of a transducer can be determined by the active transducer area and shape, the ultrasound wavelength, and the sound velocity of the propagation medium. The diagrams show the sound fields of an unfocused and a focusing ultrasonic transducer in water, plainly at differing energy levels. Since piezoelectric materials generate a voltage when force is applied to them, they can also work as ultrasonic detectors. Some systems use separate transmitters and receivers, while others combine both functions into a single piezoelectric transceiver. Ultrasound transmitters can also use non-piezoelectric principles. such as magnetostriction.

Materials with this property change size slightly when exposed to a magnetic field, and make practical transducers. A capacitor ("condenser") microphone has a thin diaphragm that responds to ultrasound waves. Changes in the electric field between the diaphragm and a closely spaced backing plate convert sound signals to electric currents, which can be amplified.

Uses in medical field

Medical ultrasonic transducers (probes) come in a variety of different shapes and sizes for use in making cross-sectional images of various parts of the body. The transducer may be passed over the surface and in contact with the body, or inserted into a body opening such as the rectum or vagina. Clinicians who perform ultrasound-guided procedures often use a probe positioning system to hold the ultrasonic transducer.

Air detection sensors are used in various roles.[further explanation needed] Non-invasive air detection is for the most critical situations where the safety of a patient is mandatory. Many of the variables, which can affect performance of amplitude or continuous-wave-based sensing systems, are eliminated or greatly reduced, thus yielding accurate and repeatable detection. One key principle in this technology is that the transmit signal consists of short bursts of ultrasonic energy.

After each burst, the electronics looks for a return signal within a small window of time corresponding to the time it takes for the energy to pass through the vessel. Only signals received during this period will qualify for additional signal processing. This principle is similar to radar range gating.

Uses in industry

Ultrasonic sensors can detect movement of targets and measure the distance to them in many automated factories and process plants. Sensors can have an on or off digital output for detecting the movement of objects, or an analog output proportional to distance. They can sense the edge of material as part of a web guiding system. Ultrasonic sensors are widely used in cars as parking sensors to aid the driver in reversing into parking spaces.

They are being tested for a number of other automotive uses including ultrasonic people detection and assisting in autonomous UAV navigation.[citation needed] Because ultrasonic sensors use sound rather than light for detection, they work in applications where photoelectric sensors may not. Ultrasonics are a great solution for clear object detection, clear label detection and for liquid level measurement, applications that photoelectrics struggle with because of target translucence. As well, target color and/or reflectivity do not affect ultrasonic sensors, which can operate reliably in high-glare environments.

Passive ultrasonic sensors may be used to detect high-pressure gas or liquid leaks, or other hazardous conditions that generate ultrasonic sound. In these devices, audio from the transducer (microphone) is converted down to human hearing range. High-power ultrasonic emitters are used in commercially available ultrasonic cleaning devices. An ultrasonic transducer is affixed to a stainless steel pan which is filled with a solvent (frequently water or isopropanol). An electrical square wave feeds the transducer, creating sound in the solvent strong enough to cause cavitation.

Arduino is typically used in the processing and manufacturing industry, typically either as a tool to improve automated processes or to control manufacturing equipment such as CNC machines. It is also a powerful prototyping device which allows electronics engineers to trial designs before arranging complex manufacturing processes for final products.

4.9 PANIC BUTTON

A panic alarm is an electronic device designed to assist in alerting somebody in emergency situations where a threat to persons or property exists. A panic alarm is an electronic device designed to assist in alerting somebody in emergency situations where a threat to persons or property exists. A panic alarm is frequently but not always controlled by a concealed panic alarm button. These buttons can be connected to a monitoring center or locally via a silent alarm or an audible bell/siren. The alarm can used to request emergency local security, police or emergency services. Some systems can also activate closed-circuit television to record or assess the event

A panic alarm is frequently but not always controlled by a concealed panic alarm button. These buttons can be connected to a monitoring center or locally via a silent alarm or an audible bell/siren. The alarm can be used to quest emergency assistance from local security, police or emergency services. Some systems can also activate closed-circuit television to record or assess the event.

Many panic alarm buttons lock on when pressed, and require a key to reset them. A button in a critical system (such as a nuclear weapons system) used to quickly activate an extreme measure to mitigate an emergency situation. A red button integral to key fobs which activates a car alarm's siren. A device given to elderly individuals in order to maintain their independence outside of an Aged Care Facility, while still affording them a means of summoning help should they require it (i.e. a medical emergency that renders them immobile, like a fall, injury or illness).

Such a device can also be referred to as an Emergency Medical Alert (EMA) button and can be fitted as either a pendant or bracelet to be worn by the user. MAB's (Medical Alert Bracelets) are usually wireless connected to a call center. When the alarm is raised, an operator will call the individual's home to ensure a false alarm has not occurred; if there is no answer, the operator will alert either family members, emergency services, or both.

A button similar to the above, which is used indoors in self-sufficient houses for elderly people, where it alerts someone inside the house, who will then first check for a false alarm by phoning the person, and if there is no false alarm, will enter the person's flat to check what is the problem. A button similar to the above, which is used indoors in self-sufficient houses for elderly people, where it alerts someone inside the house, who will then first check for a false alarm by phoning the person, and if there is no false alarm, will enter the person's flat to check what is the problem.

A button used in convenience stores, gas station, or other establishments staffed with a single employee during late hours. Often located under the counter near the cash register or safe, the button can be pressed in times of distress (Such as robbery, disruptive or threatening behavior, or a situation which may warrant assistance), triggering a silent alarm.

A button used in convenience stores, gas station, or other establishments staffed with a single employee during late hours. Often located under the counter near the cash register or safe, the button can be pressed in times of distress (Such as robbery, disruptive or threatening behavior, or a situation which may warrant assistance), triggering a silent

alarm. If the button alarms a private security company, a fee may be charged for each time the button is used. This prevents misuse, and often aids in the employees judgment of the situation; whether or not it warrants the fee to have help to deal with the situation.

CHAPTER 5

CONCLUSION

This device is designed keeping in mind, the measurement of necessary parameters, which needs to be monitored for unhindered safety of the sewage workers. The device finds major application in household sewage systems, municipal manholes and sewage, sewer, deep well, gutters and drains etc. However, the places where toxic gases or fumes are present should never be handled by human workers directly. The sewage system is an efficient and economical device, cost around 10,000INR compared to available safety equipment. In country like India, where sewage is mostly cleaned by humans, which makes this device useful around India.

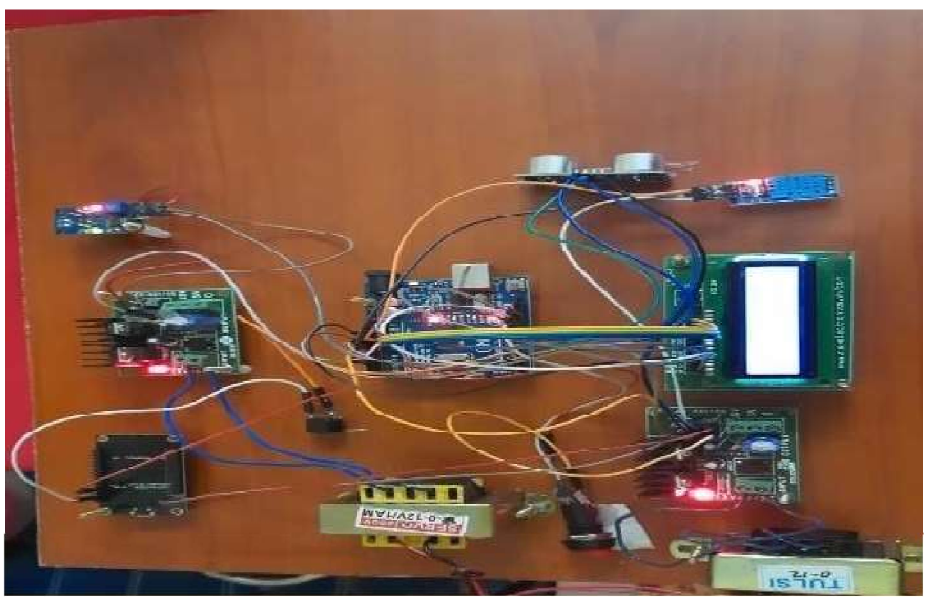

Fig 5.1 IoT Setup

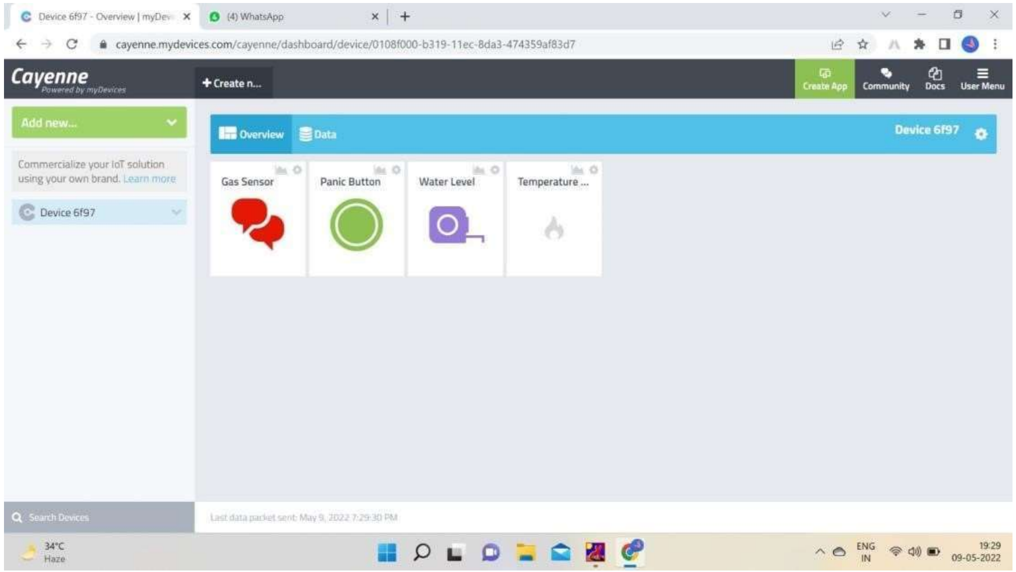

Fig 5.2 Result

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28. QUICK WITTED SHIELDING SYSTEM FOR OFFSCUM LABORS USING IOT WITH SENSORS

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Many sanitary labors die each year due to irregularities, unavailability of equipment, and harmful toxic gases released during sewage treatment. Actual well-being health observing system for such labors would be useful. This real-time health monitor acts as a safety device in the sewage. . In this post, the featured device is intended to use temperature sensors and toxic gas sensor to alert workers and field services. If the parameter is out of the safe area. These real-time parameters ensure safety before harming workers and immediately warn them to detect toxic gases.

The main component of this system is Arduino controller. Various sensors are used for the proposed system. (Toxic Gas Sensor,Temperature Sensor, Ultrasonic Sensor and Panic Button). If sensor level exceeds the limit, Vibrator will be ON. The readings of the sensor will be displayed on LCD at receiver with help of IOT.

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