HAZARD PREVENTION SYSTEM USING GSM

A PROJECT WORK - I REPORT

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BONAFIDE CERTIFICATE

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This is to certify that the Project work I report entitled **"HAZARD PREVENTION SYSTEM USING GSM"** is the bonafide record of project work done by **V. MEIPRASAANTH (21ECR116), M. JEGAN (21ECR089)** and **P. JEGAN (21ECR090)** in fulfilment of the requirements for the award of Degree of Bachelor of Engineering in Electronics and Communication Engineering of Anna University, Chennai during the year 2023-2024.

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DECLARATION

We affirm that the project work I report entitled **HAZARD PREVENTION SYSTEM USING GSM** being submitted in fulfilment of the requirements for the award of Bachelor of Engineering is the original work carried out by us. It has not formed the part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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ABSTRACT

Saarathi Animal Feeds, a leading producer of cattle feed in Tamil Nadu, faces a critical safety concern within their storage units. The current safety protocols rely on manual monitoring, which proves inadequate, posing risks of accidents, injuries, and operational disruptions. Moreover, the absence of real-time environmental surveillance leaves a significant gap in detecting potential hazards such as temperature fluctuations and hazardous gas emissions. To address these challenges, this consultancy project proposes an advanced hazard prevention system. By integrating GSM technology with gas, temperature, and light sensors, monitored continuously by an Arduino Uno development board, the system aims to provide comprehensive monitoring capabilities. Detection of any abnormal conditions, immediate alerts are triggered via GSM communication, facilitating swift response and mitigation measures. Additionally, the system offers real-time data logging and remote access functionalities for enhanced monitoring and management. This outlines the necessity for enhanced safety measures and introduces the proposed solution's potential to enhance safety, security, and operational efficiency in Saarathi Animal Feeds' storage facilities. The proposed hazard prevention system integrates various sensors, including MQ-2 gas sensors, LM35 temperature sensors, and light sensors, continuously monitored by an Arduino Uno development board, to comprehensively monitor Saarathi Animal Feeds' storage units. By leveraging GSM technology, the system triggers immediate alerts via SMS or voice calls to designated personnel upon detecting abnormal conditions, facilitating swift response and mitigation measures. The Arduino Uno serves as the central processing unit, collecting data from sensors, analyzing information, and triggering responses based on predefined thresholds. Additionally, real-time data logging and remote access functionalities enable continuous monitoring and management of environmental conditions, even from remote locations, while facilitating post-incident analysis and optimization of safety protocols. Ultimately, the proposed system aims to enhance operational efficiency by reducing downtime, minimizing risks of accidents and injuries, and improving overall productivity within the storage facilities.

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LIST OF ABBREVIATIONS

ADC	Analog-To-Digital Conversion
AO	Analog Output
ATmega328P	Atmel mega 328 Plastic dual in-line package
DO	Digital Output
GPIO	General Purpose Input/Output
GSM	Global System for Mobile Communication
I2C	Inter-Integrated Circuits
IDE	Integrated Development Environment
LCD	Liquid Crystal Display
LDR	Light Dependent Resistor
LED	Light Emitting Diode
MQ-2	Micro Quality 2
PPM	Parts Per Million
SCL	Serial Clock Line
SDA	Serial Data Line
SIM	Subscriber Identity Module
SMS	Short Message Service
USB	Universal Serial Bus
VCC	Voltage at Common Collector

CHAPTER 1

INTRODUCTION

Safety systems are integral to the manufacturing industry, serving as a linchpin for safeguarding personnel, assets, and the environment. In manufacturing environments fraught with heavy machinery, hazardous materials, and intricate processes, safety systems play a crucial role in mitigating risks and preventing accidents. They provide early warning signals, implement preventive measures, and facilitate swift responses during emergencies, ensuring the well-being of workers. Moreover, compliance with stringent government regulations on workplace safety and environmental protection is imperative for manufacturers. Safety systems aid in meeting these standards by monitoring key parameters, maintaining records, and enabling seamless audits, thus avoiding penalties and legal repercussions.

Saarathi Animal Feeds was established with a vision to enhance livestock nutrition and agricultural productivity, Saarathi has emerged as a leading producer of cattle feed in the region. Specializing in the production of high-quality feeds, Saarathi employs state-of-the-art manufacturing processes to ensure consistent quality and nutritional value. One of the hallmark features of their production line is the manufacturing of feeds in the form of pellets. These pellets offer several advantages over traditional feed forms, including enhanced digestibility, minimized waste, and ease of handling and storage.

Within Saarathi's operations, two key units stand pivotal: the production unit and the storage facilities. The production unit embodies innovation and precision, where meticulous processes ensure the consistent quality and nutritional value of the feeds. The storage unit contains raw materials and finished products that are carefully stored. We propose an advanced hazard prevention system that leverages cutting-edge technologies to revolutionize safety monitoring within the company's storage facilities.

1.1 ABOUT THE COMPANY

Saarathi Animal Feeds is a pioneering name in the realm of cattle feed manufacturing, nestled in the serene locale of Siruvalur near Gobichettipalayam, Tamil Nadu. With a steadfast commitment to quality and innovation, we have carved a niche for ourselves in the industry, catering to the diverse needs of livestock farmers across Tamil Nadu. At Saarathi, they were specialize in producing high-quality feed in the form of pellets, meticulously crafted to meet the nutritional requirements of various types of cattle. With a seamless blend of tradition and innovation, Saarathi Animal Feeds has emerged as a trusted partner for farmers seeking superior-quality feed solutions. Their unwavering commitment to customer satisfaction, coupled with a relentless pursuit of excellence, sets us apart in the competitive landscape of the industry.

1.2 PROBLEM IDENTIFICATION AND STATEMENT

Annually, the world witnesses a significant number of fatalities due to both natural and man-made hazards, underscoring the critical importance of robust safety measures across all industries. Saarathi Animal Feeds, a distinguished producer of high-quality cattle feed in Tamil Nadu, acknowledges the imperative of ensuring the safety and security of its operations amidst these risks. Within the realm of industrial safety, manual monitoring remains a common practice, yet it often proves insufficient in preventing accidents and mitigating risks effectively. The reliance on manual oversight within Saarathi's storage facilities presents a notable concern, as it leaves room for human error and oversight. Such gaps in monitoring not only endanger the well-being of personnel but also jeopardize the integrity of operations, potentially leading to significant disruptions and losses.

Furthermore, the absence of real-time environmental surveillance exacerbates the vulnerability of Saarathi's storage facilities to potential hazards. Without continuous monitoring of key parameters such as temperature and gas emissions, the company faces increased risks of incidents such as spoilage of feed due to temperature fluctuations or the release of hazardous gases, endangering both personnel and livestock.

Against this backdrop, Saarathi Animal Feeds recognizes the critical need for a proactive hazard prevention system tailored to its storage facilities. This system must transcend the limitations of manual monitoring by providing real-time surveillance and immediate alerts in response to detected abnormalities. By addressing these challenges head-on, Saarathi aims to mitigate the risks associated with accidents, injuries, and operational disruptions, thereby safeguarding its personnel, assets, and reputation.

1.3 OBJECTIVE

The objective of this consultancy project is to develop and implement an innovative hazard prevention system within Saarathi Animal Feeds' storage facilities, utilizing GSM technology. The primary goal is to address critical safety challenges faced by the company, particularly concerning manual monitoring protocols that have proven inadequate in detecting and preventing potential hazards. By leveraging cutting-edge technologies, including real-time monitoring sensors and GSM communication modules, the proposed system aims to revolutionize safety monitoring within the storage facilities

1.4SCOPE

The scope of this project encompasses a comprehensive approach to enhancing safety measures within Saarathi Animal Feeds' storage facilities through the implementation of an advanced hazard prevention system leveraging GSM technology. The project will begin with a meticulous assessment and analysis phase, during which the current safety protocols and infrastructure will be thoroughly evaluated to identify existing gaps and challenges. This includes integrating sensors, setting up GSM communication channels, and designing a user-friendly interface for real-time monitoring and alert management. Upon successful testing, the hazard prevention system will be implemented and deployed within the storage facilities, with installation of sensors, GSM modules, and alert mechanisms.

CHAPTER 2

METHODOLOGY

2.1 EXISTING METHOD

The Existing method in Saarathi Animal Feeds relies on manual monitoring methods within its storage unit. This involves periodic checks by personnel to assess safety conditions and identify potential hazards. However, this approach lacks real-time monitoring capabilities and may be prone to human error or oversight. The manual method also limits the ability to promptly detect and respond to emerging hazards, potentially compromising the safety of the storage facilities and the well-being of personnel.

2.2 PROPOSED METHOD

The proposed hazard prevention system leverages real-time monitoring sensors and GSM communication modules to enhance safety monitoring within storage facilities. By continuously monitoring environmental conditions and detecting potential hazards such as temperature fluctuations and hazardous gas emissions, the system enables rapid alerting to designated personnel via the GSM network. With a centralized control system for data analysis and remote management, this system ensures timely intervention, reducing the risk of accidents, injuries, and operational disruptions. This project is crucial as it significantly improves safety measures, enhances operational efficiency, and demonstrates a commitment to proactive hazard prevention in various industrial settings.

2.3 BLOCK DIAGRAM

A block diagram is a diagrammatic representation of a system or a process that shows the major components or functional blocks and their interrelationships. The blocks represent the major components or subsystems of the system being represented, and the lines or arrows connecting them represent the flow of signals, data or control information between them..

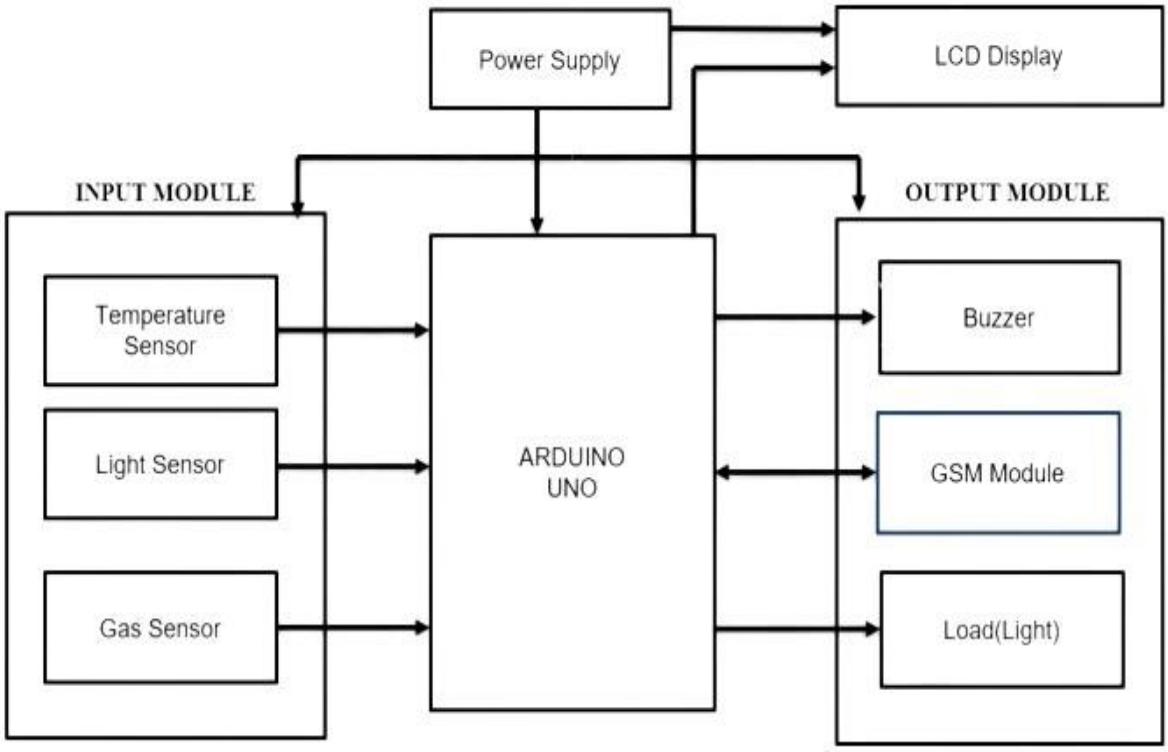

Figure 2.1 Block Diagram of Hazard Prevention System

Figure 2.1 illustrates the block diagram of our proposed method, showcasing its key components and its interconnections. The input module consists of 3 different types of sensors like temperature, gas and light sensor. The output module consists of GSM, LCD display and some actuators like buzzer and LED. Arduino UNO acts as the central processing unit, receiving inputs, making decisions, and generating output signals based on predefined algorithms. The microcontroller unit is responsible for controlling the process and coordinating the actions of other components. The output signal generated by the microcontroller unit is then directed to the output module. The GSM send the response to the through SMS and call.

This block diagram simplifies the system by breaking it down into its major components and illustrating the interconnections between them. It provides a clear and concise representation of the system architecture, making it easy to understand and analyze the functions of each component.

CHAPTER 3

SYSTEM SPECIFICATION

3.1 SOFTWARE REQUIREMENT

For the proposed hazard prevention system, the software requirements include

- Proteus 8 Professional for simulation.
- Arduino IDE for coding.

3.1.1 PROTEUS 8 PROFESSIONAL

Proteus 8 Professional is a powerful simulation software commonly used for designing and testing electronic circuits. It allows engineers to simulate the behavior of electronic components and circuits before actual implementation, which is crucial for ensuring the functionality and reliability of the system. With Proteus, engineers can model various scenarios, test different configurations, and troubleshoot potential issues in a virtual environment, saving time and resources during the development process.

3.1.2 ARDUINO IDE

Arduino IDE, on the other hand, is an integrated development environment specifically designed for programming Arduino microcontrollers. It provides a user-friendly platform for writing, compiling, and uploading code to Arduino boards. Arduino IDE supports the Arduino programming language, which is based on C/C++, making it accessible to both beginners and experienced programmers. With Arduino IDE, developers can write code to control sensors, process data, and communicate with other components of the hazard prevention system. Additionally, Arduino IDE offers a range of libraries and examples to streamline the development process and facilitate rapid prototyping of electronic projects.

3.2HARDWARE REQUIREMENTS

Arduino The hardware requirements encompass a suite of specialized sensor for monitoring the environment 24/7 and to provide real time data, complemented by a core controller for data processing and transmission. This setup facilitates real time data collection and analysis to ensure effective monitoring to detect any hazard from the industry.

- Arduino UNO Development Board
- Specialized Sensor
  - Temperature (LM35)
  - Gas (MQ-2)
  - Light (LDR)
- LCD Display – I2C
- GSM
- Lithium Ion Battery
- Printed Circuit Board

3.3 HARDWARE DESCRIPTION

3.3.1 ARDUINO UNO

Arduino Uno is a popular microcontroller board based on the ATmega328P microcontroller. It is widely used in electronics projects due to its simplicity, versatility, and ease of use. The Arduino Uno board features digital input/output pins, analog input pins, power pins, and a USB interface for programming and communication with a computer. It is compatible with various sensors, actuators, and other electronic components, making it suitable for a wide range of applications, including hobbyist projects, prototyping, and educational purposes.

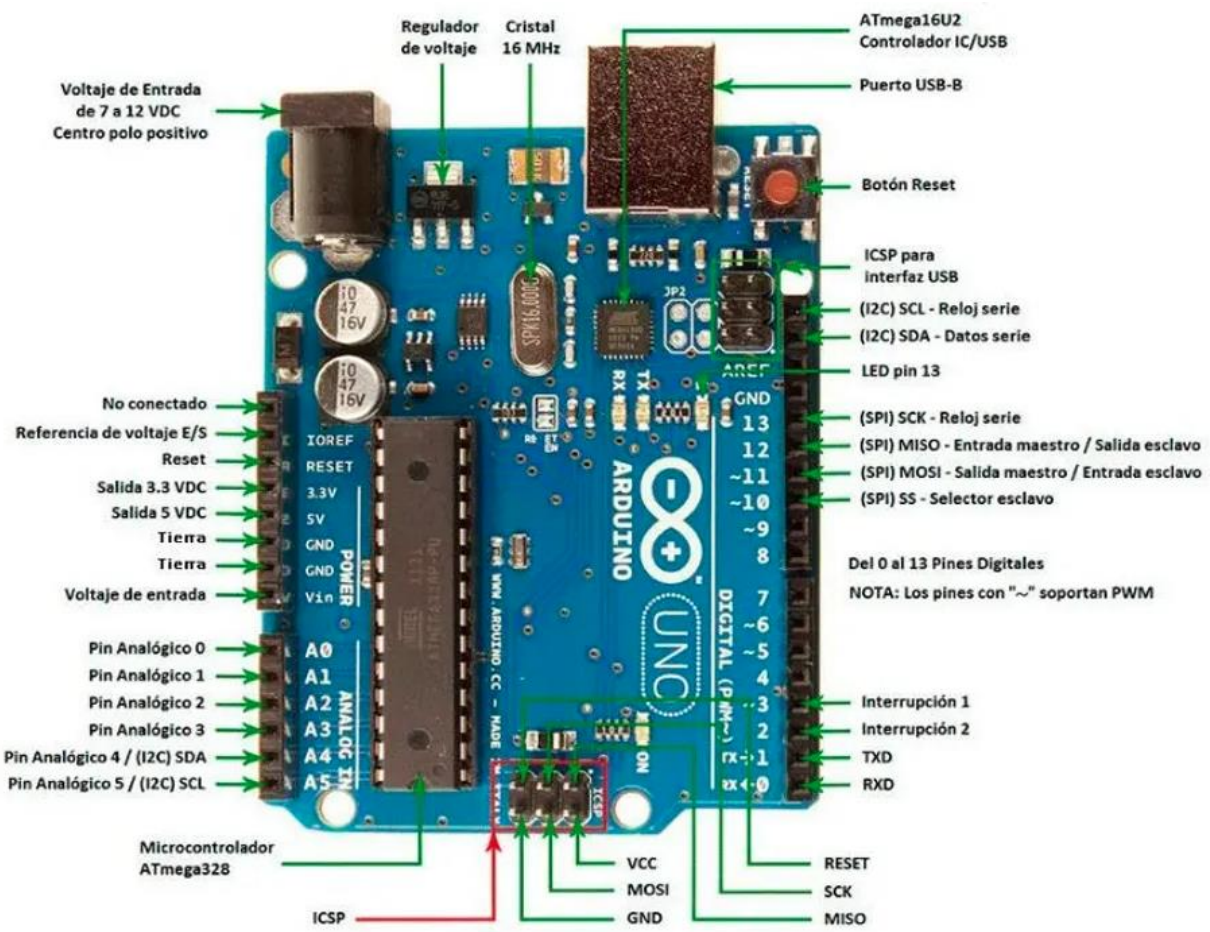

Figure 3.1 Pin Diagram of Arduino UNO

Figure 3.1 represents the Arduino UNO comprises of ATmega328P microcontroller with dual in-line package capable of clock frequency of up to 16 MHz, it offers a balance between processing power and energy efficiency. With 2 KB of SRAM, the Uno provides ample memory for storing variables and runtime data during program execution. Its GPIO capabilities are robust, featuring 14 digital pins and 6 analog input pins, enabling seamless interfacing with a plethora of sensors, actuators, and peripherals. The pin description of Arduino UNO is given below:

- Digital Pins (D0-D13): These pins can be configured as either digital inputs or outputs. They support a voltage range of 0V to 5V and can provide or sink up to 20 mA of current per pin.

- Analog Input Pins (A0-A5): These pins can be used to read analog voltage levels from sensors and other analog devices. They have a 10-bit resolution, providing values ranging from 0 to 1023 corresponding to voltages between 0V and 5V.
- Power Pins: These pins include +5V (providing 5V power), +3.3V (providing 3.3V power), GND (ground), and Vin (voltage input).
- The Arduino Uno also features additional pins such as RESET (for resetting the microcontroller), TX (transmit) and RX (receive) pins for serial communication, and AREF (analog reference voltage) pin for setting the analog reference voltage.

ATmega328 MICROCONTROLLER:

The ATmega328 is a high-performance microcontroller manufactured by Atmel (now Microchip Technology). ATmega328 has three types of memories, named:

- Flash Memory: 32KB. It is a Programmable Read-Only Memory (ROM). It is a nonvolatile memory.
- SRAM: 2KB. Stands for Static Random Access Memory. It is a volatile memory i.e. data will be removed after removing the power supply.
- EEPROM: 1KB. Stands for Electrically Erasable Programmable Read-Only Memory.
- It has 8 Pins for ADC operations, which all combine to form PortA (PA0 - PA7)
- It operates ranging from 3.3V to 5.5V but normally we use 5V as a standard.

3.3.2 GSM

Figure 3.2 Pin Diagram of GSM Module

Figure 3.2 represents GSM serves as a communication medium between the controller and user. So whenever any hazard is detected, it send message and call to the fire safety department and owner of the company about the hazard. If it is a fire hazards, it sends “FIRE ALERT-NOT SAFE HERE” or else if it any hazardous gas is detected, it sends “GAS ALERT-NOT SAFE HERE”. Likely it varies based on the hazard. The pin 4 (RXD) and pin 5 (TXD) of GSM is connected to the digital pin D3 and D4 of the Arduino. The pin 2 (VCC) of GSM is connected to 3.7 V lithium ion battery.

It is a widely adopted standard for cellular communication, offering voice and data services to users worldwide. It operates on various frequency bands and employs digital modulation techniques for clear and reliable communication. Key features include multiple access schemes for efficient channel sharing, global roaming capabilities, robust security measures, and support for services like SMS and data transmission. GSM is extensively used in mobile telephony, machine-to-machine communication, IoT applications, and security systems. It continues to be a cornerstone of modern communication infrastructure, providing connectivity and enabling a wide range of applications across industries.

3.3.3 GAS SENSOR (MQ-2)

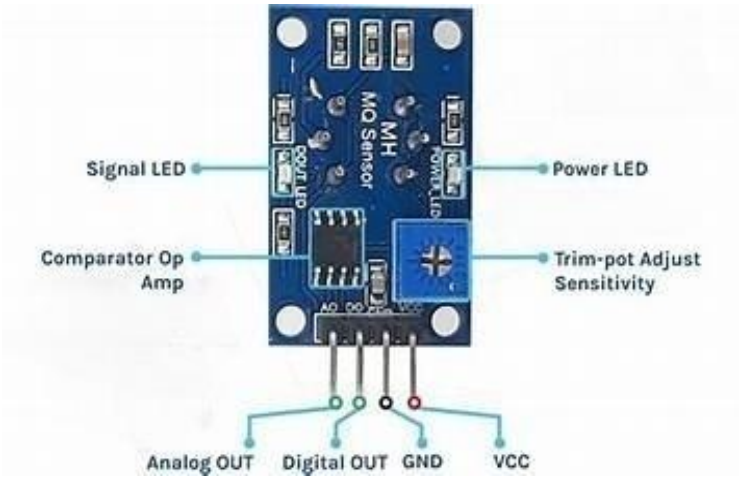

Figure 3.3 Pin Diagram of Gas Sensor

Figure 3.3 depicts MQ-2 gas sensor, it is a versatile component widely used for detecting a variety of gases, including methane, propane, butane, alcohol, and smoke. It operates on the principle of gas detection through resistance changes in a sensing element when exposed to target gases. The sensor's sensitivity to different gases can be adjusted using a potentiometer. With its small size, low cost, and ease of integration, the MQ-2 sensor finds applications in gas leakage detection systems, air quality monitoring devices, and fire detection systems. Its ability to detect a range of gases makes it valuable for ensuring safety in various environments, from homes and offices to industrial settings.

In this project, the gas sensor interfaces with the Arduino Uno using its analog pin for output, it is connected to the analog pin (A1) of the Arduino. The sensor is calibrated to detect gas levels, and a threshold value of 450 ppm is set for this application. When the gas concentration surpasses this threshold, the sensor triggers appropriate actions through the Arduino Uno, such as initiating alerts system using buzzer and LED and activates the GSM module.

3.3.4 TEMPERATURE SENSOR (LM35)

Figure 3.4 Pin Diagram of Temperature Sensor

Figure 3.4 depicts LM35 temperature sensor, it is a precision analog device widely used for measuring temperature with high accuracy and reliability. Operating on the principle of generating a voltage proportional to temperature, the LM35 provides an output voltage linearly proportional to Celsius temperature. With its simple interfacing, low power consumption, and wide temperature range (-55°C to +150°C), the LM35 sensor finds applications in various fields, including temperature monitoring and control systems, weather stations, HVAC systems, and electronic thermometers. Its compact size and low cost make it a popular choice for both hobbyist projects and industrial applications, offering precise temperature measurements in a straightforward and efficient manner.

In this project, the temperature sensor is integrated with the Arduino Uno, utilizing its analog pin for output. It is connected to the analog pin (A0) of Arduino. The sensor is calibrated to monitor ambient temperature levels, with a predefined threshold set at 55°C. Upon surpassing this threshold, indicative of potentially hazardous temperature levels, the sensor triggers alerts system using buzzer and LED and activates the GSM module.

3.3.5 LIGHT SENSOR (LDR)

Figure 3.5 Pin Diagram of Light Sensor

Figure 3.5 depicts light sensor, it is known as a photoresistor or LDR, is a passive electronic component that exhibits a change in resistance based on the intensity of light it detects. As the ambient light level increases, the resistance of the sensor decreases, and vice versa. This property makes it suitable for various applications, including automatic lighting control systems, brightness adjustment in displays, and dusk-to-dawn switches for outdoor lighting.

In this project, the light sensor interfaces with the Arduino Uno through its analog pin, serving to measure the ambient light intensity. The analog pin of LDR is connected to the analog pin (A2) of the Arduino. The sensor captures the present light levels, converting them into analog signals that are fed into the Arduino Uno. Utilizing this information, the Arduino Uno drives a connected LCD, presenting a real-time display of the light intensity.

3.3.6 LCD DISPLAY (16X2) – I2C

Figure 3.6 Pin Diagram of 16X2 LCD Display-I2C

Figure 3.6 depicts 16x2 LCD display with I2C, it is a commonly used alphanumeric display module with 16 columns and 2 rows, capable of displaying up to 32 characters at a time. It utilizes liquid crystal technology to produce characters and symbols in a clear and readable format. The display is controlled by an integrated controller chip, typically HD44780, which simplifies interfacing with microcontrollers. The SDA and SCL from I2C connected to the analog pin A4 and A5 of the Arduino.

The LCD display with I2C communication is utilized to provide real-time monitoring and display of temperature, gas levels, and light intensity within Saarathi Animal Feeds' storage facilities. The display presents these sensor readings in a user-friendly format, enabling personnel to easily assess environmental conditions at a glance.

Additionally, the LCD display serves as a crucial interface for alerting users to potential hazards detected by the sensors. In the event that unsafe conditions are detected, such as exceeding predefined thresholds for temperature, gas levels, or other parameters, the display will show alert messages like "NOT SAFE HERE." This immediate visual feedback informs personnel of the hazardous situation, prompting them to take appropriate actions to mitigate risks and ensure the safety of individuals and assets within the facility.

3.3.7 LITHIUM ION BATTERY

Figure 3.7 Lithium Ion Battery

Figure 3.7 depicts 3.7V lithium-ion battery, it is used to power the GSM module is a strategic choice that aligns with the system's requirements and objectives. Lithium-ion batteries are renowned for their high energy density, compact size, and long cycle life, making them ideal for powering electronics in remote monitoring and communication systems.

By integrating a lithium-ion battery, hazard prevention system benefits from reliable and consistent power supply to the GSM module, ensuring continuous communication capabilities without frequent battery replacements or recharges. Additionally, the compact and lightweight design of lithium-ion batteries allows for seamless integration into the system, while their low self-discharge rate and compatibility with charging systems ensure sustained operation over extended periods.

The positive pin is connected to VCC pin of the GSM and ground pin is connected to GND pin of the GSM.

3.3.8 PRINTED CIRCUIT BOARD

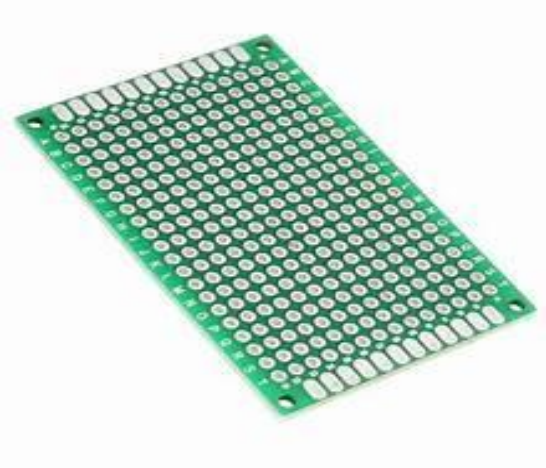

Figure 3.8 Printed circuit board

Figure 3.8 depicts PCB which facilitates the integration and organization of electronic components, ensuring efficient layout and electrical connectivity. PCBs enable miniaturization, allowing for compact designs suitable for hazard preventing applications. Additionally, they enhance durability, providing mechanical support and protection for components, crucial for reliable operation in varying environmental conditions.

3.3.9 BUZZER

Figure 3.9 Pin Diagram of Buzzer

Figure 3.9 depicts DC buzzer, it is an electromechanical device commonly used to generate audible alerts or alarms in various electronic systems and applications. It is connected to the digital pin (D4) of the Arduino. Unlike traditional mechanical buzzers, DC buzzers are driven by direct current (DC) voltage and produce sound through the vibration of an internal piezoelectric element. DC buzzers typically operate within a specific voltage range, such as 3V to 24V. They are commonly used in alarm systems, security devices, automotive applications, industrial machinery, and consumer electronics to provide auditory feedback for critical events or notifications.

In this project, buzzer is integrated into the system to provide auditory alerts in addition to visual alerts on the LCD display. When hazardous conditions are detected by the sensors, such as exceeding predefined thresholds for temperature, gas levels, or light intensity, the buzzer can emit an audible warning signal, alerting personnel to the potential danger.

3.4 PIN CONFIGURATION

Efficiently configuring sensor, LCD and GSM pins on the Arduino Uno is essential for accurate data acquisition. Understanding the pin assignments and voltage requirements ensures seamless integration of sensors, facilitating precise monitoring of hazard.

Table 3.1 Components PIN Configuration on Arduino Uno

COMPONENTS	ANALOG / DIGITAL PIN	VOLTAGE
LM35	A0	5 V
MQ-2	A1	5 V
LDR	A2	5 V
LCD - I2C (SDA, SCL)	A3, A4	5 V
GSM (TX, RX)	D2, D3	3.7 V
Buzzer	D4	5 V
LED	D5	5 V

Table 3.1 displays the pin configuration of all the components that is connected to Arduino Uno. It details the analog and digital pins on the Arduino Uno to which each sensor is connected, along with the voltage supplied to each component. This information is crucial for understanding the hardware setup and interfacing of components with Arduino Uno in the hazard prevention system using GSM.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 SIMULATION RESULTS

The simulation output of the proposed hazard prevention system vividly demonstrates its real-time monitoring capabilities within Saarathi Animal Feeds' storage facilities. Through visual representations and numerical data, the simulation showcases the system's ability to detect and respond to potential hazards such as temperature fluctuations and hazardous gas emissions promptly. Alerts generated via the GSM network ensure swift communication to designated personnel, facilitating rapid intervention and minimizing risks. The user-friendly interface allows for remote management and monitoring, enabling personnel to access system status and sensor data from any location. Simulated response actions, such as adjusting ventilation systems or activating emergency protocols, underscore the system's effectiveness in mitigating hazards. Comprehensive reports generated by the simulation provide valuable insights for optimizing safety protocols and ensuring regulatory compliance. Overall, the simulation output validates the efficacy of the hazard prevention system in enhancing safety and operational efficiency within the storage facilities.

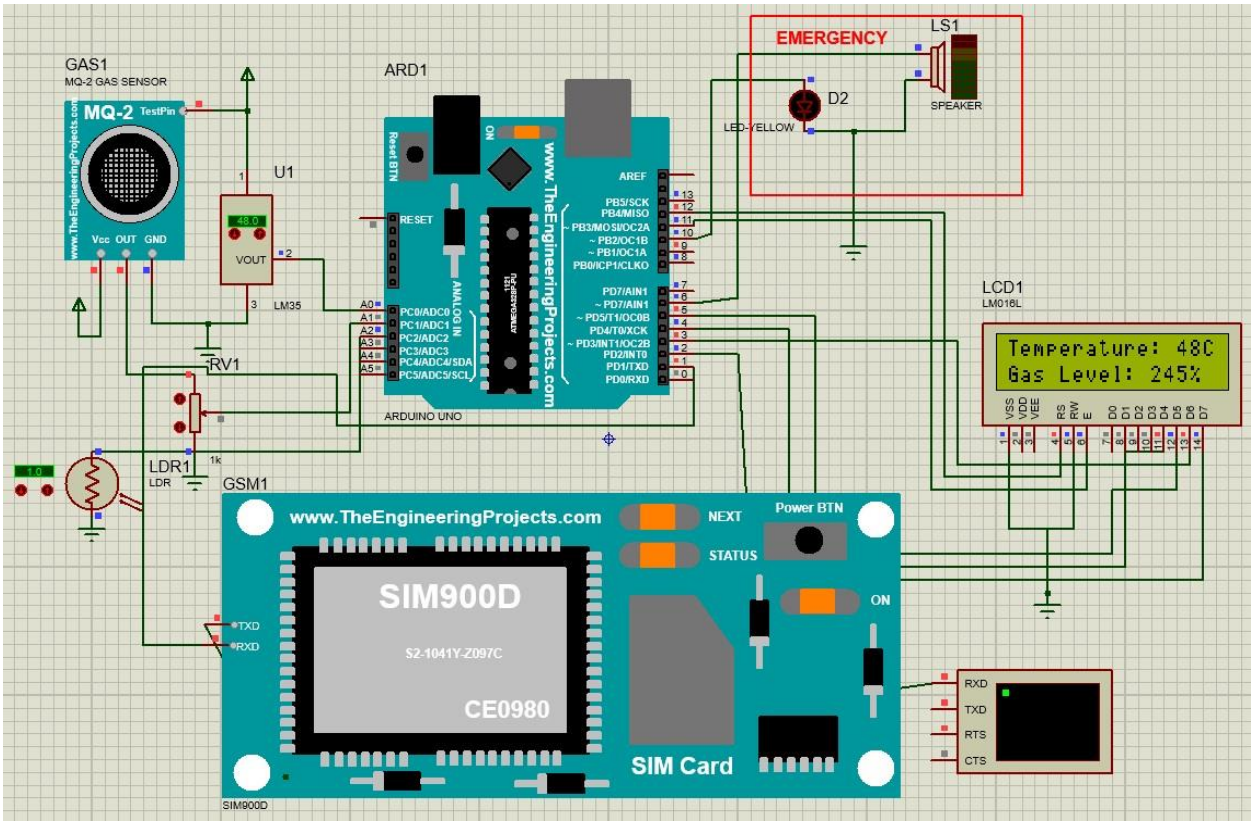

Figure 4.1 Under normal condition (i.e., when no hazard is detected)

Figure 4.1 depicts the stimulated output of hazard prevention system using GSM, under normal condition (i.e., when no hazard is detected) LCD displays the real time temperature, light intensity and gas level.

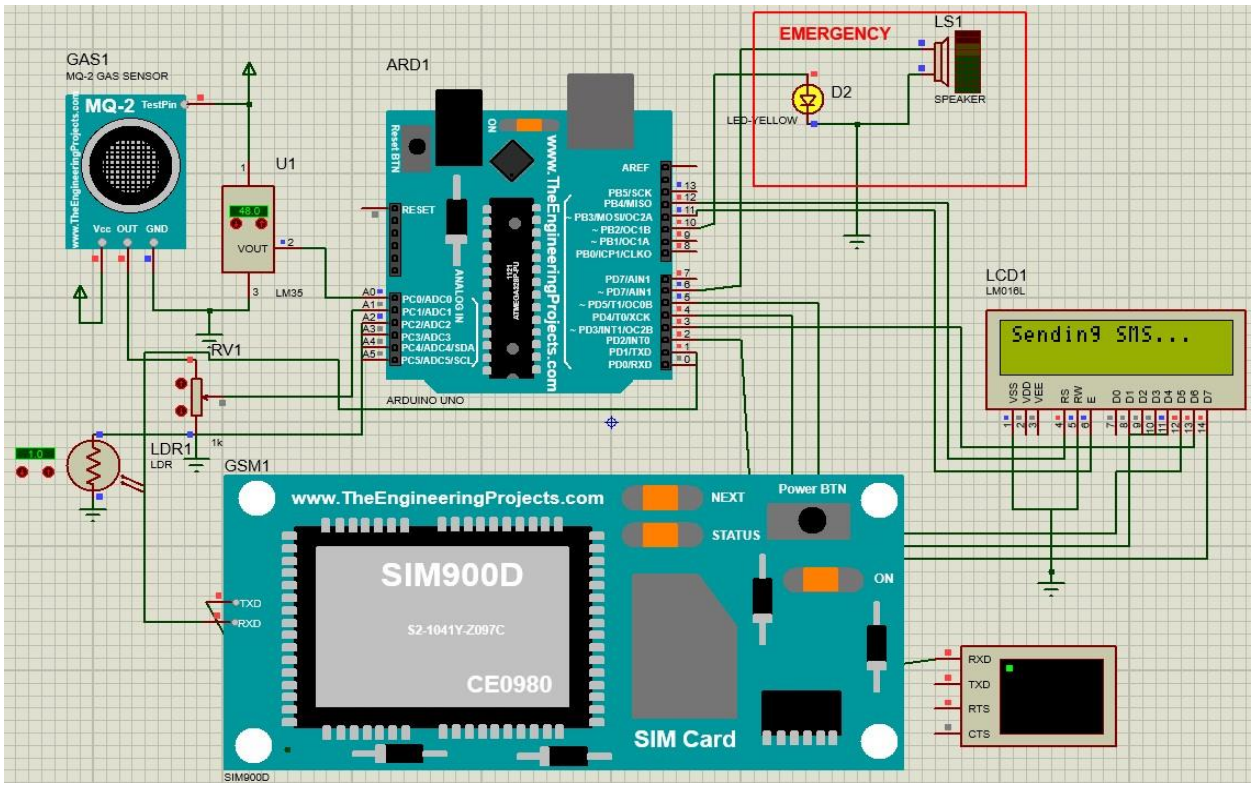

Figure 4.2 Message send through GSM (When hazard is detected)

Figure 4.2 depicts the simulated output when sensor values exceed predefined threshold levels, the hazard prevention system triggers an immediate response through GSM communication and also through buzzer, LED and LCD display. In such instances, the system initiates a series of actions to alert users and ensure timely intervention. First, the system generates an alert message containing relevant information about the detected hazard, such as the type of sensor triggered and the current environmental conditions. This alert message is then transmitted via SMS to designated personnel's mobile phones, providing instant notification regardless of their location.Simultaneously, the system initiates a voice call to predefined phone numbers, ensuring that users receive urgent alerts even if they are unable to access text messages immediately. The voice call delivers a concise message alerting the user to the detected hazard and prompting them to take appropriate action. This dual-alert mechanism ensures redundancy and reliability, mitigating the risk of missed notifications and enabling users to respond promptly to emerging safety threats.

4.2 DEMO PROTOTYPE

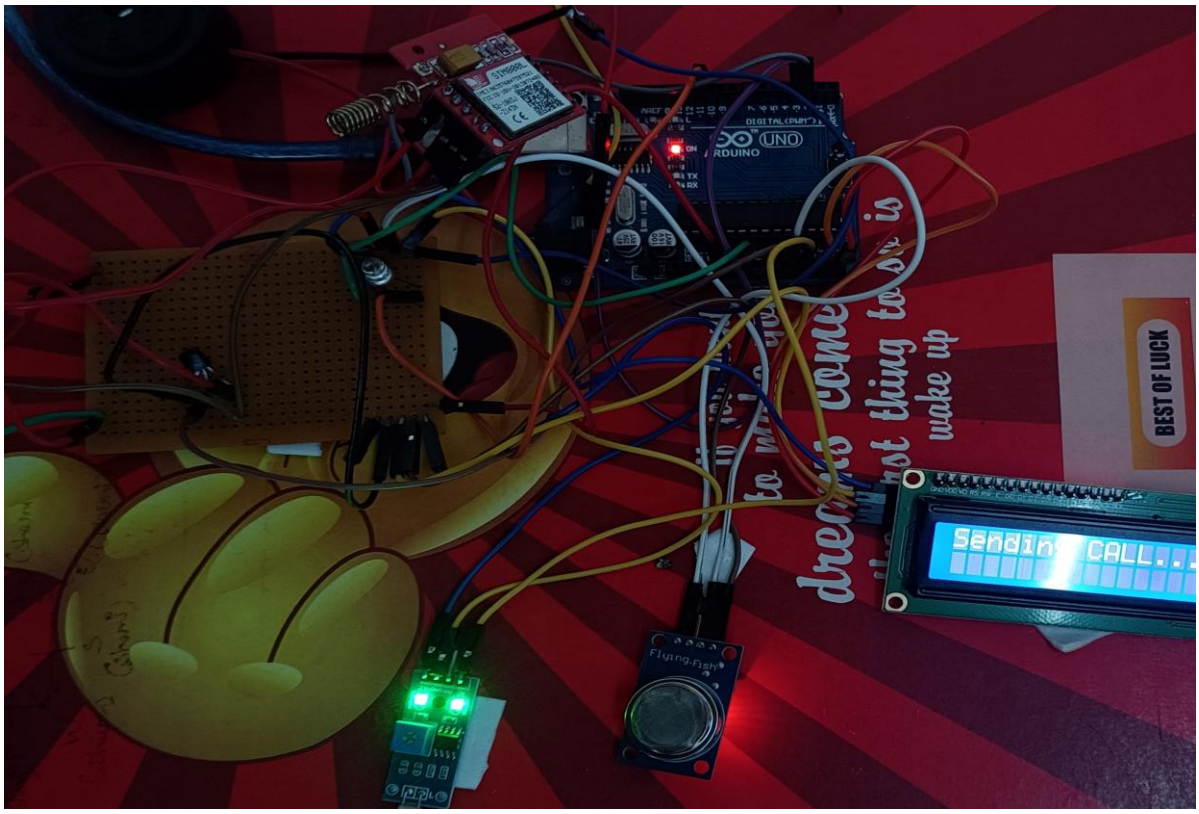

Figure 4.3 Demo prototype

Figure 4.3 depicts the demo prototype of the hazard prevention system provides a comprehensive overview of its functionality, starting with a detailed explanation of its hardware setup. Attendees are guided through the physical components, including sensors for environmental monitoring, an Arduino Uno microcontroller for data processing, an LCD display module for visual output, and a GSM module for communication. By showcasing how these components interact within the system architecture, attendees gain a clear understanding of the system's underlying technology. The alert mechanism is a key highlight of the demo prototype, showcasing the system's capability to notify designated personnel in the event of a hazard. Attendees witness the delivery of SMS alerts containing crucial information about the detected hazard, as well as the initiation of voice calls for immediate attention.

This dual-alert mechanism ensures that users receive timely notifications regardless of their communication preferences, enhancing the system's effectiveness in facilitating rapid response and intervention.

The demo prototype also emphasizes the system's remote management capabilities, allowing users to access and control the system from anywhere. Attendees learn how to remotely monitor sensor data, acknowledge alerts, and initiate response actions through an intuitive user interface. This feature enhances operational flexibility and efficiency, enabling users to manage safety risks effectively even when they are off-site.

4.3 FINAL PROTOTYPE

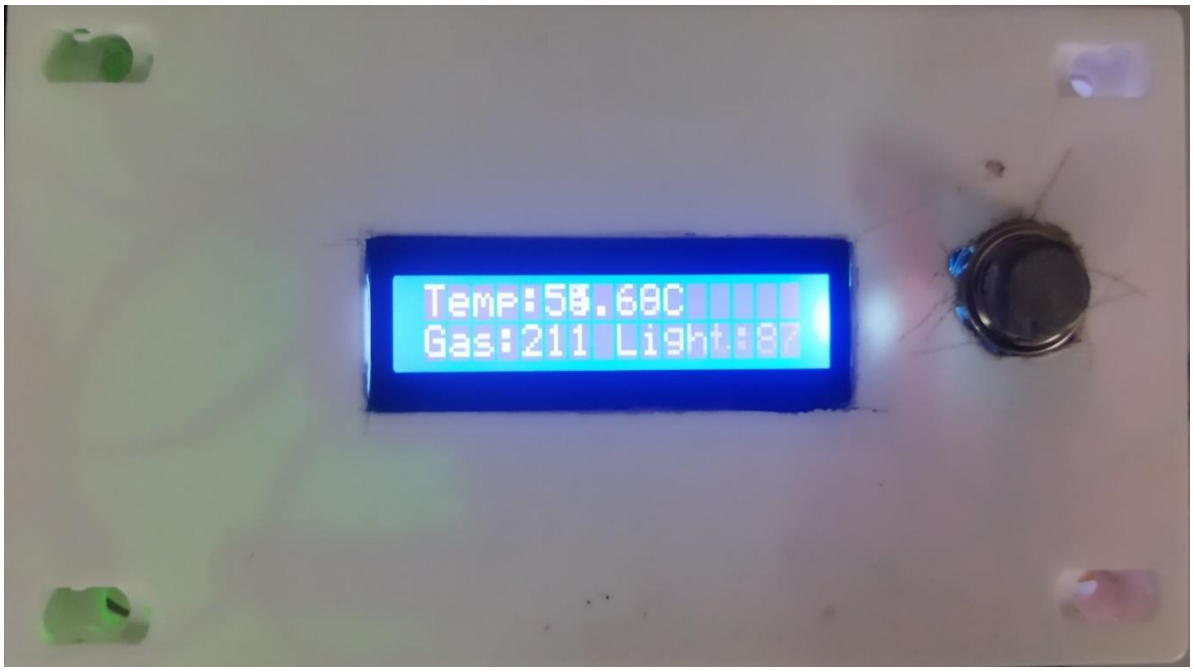

Figure 4.4 Under normal condition (i.e., when no hazard is detected)

Figure 4.4 depicts the hardware output of hazard prevention system using GSM, under normal condition (i.e., when no hazard is detected) LCD displays the real time temperature, light intensity and gas level.

Figure 4.5 Message send through GSM (When hazard is detected)

Figure 4.5 depicts the hardware output when sensor values exceed predefined threshold levels, the hazard prevention system triggers an immediate response through GSM communication and also through buzzer, LED and LCD display. In such instances, the system initiates a series of actions to alert users and ensure timely intervention. Figure 4.5 depicts the alert message that is transmitted via SMS and phone call to designated personnel's mobile phones, providing instant notification regardless of their location.

Figure 4.6 Geo tag photo

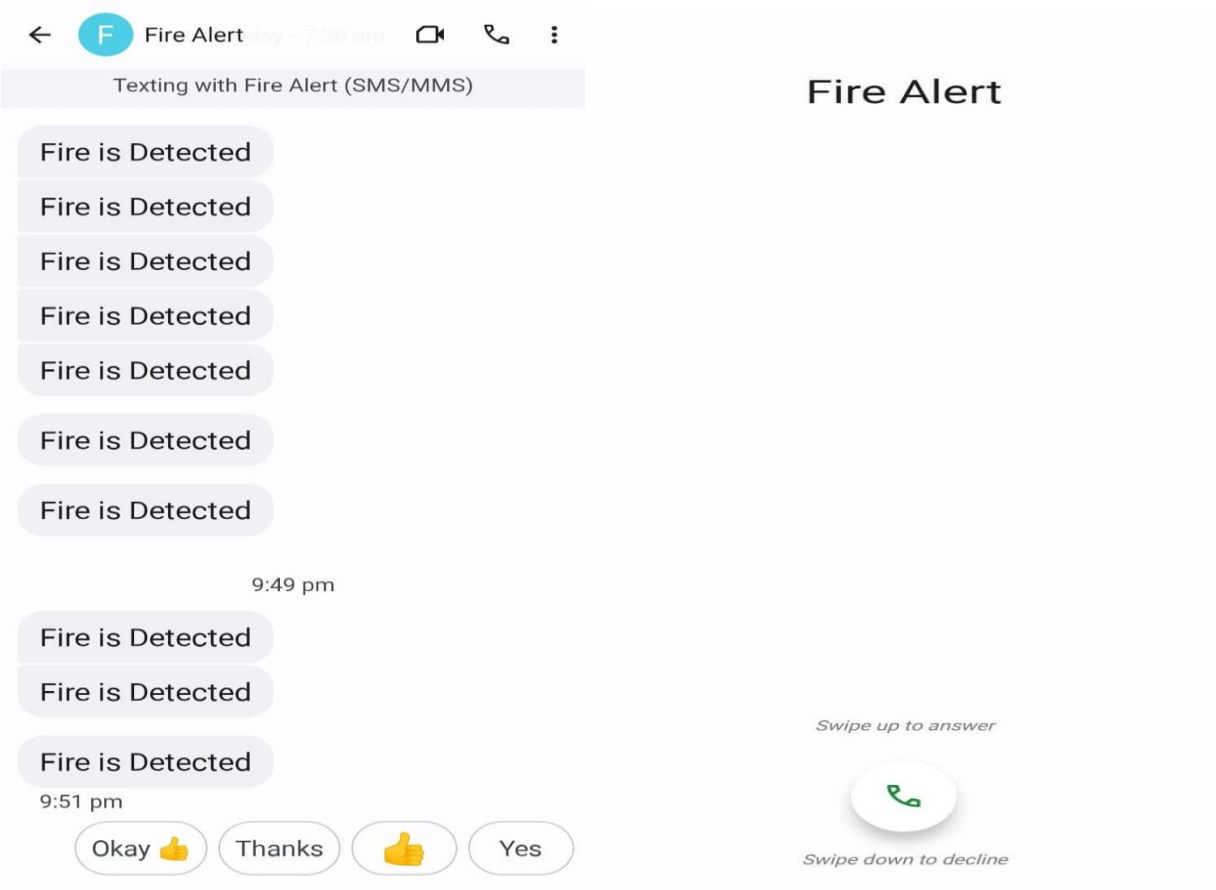

Figure 4.7 Hazard Alert System

Figure 4.7 depicts the alert system which includes the alert message and call received by the fire safety department and the respective owner of the company when any hazard occurs within the storage unit of the company.

So that, the huge loss can be avoided by taking necessary actions promptly. This system ensures swift communication and response to any hazard within the storage unit, enabling the fire safety department and the company owner to coordinate effectively and mitigate potential risks before they escalate. This proactive approach not only minimizes the impact of emergencies but also underscores the company's commitment to safety and resilience in the face of adversity.

CHAPTER 5

CONCLUSION AND FUTURE WORK

The hazard prevention system effectively showcases its real-time monitoring, alerting, and response capabilities. Through interactive demonstrations and simulations, attendees gained insight into how the system detects and mitigates potential hazards within storage facilities. By integrating hardware components such as sensors, microcontrollers, and communication modules, coupled with intuitive software interfaces, the prototype demonstrated its potential to enhance safety and operational efficiency in various industrial settings. The dual-alert mechanism, remote management features, and simulated response actions underscored the system's reliability and effectiveness in mitigating safety risks. Overall, the demonstration provided a compelling overview of the hazard prevention system's capabilities and its significance in ensuring workplace safety and compliance.

Moving forward, several avenues for future work and enhancements to the hazard prevention system can be explored. Firstly, integrating advanced machine learning algorithms for predictive analytics could enable the system to anticipate safety hazards before they occur, thereby enhancing proactive risk mitigation. Additionally, expanding the system's compatibility with other communication protocols such as Wi-Fi or LoRa could improve its versatility and connectivity options. Furthermore, conducting field trials and pilot implementations in real-world industrial environments would provide valuable insights into the system's performance, usability, and scalability. Collaborating with industry partners and regulatory bodies to refine safety standards and compliance requirements could also inform future iterations of the system. Overall, ongoing research and development efforts will continue to drive innovation and improve the hazard prevention system, ensuring its continued effectiveness in safeguarding personnel and assets in industrial settings.

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ACCEPTANCE LETTER

SAARATHI ANIMAL FEEDS

DATE:19-02-2024

To

The Principal,

Kongu Engineering College,

Perundurai-638060.

Subject: Request to undertake consultancy work to develop a Hazard prevention system using IOT for our company.

Respected Sir/Madam,

We are in a need for a Hazard prevention system for our company . In this regards ,we hereby like to offer a consultancy work of developing Hazard prevention system for our company **SAARATHI CATTLE FEEDS** to the team comprising of **Mrs V.MEKALA** [AP/ECE] and student **MEIPRASAANTH V(21ECR116), JEGAN M(21ECR089) & JEGAN P(21ECR090)** from KONGU ENGINEERING COLLEGE to take up the work of developing a Hazard prevention system .We look forward for a good contribution from the above mentioned students to the company.

Thanking You

For Saarathi Animal Feeds

Proprietor

SAARATHI CATTLE FEEDS

APPRECIATION LETTER

SAARATHI ANIMAL FEEDS

DATE:05-05-2024

To

The Principal
Kongu Engineering College,
Perundurai,
Erode – 638060.

Respected Sir,

Sub: Completion of Hazard Prevention System using GSM in Saarathi Animal Feeds - Reg.

I bring it to your kind attention that Mrs.V. MEKALA, AP/ECE, KEC and her team JEGAN M (21ECR089), JEGAN P (21ECR090), MEIPRASAANTH V (21ECR116) has completed the Hazard prevention system using GSM on 05-05-2024 as per requirements. We are fully satisfied with the consultancy work. I would like to thank Mrs.V. MEKALA and institution (Kongu Engineering College) for considering my request and completing the work on time.

Thanking you.

For Saarathi Animal Feeds

Proprietor

SAARATHI ANIMAL FEEDS

IC 01 FORM

KONGU ENGINEERING COLLEGE

IIP CELL

Consultancy Approval

1	Nature of Consultancy	Hazard Prevention system using GSM
2	Name and Address of Industry / Company	SAARATHI ANIMAL FEEDS H.O SIRUVALUR, GOPICHETTIPALAYAM, ERODE
3	Details of request from the industry / company	EMBEDDED SYSTEM
4	Details of Work Involved	EMBEDDED SYSTEM
5	Fee	Rs.6000 +Service tax(18%): 7080
6	Transport (KEC/Faculty/Industry/Nil)	faculty
7	Faculty Name and Department involved	V.MEKALA Dept : ECE
8	Remarks,if any	(i)Without using college facilities (ii)To be directly handled