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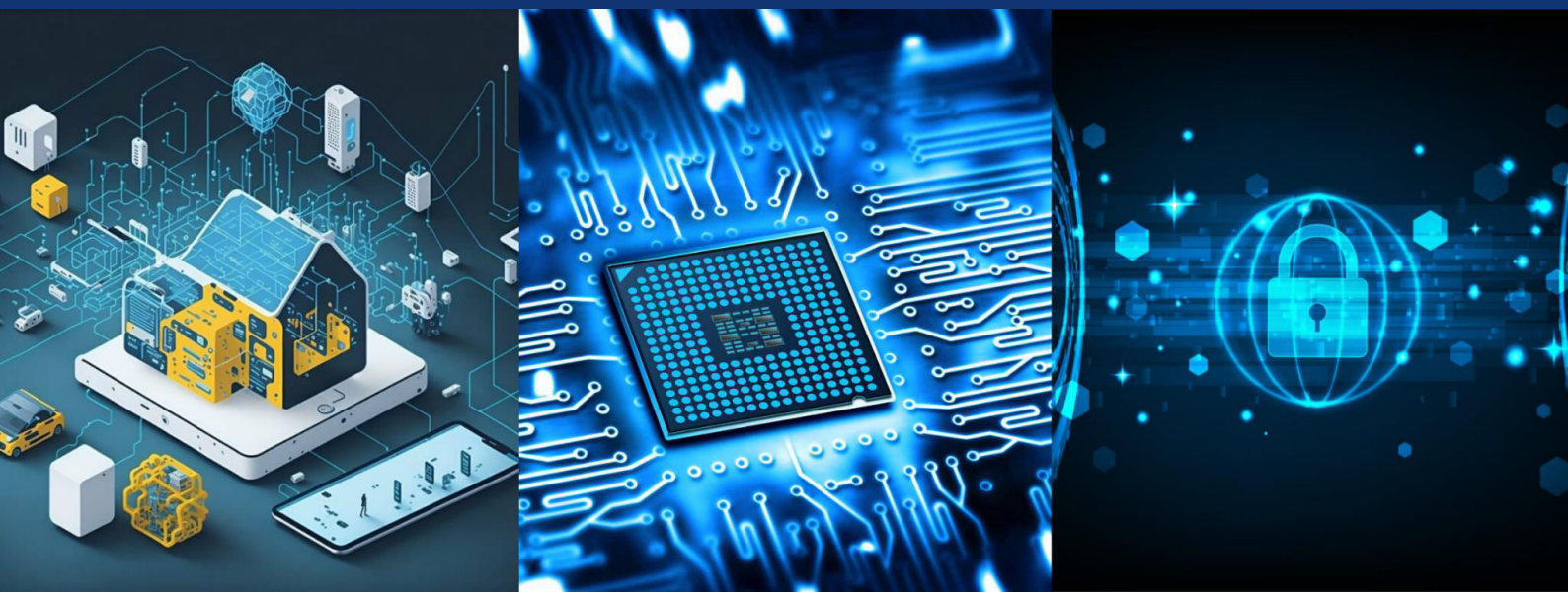

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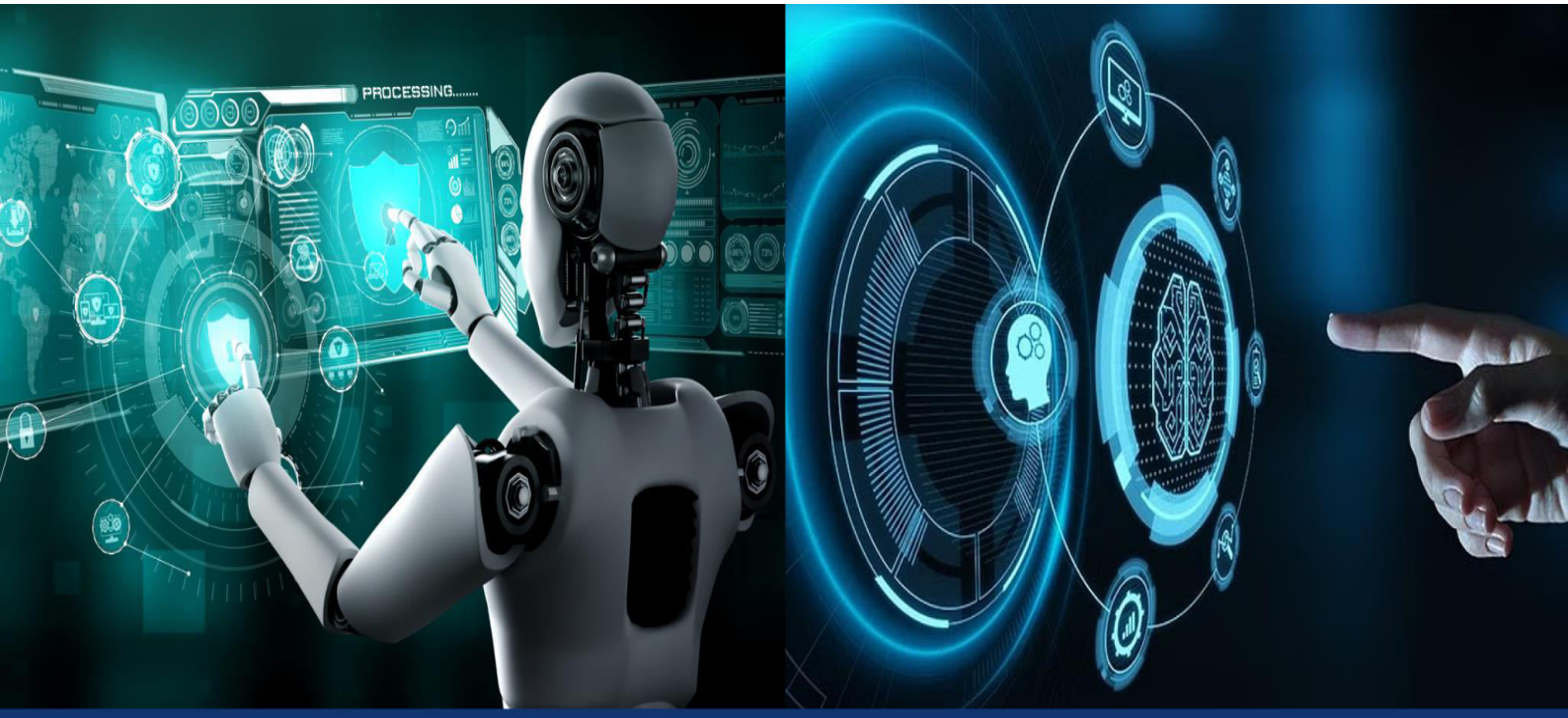

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Industrial Safety Monitoring System using IoT

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ABSTRACT: Industrial environments are inherently prone to hazards such as gas leaks, overheating, smoke emissions, and unauthorized movement, posing significant risks to personal assets. This project presents an IoT-based Industrial safety monitoring system designed to provide continuous, real-time surveillance of critical safety parameters. The modular architecture supports easy addition of new sensors and integration with existing SCADA platforms. By delivering automated, around-the-clock hazards detection and alerting, this IoT solution enhances industrial safety, minimizes downtime, and contributes to regulatory compliance and audit readiness.

KEYWORDS: Temperature sensor, Gas sensor, Humidity sensor, Wi-Fi module, Buzzer, LCD Display, Microcontroller.

I. INTRODUCTION

Accident occurring in most Indian industries are a source of concern to everyone. Industries that reflect workers safety workers safety and health issues based on mechanical maintenance protection, and other management related issues. Environmental, Health and Safety departments have the top management in Indian industries fails to put in place adequate safety practise their workplace to safeguard not only the employees and management but also clients and contractors and subcontractor who might have some importance in the industry. Ineffective safety practices have an adverse impact on the organization as well as the workforce. Some of these include delay medical and compensation charges, tool and apparatus impairment, and moral of employees being an industry related work practices employee, management, supervisor subcontractors, third parties, and visitors are exposed to several hazards and risks.

Majority of the industries uses heavy duty machines to achieve their commercial goal. These machines can subject the workers into fatal accidents due to rise in temperature of boilers and gas leakages in industries. To overcome this problem, we are implementing “Industrial safety monitoring system using Internet of Things”, where we are using temperature sensor, humidity sensor and gas leakage sensor, where sensor play a crucial role in industry automation in making system intellectual.

II. BLOCK DIAGRAM AND METHODOLOGY

2.1 BLOCK DIAGRAM

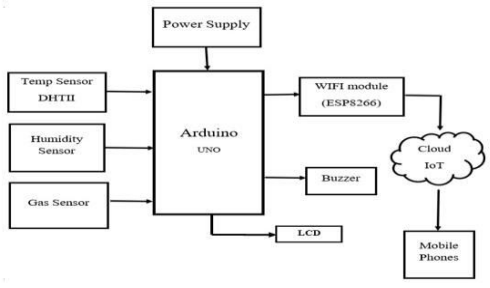

Fig1.Block diagram of industrial safety monitoring system using IoT

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2.2 WORKING METHODOLOGY

The above figure1 represent the methodology of Industrial Safety Monitoring System Using IoT In this project we are using three sensors, such as temperature sensor, humidity sensor and gas sensor. The temperature and humidity sensor used is DHT11 sensor module. The components used are physical parameter sensors, Arduino UNO, ESP8266 Wi-Fi module, buzzer. Here we are going to monitor humidity, temperature and gas level over the internet.

Working of this project is based on single wire serial communication. First Arduino sends start signal to DHT11 module gas sensor and then DHT gives a response signal containing temperature and humidity. DHT11 sensor module is combined module for sensing humidity and temperature which gives a calibrated digital output signal. DHT11 gives us very precise value of humidity and temperature and ensures high reliability and long-term stability. ESP8266 is a Wi-Fi enabled system on chip. It is mostly used for development of IoT. ESP8266 module is a low-cost standalone wireless transceiver that can be used for end point IoT developments.

The sensced data from sensor is given to Arduino UNO. The Arduino send data to Wi-Fi module which is a wireless communication system. It operates on low voltage. The Wi-Fi module send data to cloud. If there is any gas leakage in industry, temperature and humidity crosses the threshold value then it sends alert signal to staff members of the industry through mobile phone.

2.2 WORKING FLOWCHART

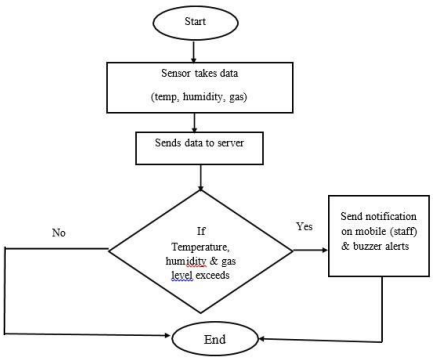

Fig2.Flowchart of the industrial safety monitoring system using IoT

The above figure2 represent the flow chart of the proposed model i.e., Industrial safety monitoring system using IoT. It explains about the flow of working of the proposed model or the step-by-step representation of the proposed model and its working, this process repeats every 3 minutes once.

III. COMPONENTS REQUIRED

3.1HARDWARE REQUIREMENTS

3.1.1 ARDUINO NANO

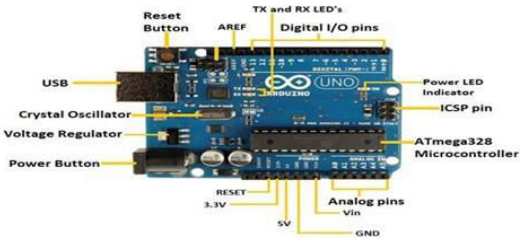

Fig3. Arduino nano

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The Arduino Nano as shown in Fig3.is a small, compact board based on the ATmega328 microcontroller. It lacks only a DC power jack, and it works receiving instructions from a computer or another device via USB, interpreting those instructions, executing them using its microcontroller. It works with a Mini-B USB cable instead of a standard one. The Arduino Nano uses on Mini-B USB port connection, unregulated power supply of 6-20V to Vin pin of the Arduino Nano (pin 30), and Connect the positive terminal of 5V external power supply (pin 27) to the 5V pin on Arduino Nano, and the negative terminal to the GND pin. This bypasses the on board voltage regulator since the input voltage is already at the required 5V.

3.1.2 ESP8266 Wi-Fi module

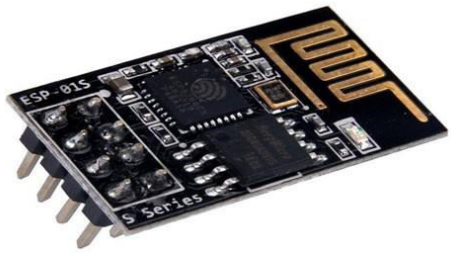

Fig4. ESP8266 Wi-Fi module

The above figure4 shows the ESP2866 Wi-Fi module is an embedded wireless technology thatis web friendly with no use of shields or peripherals. It consists of 8 GPIO pins which can be assigned to various functions such as UART, PWM, and LED light and button programmatically. ESP2866 Wi-Fi SoC is embedded with memory controller, including SRAM and ROM. MCU can visit the memory unit through IBUS and AHB interface. It operates on low voltage that is 3.3 V. ESP8266 delivers highly integrated Wi-Fi SoC solution to meet users' continuous demands for efficient power usage, compact design and reliable performance in the Internet of Things industry. With the complete and self-contained Wi-Fi networking capabilities, ESP8266 can perform either as a standalone application or as the slave to a host MCU. The integrated high speed cache helps to increase the system performanceand optimize the system memory. Also, ESP8266 can be applied to any microcontroller design as a Wi-Fi adaptor through SPI/SDIO or UART interfaces.

3.1.3 TEMPERATURE AND HUMIDITY SENSOR (DHT11)

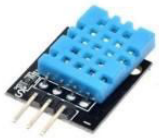

Fig5. Temperature and Humidity sensor

The above figure5 shows DHT11 is a basic ultra-low-cost digital temperature and humidity sensor. It uses capacitive humidity sensor and thermistor to measure the surrounding air and spits out a digital signal on data pin. The DHT11 temperature range is from 0 to 50 degrees Celsius. DHT11 sensors are made up of two parts, a capacitive humidity sensor and a thermistor with a basic chip that is responsible for analogy to digital conversion. The operating voltage of DHT11 is 3.3 V to 5.5 V and the operating current is 0.3mA. The single-wire serial interface makes system integration quick and easy. Its small size, low power consumption and up-to 20 meters signal transmission making it the best choice for various applications, including those most demanding ones. The component is 4-pin single row pin package.

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3.1.4 GAS SENSORE (MQ-5)

Fig6. Gas sensor

The above figure6 shows the MQ-5 gas sensor. MQ5 sensor is useful for gas leakage detection.It can detect H2, LPG, CH4, CO, Alcohol. Due to its fast response time and high sensitivity, measurements can be taken as soon as possible. The range of MQ-5 gas sensor ranges between 300-10000ppm. The gas sensing material used in MQ5 gas sensor is tin dioxide (SnO2), which has a low conductivity in clean air. When there is flammable gas in the environment where the sensor is located, the conductivity of the sensor increases with the increase of the flammable gas concentration in the air. Sensitive for LPG, natural gas, coal gas. The output voltage boosts alongwith the concentration of measured gases increases. The sensitivity of MQ5 sensor can be varied.It provides fast response and recovery.

3.2 SOFTWARE REQUIREMENTS

3.2.1 ARDUINO IDE

The Arduino IDE provides a user-friendly interface for writing, compiling, and uploading code to Arduino boards. It supports a variety of programming languages, including C and C++, and comes with a range of built-in libraries for different functionalities. The IDE also includes features like syntax highlighting, automatic code indentation, and serial monitoring for debugging. Additionally, it offers extensive documentation and a large community of users who share projects, tutorials, and troubleshooting tips

IV. CIRCUIT DIAGRAM

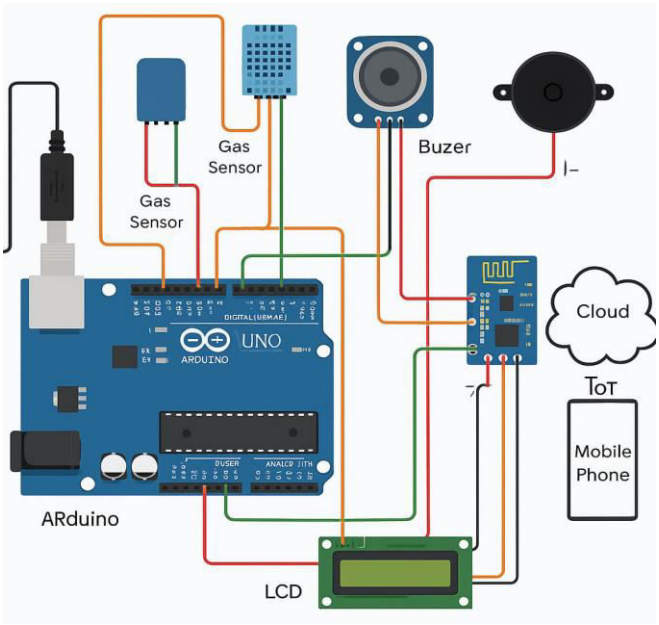

Fig7. Circuit diagram

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V. RESULT AND CONCLUSION

The "Industrial Safety Monitoring System Using IOT" is designed to be affordable, user friendly and robust in design to facilitate easy indoor and outdoor monitoring for the industries. Various sensors such as temperature sensor and humidity sensor and gas sensor are used to detect increase above the threshold value and buzzer is used to provide an alert to the staff members during monitoring.

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