REAL TIME MONITORING OF GAS LEAKAGE IN STEEL INDUSTRY

A MINI PROJECT REPORT

Submitted by

SARANYA S

(18ECR183)

SWEETHA S

(18ECR219)

SURYA R

(18ECR216)

in partial fulfilment of the requirements

for the award of the degree

of

BACHELOR OF ENGINEERING

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SCHOOL OF COMMUNICATION AND COMPUTER SCIENCES

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BONAFIDE CERTIFICATE

This is to certify that the project report entitled **REAL TIME MONITORING OF GAS LEAKAGE IN STEEL INDUSTRY** is the bonafide record of project work done by SARANYA S(18ECR183), SWEETHA S (18ECR219),SURYA R(18ECR216) in partial fulfilment of the requirements for the Degree of Bachelor of Engineering in Electronics and Communication Engineering of Anna University, Chennai during the year 2020-2021.

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Submitted for the end semester viva voice examination held on_____

INTERNAL EXAMINER **EXTERNAL EXAMINER**

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

KONGU ENGINEERING COLLEGE

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DECLARATION

We affirm that the Project report entitled **REAL TIME MONITORING OF GAS LEAKAGE IN STEEL INDUSTRY** being submitted in partial 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.

Date: (Signature of the candidates)

SARANYA S

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I certify that the declarations made by the above candidates are true to the best of my knowledge.

Date: Name and Signature of the supervisor with seal

ABSTRACT

Industries disasters are the purpose for the increasing unreliability in the human life particularly to the workers. To decrease these industries disasters, we developed a gadget that might recognize the poisonous gas and other physical condition utilizing the Internet of things (IoT). This project planned to avoid industries accident and checking the contamination control board.

A central microcontroller is joined with sensors like fire sensor, temperature sensor and some gas sensors. Sensors would be used to get the information from the environment at the leakage time. If the assumed level of the gasses and temperature goes above the average level than the indicated values, than the alert will be provided for utilizing the internet of the web page.

This information of the sensors will be stored on the internet in the equivalent website that could make utilized for future and further processing, and this will be good begin for industries to secure the humans in the surroundings and guarantee them a secured existence.

ACKNOWLEDGEMENT

We extend our hearty gratitude to our honorable Correspondent **Thiru.P.Sachithanandan** and other trust members for having provided us with all necessary infrastructures to undertake this project.

We extend our hearty gratitude to our honorable Principal, **Dr.V.Balusamy B.E.,M.Tech.,Ph.D.,** for his consistent encouragement throughout our college days.

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A special dept is owed to the project coordinator **Dr.S.Sasikala BE.,ME.,PhD.,** Assiant Professor (SRG), Department of Electronics and Communication Engineering for her encouragement and valuable advice that made us to carry out the project work successfully.

We extend our sincere gratitude to our beloved guide, **Ms.G.Sivapriya M.E.,** Assistant Professor, Department of Electronics and communication engineering for her ideas and suggestions, which have been very helpful to complete the project.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

In our daily life, the environment and its condition is very important for our health as it will impact the quality of life for all of earth's inhabitants. Consequently, the issues from environment and the air quality in industrial area are discussed to increase the alertness and responsibility regarding the environment towards public and workers' health. The dangerous gases such as CH4, and CO ,NH3 will bring harmful effect towards human as they may cause explosions and accident in most industrial areas**.**

Specific harmful gases are continuous breathing intake the human body continues causes might be going to die. If the few gases are scentless, they will be unprotected for a long time that means cause significant health problems

1.1REQUIREMENTS OF THE COMPONENTS:

- Arduino UNO
- Esp8266 wifi module
- Temperature sensor
- Fire sensor
- MQ-7
- MQ-135

1.2ARDUNIO UNO:

Arduino is a single-board microcontroller meant to make the application more accessible which are interactive objects and its surroundings. The hardware features with an open-source hardware board designed around an 8-bit Atmel AVR microcontroller or a 32-bit Atmel ARM. Current

models consists a USB interface, 6 analog input pins and 14 digital I/O pins that allows the user to attach various extension boards.

The Arduino Uno board is a microcontroller based on the ATmega328. It has 14 digital input/output pins in which 6 can be used as PWM outputs, a 16 MHz ceramic resonator, an ICSP header, a USB connection, 6 analog inputs, a power jack and a reset button. This contains all the required support needed for microcontroller. In order to get started, they are simply connected to a computer with a USB cable or with a AC-to-DC adapter or battery. Arduino Uno Board varies from all other boards and they will not use the FTDI USB-to-serial driver chip in them. It is featured by the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

1.2.1 ARDUINO UNO WITH DIGITAL INPUT/OUTPUT

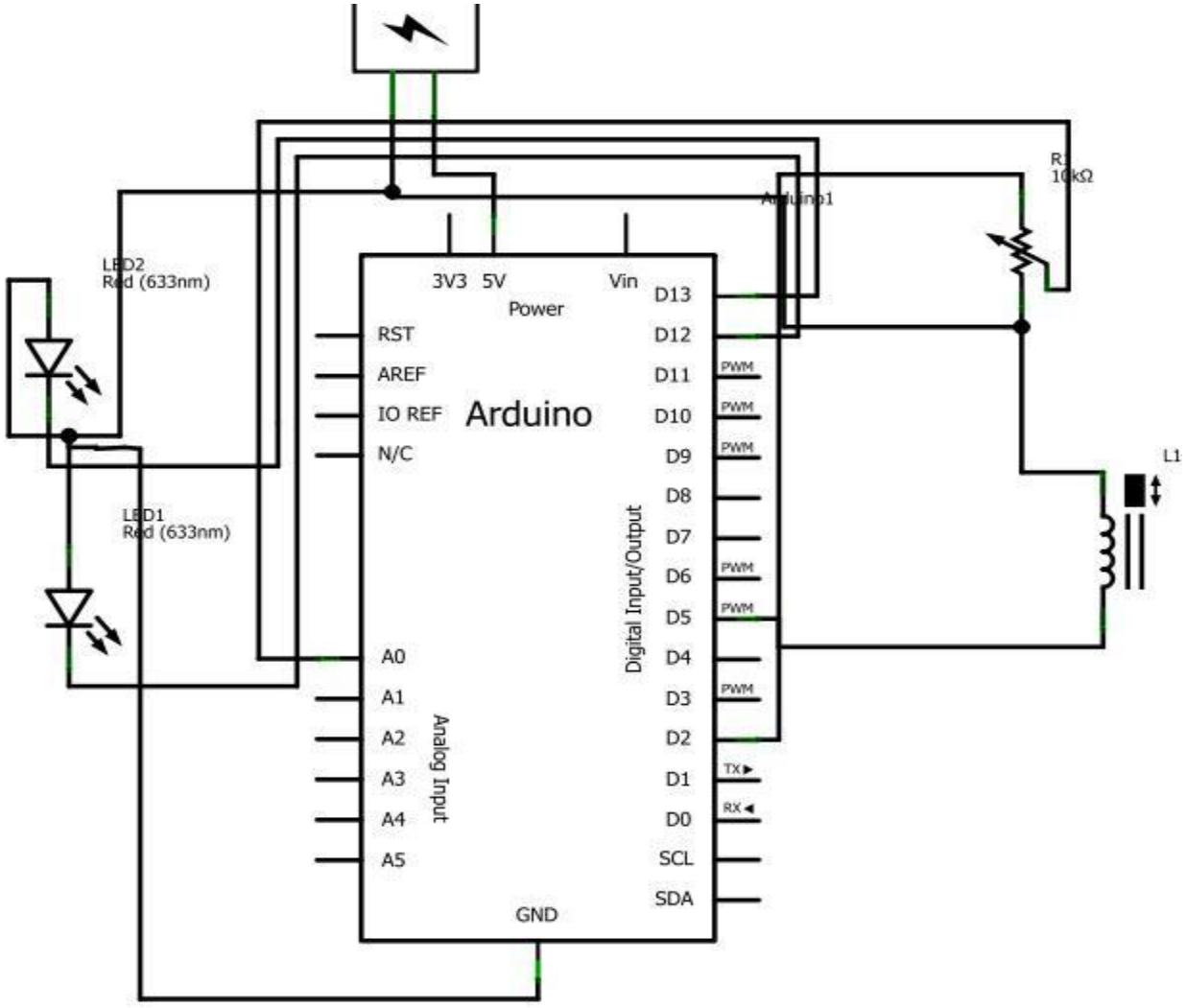

Figure 1.1.Arduino UNO

1.2.2 FEATURES OF THE ARDUINO UNO BOARD:

- It is an easy USB interface. This allows interface with USB as this is like a serial device.

- The chip on the board plugs straight into your USB port and supports on your computer as a virtual serial port. The benefit of this setup is that serial communication is an extremely easy protocol which is time-tested and USB makes connection with modern computers and makes it comfortable.
- It is easy-to-find the microcontroller brain which is the ATmega328 chip. It has more number of hardware features like timers, external and internal interrupts, PWM pins and multiple sleep modes.
- It is an open source design and there is an advantage of being open source is that it has a large community of people using and troubleshooting it. This makes it easy to help in debugging projects.
- It is a 16 MHz clock which is fast enough for most applications and does not speeds up the microcontroller.
- It is very convenient to manage power inside it and it had a feature of built-in voltage regulation. This can also be powered directly off a USB port without any external power. You can connect an external power source of upto 12v and this regulates it to both 5v and 3.3v.
- 13 digital pins and 6 analog pins. This sort of pins allows you to connect hardware to your Arduino Uno board externally. These pins are used as a key for extending the computing capability of the Arduino Uno into the real world. Simply plug your electronic devices and sensors into the sockets that correspond to each of these pins and you are good to go.
- This has an ICSP connector for bypassing the USB port and interfacing the Arduino directly as a serial device. This port is necessary to re-bootload your chip if it corrupts and can no longer used to your computer.
- It has a 32 KB of flash memory for storing your code.
- An on-board LED is attached to digital pin 13 to make fast the debugging of code and to make the debug process easy.
- Finally, it has a button to reset the program on the chip.

1.3 UBIDOTS:

Every time a device updates a sensor value in a variable, a data-point or "dot" is created. Ubidots stores dots that come from your devices inside variables, and these stored dots have corresponding timestamps

1.3.1UBIDOTS DATA HIERACHY:

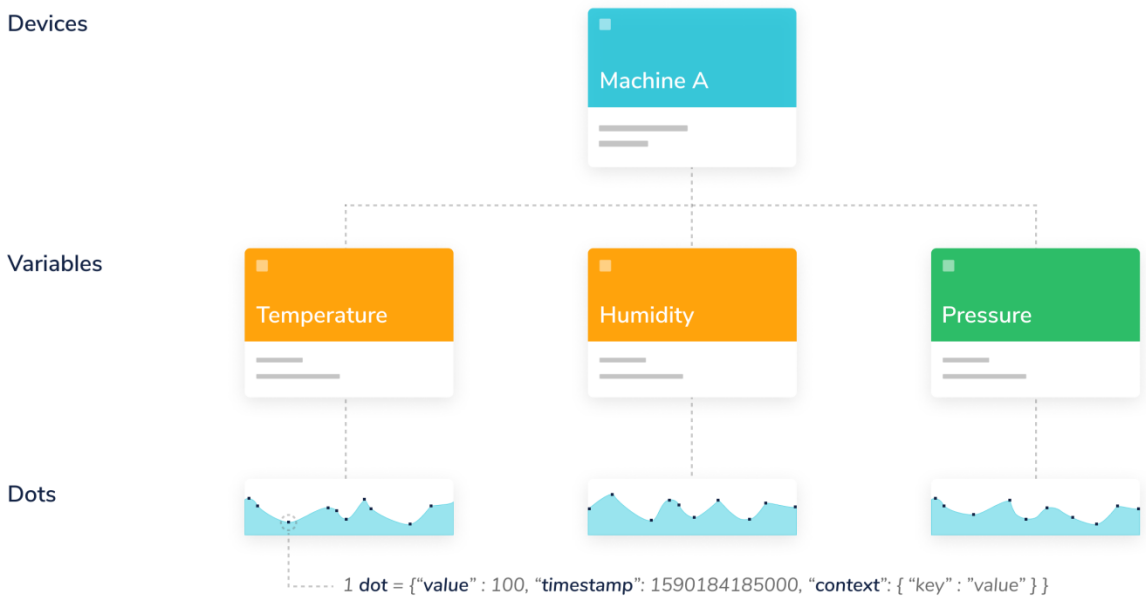

Figure 1.2. Ubidots hierachy

1.3.2 Each dot contains these items:

ITEM	DESCRIPTION	MANDATORY
		YES
TIMESTAMPS		NO
CONTEXT		NO

Table 1.3.2

1.3.3 VALUES:

A numerical value. Ubidots accepts up to 16 floating-point length numbers.

{"value" : 34.87654974}

1.3.4 TIMESTAMPS:

A timestamp, as best described here, is a way to track time as a running total of seconds. This count starts at the Unix Epoch on January 1st, 1970 at UTC. Therefore, the unix time stamp is merely the number of seconds between a particular date and the Unix Epoch. Please keep in mind that when you send data to Ubidots, you must set the timestamp in milliseconds; also, if you retrieve a dot's timestamp, it will be in milliseconds.

"timestamp" : 1537453824000

The above timestamp corresponds to Thursday, September 20, 2018 2:30:24 PM.

1.3.5 CONTEXT:

Numerical values are not the only data type supported; you can also store string or char data types inside what we call context**.** The context is a key-value object that allows you to store not only numerical but also string values. An example use of the context could be:

"context" : {"status" : "on", "weather" : "sunny"}

A context is commonly used to store the latitude and longitude coordinates of your device for GPS/tracking application use cases. All Ubidots maps uses the *lat* and *lng* keys from a dot's context to extract the coordinates of your device, in that way you just need to send a single dot with the coordinates values in the variable context to plot a map instead of sending separately both latitude and longitude in two different variables. Below you can find a typical context with coordinates values:

"context" : {"lat":-6.2, "lng":75.4, "weather" : "sunny"}

Please note that you can mix both string and numerical values in the context. If your application is for geo-localization purposes, make sure that the coordinates are set in decimal degrees.

CHAPTER 2

LITERATURE REVIEW

S. Sindhu , Dr.M. Saravanan , S.Srividhya 2020. In this paper they summarizes the latest advances in sensors for detection of pernicious gases. The primary sources of hazardous gases include ignition of coal, oil for electricity and transport, as well as emissions from industries and refineries. Volatile organic compounds are common in air pollutants which includes different kind of chemicals cause's adverse health effects. In last few years sensors which has high sensitive to VOCs had been used Atmospheric pollution is the massive issue faced by the people worldwide In addition analytical information revised here shows the efficacy of the existing approaches in toxic gas prediction and an improvement in terms of data validation techniques to improvise the accuracy.

A.A. Qazi1, Monika Bhakare, Sushant Ghavale, Bhagyashree Thakur 2020. This project aims towards providing a safe environment for the health of workers in chemical, steel, petroleum Industries, etc.The major accidents cause due to leakage of hazardous gases used in production leads to the deaths and unsafe environment. To avoid such unpredictable incidents we had worked on a protocol system, The altering and detection of gases using Raspberry Pi and IoT. In this system gas sensor detects the presence of gases in the environment of intended level and alarm is used to alert the industrial area and surrounded residential area. If the average level of particular gases and temperature goes above then it is notified using internet of webpage and LCD display. In this GSM SIM900 module which sends alert message to the inspector' specific mobile for taking essential control action. The proposed system gives high accuracy by effective use of gas sensor like MQ2, MQ4. MQ8, MQ135 not only detect the leakage of hazardous gases also providing graphical user interface to the user using Thingspeak over an IOT

Mobasshir Mahbub 2019 A person can fall into danger if the level of those gases exceeds human body tolerance limit or even can die if the gas level is too high as against sustainability. To cope out against this kind of situation, gas detection and measurement system is highly necessary to detect and measure the level of toxic gases in places where human inhabit such as home and industrial areas. The human environment is surrounded with different toxic and dangerous gases such as natural gas (CH4) found in kitchen stove or LNG in cylinder, different type of fuels for burning etc. In industrial areas, the amount of toxic gases is high and therefore the probability of an accident from those gases. Thus in these areas different types of gases are present as exhaust gases during manufacturing such as CO (Carbon Monoxide), CH4 (Methane), fuels for burning purpose etc. Therefore, for better protection of human life, a gas monitoring system is required. It can be more effective if we measure these gases from a distant safer place with wireless communication devices and components, so that a monitoring system is developed with MQ2 gas Sensor, nRF24L01P Wireless Transceiver Module and Arduino as a MCU.

Rohan Chandra Pandey , Manish Verma , Lumesh Kumar Sahu 2017.The main objective of the work is designing microcontroller based toxic gas detecting and alerting system. The hazardous gases like LPG and propane were sensed and displayed and notify each and every second in the LCD display. If these gases exceed the normal level then an alarm is generated immediately and also an alert message (Email) is sent to the authorized person through the INTERNET and used ARM development board. The advantage of this automated detection and alerting system over the manual method is that it offers quick response time and accurate detection of an emergency and in turn leading faster diffusion of the critical situation. This work modifies the existing safety model installed in industries and this system also be used in homes and offices.

Lei Shu, Yuanfang Chen , Zhihong Sun, Fei Tong, Mithun Mukherjee 2017. Toxic gas leaking and explosion, result in serious damage, so the detection and visualization of the dangerous area of leaking toxic gases is an important research issue for large-scale petrochemical plants. There have been many efforts made to address this issue by using a large number of special monitoring devices. These special devices provide the gas concentration reports within their individual ranges. However, because of the continuity of gas diffusion and the invisibility of toxic gases, it is difficult to detect and visualize the continuous dangerous area of gas diffusion by only using

the scattered concentration reports. This paper proposes a scheme to detect and visualize the dangerous area using Wireless Sensor Networks (WSNs). In this proposed scheme, a planarization algorithm is used to planarize a WSN, and based on the planarized network, the boundary area of gas diffusion is calculated to delimitate the dangerous area. This study also verifies the robustness of the proposed scheme in regards to the node failure. The node failure has a special kind of influence on the accuracy of dangerous area detection. This paper also analyzes the impact of 5 planarization algorithms on the accuracy of dangerous area detection.

Bichinapally Sruthi1 , E Sreenivasulu 2018 Industries disasters are the purpose for the increasing unreliability in the human life particularly to the workers. To decrease these industries disasters, we developed a gadget that might recognize the poisonous gas and other physical condition utilizing the Internet of things (IoT). This project planned to avoided industries accident and checking the contamination control board. A central microcontroller is joined with sensors like shoot sensor, temperature, gas sensor. Sensors would be used to get the information from the environment at the leakage time. This will be utilized with single or multi dangerous gasses leakage that provides the fast resultant response time is also high. An alarm may be used to generate a sound signal alert by industries to the nearby area living humans. If assume the level of the gasses and temperature goes above the average level than the indicated values than the alert will be provided for utilizing the internet of the web page and the android app which is created. Firstly, when the framework is developed we make one web page and an android app. Several numbers of clients who have a security ID (password) might see the information about temperature and gases leakages is an included principle advantage. This information of the sensors is stored on the internet in the equivalent website that could make utilized for future and further processing, and this will be good begin for industries to secure the humans in the surroundings and guarantee them a secured existence.

CHAPTER 3

EXISTING METHOD

3.1.MICRO CONTROLLER

This zone shapes the control unit of the whole endeavor. This section mainly includes a microcontroller with its associated hardware such as reset hardware, Pull up resistors (if necessary), crystal with capacitors, etc. The Microcontroller frames the center of the task since it controls those devices being interfaced and expresses with those devices as per every program being composed.

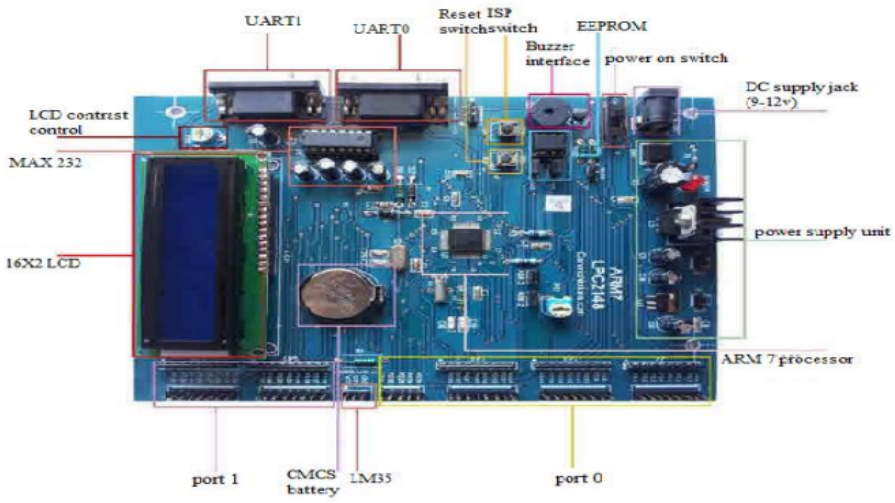

Fig.3.1.Microcontroller

3.2.SENSOR

A sensor (likewise known as finders) is a device that measures a quantifiable eminence and proselytes it into a flag that might be perused by an observer or by a gadget. For instance, a “mercury-in-glass thermo meter” progression over the calculated temperature into improvement and density of a liquid which can be perused on a simple glass tube. A

thermocouple transforms over temperature to a yield voltage that could be perused through a voltmeter. For exactness, the majority of sensors are adjusted against known models.

3.2.1.TEMPERATURE SENSOR

The temperature sensor that modifies over temperature regard into electrical indications. We used IC is also called as LM 35 is a temperature sensor. LM35 alignment sensors are exactness corresponding “circuit temperature sensors” whose output voltage will be directly relative to the Centigrade temperature. The LM35 needs no outside arrangement since it is inside adjusted. The LM35 has not required any outside arrangement or trimming to provide for a run of the mill exactness about ±1⁄4°C. In room temperature and ±3⁄4°C again a full −55 with +150°C temperature augment. The LM35's low output impedance, straight yield, and specific typical arrangement make interfacing to control hardware exceptionally straightforward. It could be used with “single power supplies”, or with additionally to and short supplies. Concerning illustration it draws just 60 μA from its supply, it has low self-warming, under 0. 1°C in the present air.

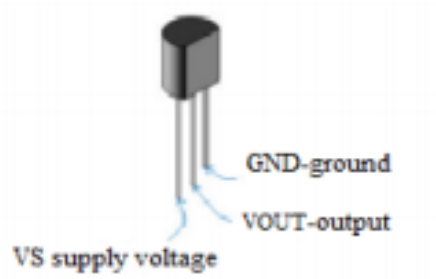

Fig.3.2. Temperature sensor

3.2.2.HUMIDITY SENSOR

A “humidity sensor or hygrometer sensor” is measures and reports the comparative humidity in the air. It measures both air temperature and moisture. Relative humidity is the ratio of actual humidity in the air to the maximum amount of humidity that might be held at the air temperature. Humidity will be the existence of water in air. The quantity of

water in air might influence human comfort such as various manufacturing procedures in industries. The existence of water vapor is impacting different biological, physical, and chemical processes.

Fig.3.3.Humidity sensor

3.3.BLOCK DIAGRAM

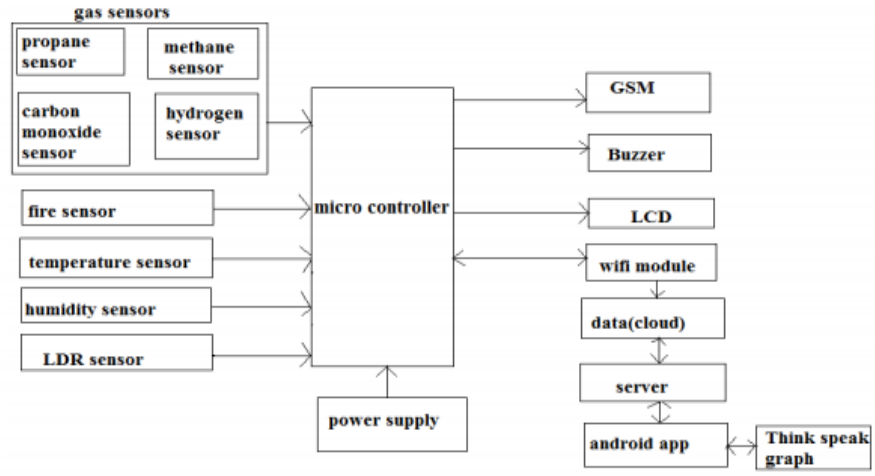

Fig.3.4.Block diagram of the existing model

CHAPTER 4

PROPOSED METHOD

4.1. PROPOSED SYSTEM

The poisonous gas leakage monitoring process of this framework is noticeable with the significance of real-time identification and control of the toxic gas leakage.In this project we are mainly focusing on the toxic gas leakage in the steel industry for the gases such as ammonia, carbon monoxide and nitrogen oxide. Ubidots holds the gathered information from the sensors.

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 I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with Arduino IDE (Integrated Development Environment), via a type B USB cable

Fig.4.1.Arduino UNO

4.2.1.ESP8266 WiFi Module

The **ESP8266** is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability, produced by Espressif Systems in Shanghai, China.

The chip first came to the attention of Western makers in August 2014 with the **ESP-01** module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at first, there was almost no English-language documentation on the chip and the commands it accepted. The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, the chip, and the software on it, as well as to translate the Chinese documentation.

The **ESP8285** is an ESP8266 with 1 MiB of built-in flash, allowing the building of single-chip devices capable of connecting to Wi-Fi.

These microcontroller chips have been succeeded by the ESP32 family of devices, including the pin-compatible ESP32-C3.

Fig.4.2.ESP8266 WiFi Module

4.3.SENSOR

4.3.1.MQ 7 SENSOR

The MQ-7 can detect CO-gas concentrations anywhere from 10 to 500ppm. This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.

Fig.4.3.Carbonmonoxide sensor

4.3.2.MQ 135 SENSOR

MQ-135 Module sensor has lower conductivity in clean air. When the target combustible gas exist, the sensors conductivity is more higher along with the gas concentration rising. Convert change of conductivity to correspond output signal of gas concentration

Fig.4.4.Nitrogen Oxide sensor

4.3.3.FIRE SENSOR

A flame-sensor is one kind of detector which is mainly designed for detecting as well as responding to the occurrence of a fire or flame. The flame detection response can depend on its fitting. It includes an alarm system, a natural gas line, propane & a fire suppression system. This sensor is used in industrial boilers.

Fig.4.5.Fire sensor

4.4.UBIDOTS

Born as an engineering services firm in 2012, Ubidots delivered end-to-end IoT solutions in tandem with its partner and co-founding company Netux, to remotely monitor, control, and automate processes for healthcare clients as well funded startups and Fortune 1,000s in the American Southeast and across Latin America.

Between 2012 and 2014, Ubidots accomplished countless internet connected projects across Healthcare, Energy / Utilities, Manufacturing, Transportation, and Retail – learning the many small characteristics of IoT and Cloud enablement that digital transformation experts cannot speak to unless they have gotten their hands dirty in the field.

With a strong backbone and a steadfast determination to become a product-led company, Ubidots joined the Boston MassChallenge Accelerator in 2013, pivoting into a global tech startup, gaining US venture and support, and leaving behind the local services business.

Since Ubidots pivot in 2014, Ubidots has become known within hardware, software, embedded engineering, and maker circles as the affordable, reliable, and most usable platform in the IoT Application Enablement ecosystem.

4.5.BLOCK DIAGRAM

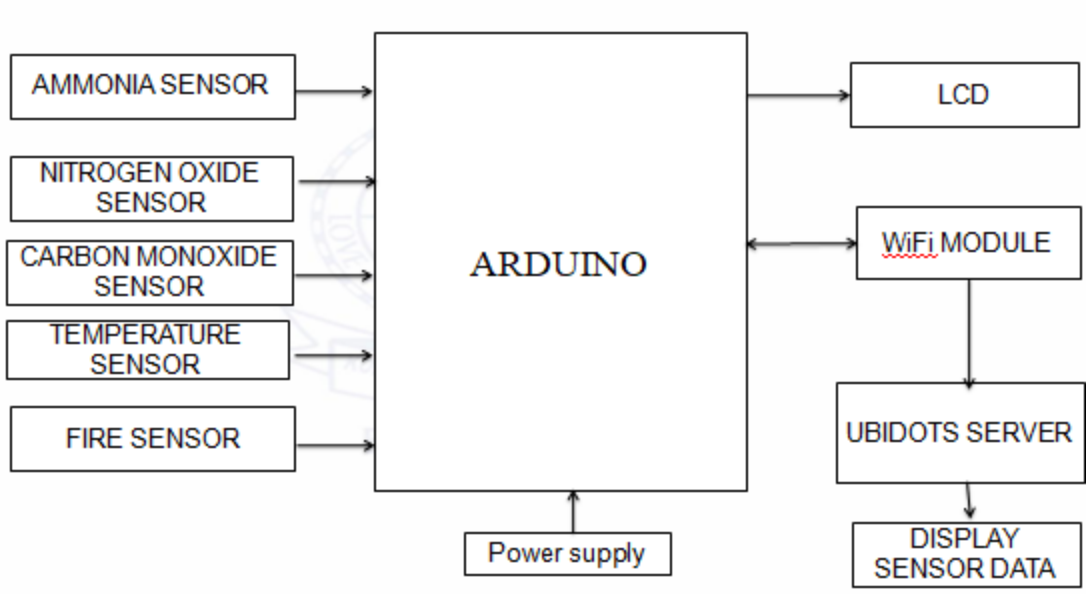

Fig.4.6.Block diagram of proposed method