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A Survey to Detect Poisonous Gas in Industrial Plant and Residential Area

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ABSTRACT: Now a day, due to leakage of poisonous gases, quality of air has been affected. This paper deals with the proposed system of ZigBee sensor using wireless networks. This system provides a simpler way to detect and analyze the poisonous level gas in both industries and residential area. This scheme mainly deals with several many sensors such that they are employed to detect gases of variety form such as carbon monoxide, methane, arsenic etc. by using this system they are able to detect various gases at various form of level anywhere and anyplace

KEYWORDS : Zigbee , raspberry Pi , MQ5 sensor , Android Application

I. INTRODUCTION

In this century, a wireless sensor network plays a vital role in upcoming and current technologies. They have already been applied in various fields such as military, home, transport, industries etc. They mainly focus on the data rate, battery life, the transmitting distance etc. Here each and every network has its own advantage, the critical factor is constructing network which is wireless. There are various special sensors and they have several specifications such as Wi-Fi, Raspberry pi and ZigBee which are developed for low power consumption, and these sensors are used in various sectors based on their features. ZigBee is a special type of wireless sensor used for home automation, medical health care and industries with small scale projects. Now-a-days in modern world people tends to consume outdoor air which is toxic to health. These gases usually contain certain level of poisonous gases in the air. The air quality may be affected by such gases such as carbon monoxide, carbon dioxide. Obviously, industries-based machine releases some gases which are basically very harmful to human. And these types of gases may cause diseases such as breathing problems and they may affect the entire generation because of these toxic gases. To overcome this problem, the best way is to fix a sensor in each and every machine and they need to analyze the leakage of gas in machine and they need to alert the main EB to power off automatically. In this paper we use raspberry pi which is mainly used to handle peripherals such as keyboard and mouse. By using this type of sensor, we can easily detect the risk and help them to protect in a secure way. Here we develop an android mobile application to detect the leakage of poisonous gas in residential area. With the help of this application we can also be able to switch the mode between industries and residents. With the help of this app we can detect the gas such as carbon dioxide and carbon monoxide with ppm level.

II. RELATED WORKS

[1] From the existing paper IOT makes life simple by automating every small task around use. The concentration of certain gases leads to extreme danger in the atmosphere. These gases may be flammable at certain temperature, humidity conditions. If the toxic gas mixed with fresh air then air gets polluted and the surrounding will be full of smog and reduce the visibility which can cause several accidents and also affect health of people. This paper uses MQ-2 sensor which is used to detect gases such as CH₄, CO₂, alcohol, smile and propane. The gas leakage detector system is used to send the sensor reading to cloud and carried out on the reading to increase the precision of the system. The handheld EGD01 delivers high sensitivity and adjustable for detecting combustible gases, including methane, propane and butane. IOT improves quality of life and ease to our daily use. The traditional gas leakage can check for

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concentration level and alert people through audio and visual alarm. Every value is recorded by sensor and checked against threshold value. The threshold values decide the nature of gas by the sensor behavior.

[2] This paper proposes Due to large scale construction of urban natural gas pipeline, the accidents occur such as fire explosion has increased. They use Gaussian model to adopt pipeline monitoring system for gas leakage and diffusion model. The distance between urban pipeline and other pipeline are closer and thus leakage may lead to chain reaction and increase the risk. The network is located on heavily populated region where people can affect easily into toxicities. The urban natural gas pipeline leakage was based on artificial neural network it can extract the gas leakage from monitoring data to generate the risk parameter by surrounding environment. The artificial neural network can adjust the structure parameter automatically and change the mapping relationship by corresponding output with specific input. This system can monitor wide range of gas pipeline leakage in real time and provide risk factor. It presents a risk assessment system which is based on artificial neural network from the leakage protection.

[3] It is very important to detect and visualization of toxic gas leakage and explosion which leads to serious damage in large scale petrochemical plants. The gas concentration report provides their individual ranges. It is difficult to detect the gas diffusion with continuous danger which can be visualized by scattered concentration report. To avoid this kind of explosion we use toxic gas threat to local citizen to detect and visualize the concentration of toxic gases. The environmental factor which is influenced such as wind, airflow and air pressure on gas diffusion was not taken into the consideration. The toxic gas is a continuous object and invisible. It is very hard to detect. The dangerous area consists of inner and outer boundary. If the size of detected area is increased then the radius of gas diffusion is also increase. The link cost is reduced if the number of communications reduced to the node can be conserved.

[4] From this paper the daily wages of household are LPG where it acts as an alternative to petroleum, and continues to decrease. There are several problems of gas leakage and it leads to cause accidents. The LPG gas is highly flammable. Internet technology makes communication faster between devices. They use node MCU as an open source IOT platform. The proposed system is able to detect the gas in node MCU, which is also connected to fire sensor and gas sensor. The node MCU is connected to gas sensor as well as fire sensor. The proposed software will be embedded in smartphone with android operating system. The yellow LED is turned on when the device is started. They use alarm to alert the user by android app which is present in smart phone and it will produce vibration and alarm sound. The alert message will also be sent to the user who uses the specific app. Testing was performed on each function in which the overall i7process will uncover the possible error occur in each function. The testing can be done two ways hardware and software. The hardware provides testing of gas detection and testing of fire detection. The software provides android app in which it observes notification as well as receiver list.

[5] From the existing paper This paper report on gas sensing property of CeFe₂O₄ nanoparticles toward liquefied petroleum gas (LPG) ethanol and ammonia. They use Nano ferrite has a gas sensor application because it is low cost, simple electronic structure, fast response etc. It is generally used to detect toxic and flammable gases like LPG, ethanol, H₂S, chlorine and ammonia. These are the gases which create allergic and respiratory problems like asthma, allergic bronchial asthma and rhinitis. They report the effect of surface like microstructure, operating temperature, and gas concentration etc. on selectively, response and recovery time of the sensor present in NH₃ gases. This paper focus on gas sensing properties of varying size in nanoparticles. The order of gases which follows are LPG>ethanol>ammonia at all temperature for ten samples of various particle size of CeFe₂O₄. The smallest nanoparticles, speed of chemical reaction will start to increase at lower temperature due to large surface area of particle. The ammonium hydroxide is volatile in nature. The high volatile of NH₄OH is quick response and fast recovery. The sensitivity of ethanol gas is smaller than LPG and ammonia gas. The gas sensitivity is depending upon ferrite composition.

[6] From the existing paper the gases are classified into three types they are compressed gas, liquefied gas and dissolved gas according to management condition. The gases are classified as combustible gas, supporting gas and non-combustible gas depends upon the nature of specific gas. In addition, the gases are also classified as toxic and non-toxic gases. In this paper ammonia gases are toxic and cause disease like throat infection and nose problem. For this we use least square method and Neville interpolation. For further use the measured data can be transmitted via smart devices using Bluetooth communication and manage data in smart phone. The transmitted data can be sent to server and it is possible to manage data by web or mobile application. Neville interpolation is based on Newton method and defines as recursive algorithm. The data can be frequently communicated to smart phone using Bluetooth. The structure of this

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detector is detachable structure with sensor and display can be separated. The display can be received by Bluetooth communication. The products make use of electrochemical sensor.

[7] From the existing paper Now-a-days safety for industrial plants are tougher with respect to employee state monitoring and environmental working condition compare to wireless sensor with wearable technology to improve safety delivery capability of such system and add new functionality to those the wireless sensor use batteries as a sole energy the efficiency become critical. It uses appropriate control for radio data transmission. The wearable sensor system such as switching the system from sleep to measure the data transmission to RF signal provide greater power supply by using WSN with wearable technology it improves the early detection of hazardous situation and increase with the application of WSN the main feature of wireless system is possible to be activated remotely by RF control signal. It is used to convert RF to DC and unable switching of circuit module from the measurement modes when RF signal is available and power is greater. This system is available to sense the employee relation and working facility to monitor temperature and concentration of combustible gas present in the environment. The RF signal has transmission as well as receiving of data.

[8] From the existing paper Due to change in technologies now a day's world is very fast and automated. Internet of things is important is technology which operate the hardware resource. It will also detect the leakage of gas from LPG cylinder using gas cylinder which is sensitive to detect the presence of LPG. This system helps to provide safety standards with the help of basic junction it will prevent accident and protect human life. If the gas leakage is detected by sensor, the output of particular sensor goes high which is given to the microcontroller. The amount of gases continuously viewed and measured by the load cell and display in LCD. If the output reaches to specified threshold value then the message will be sent regarding booking of cylinder along with displaying message on LCD the design and implementation requires very fast, single cycle execution rate microcontroller. It produces security to the people by sensing the gas leakage and useful in house. It helps people to save their time by automatic booking system. It also helps in analysis data about how consuming should and how much gas consume with certain people of time in particular region.

[9] Tracking of gas pipeline to find flammable gas leakage can be done manually by human worker. If the worker detects the flammable gas present or leaked it is usually smell and find the leakage point to stop and raise the concern for people present in surrounding and report to the office for further action. Gas pipeline leakage can be tracked manually by people walking along to the way of pipeline and to detect whether the leakage has been evolved. It helps people to detect the presence of flammable gas and leakage of gas in a point as well as electronic hardware component design and software design. Most of the electronic components like microcontroller were placed inside the body while the gas sensor, LED, alarm buzzer was placed upper side of the body. The serial data communication module is transmitted via micro SD memory card in micro SD to store the ratio frequency value. The objective is to test the performance in tracking of gas leakage. This work could enhance by adding functionalities, features and adding temperature sensor with cellular data communication.

[10] From the existing paper In order to realize leakage detection and leakage localization by ultrasonic waves leak generated, ultrasonic gas leak location method based on sensor array is proposed, leakage detection can effectively improve production and avoid unnecessary energy loss, therefore the research of leak detection and leak technology have important application value. At present the time difference of arrival algorithm (TDOA) location technology is used. Aiming at the limitations of traditional leakage location, this paper proposes ultrasonic sensor area array in order to detect leakage. This paper mainly deals with ultrasonic gas leak detection principle calculation method of remaining time difference and whole cycle number. Sensor array introduction and estimation algorithm of position of leakage point. The time difference of arrival is calculated as $t = m \cdot T + t_r$. T is the remaining time difference, which is the part of time difference of arrival less than one signal cycle. M is whole cycle number of time difference of arrival, T is ultrasonic signal cycle. For calculating time difference here, we are using cross correlation algorithm. Here to estimate leakage location time difference, relational hyperboloids are established. This paper also deals with Newton iteration method to find the gas leakage location. Finally, the experimental results show that the method proposed this paper can estimate position of gas leakage point with error of less than 5 mm even if the time difference of arrival is larger than one Signal cycle.

[11] This existing paper says Gas leakage is a major problem with industrial sector, residential areas and gas driven vehicles like CNG (Compressed Natural Gas) buses, cars etc. One of the preventive methods to stop accidents related

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Vol. 8, Issue 3, March 2019

with the gas leakage is to install a gas leakage detection device at permeable places. The system detects the leakage of the LPG (Liquefied Petroleum Gas) using a gas sensor and uses the GSM to alert the person about the gas leakage via SMS. This is used to Detect Gas Leakage (like LPG, Butane, and Methane) or any such petroleum based gaseous substance that can be detected using MQ-5 Sensor. To setup an SMS based Alert Mechanism. This SMS based mechanism find out whether there is any leakage happening in the industrial sector. With the help of sensor, it sends an alert message to the user about the gas leakage. Here the output of the sensor gas low as soon as the LPG sensor Senses away the gas leakage. This is detected by the microcontroller and the LED and buzzer are turned on. After the delay a few milliseconds the exhausted fan is turned on for throwing the gas out and a “gas leakage” message is sent to the user using GSM module. Some techniques have been improved since their invention and some new area were resulting in advancement of sensor. Leak detection techniques have some advantages and disadvantages.

[12] From the existing paper already there are many products available in market to detect gas leakage. The best way which is used in product is they make use of technique called IoT (internet of things). This paper introduces a method wherein the client is kept mindful of the leakage status through an Android application and cellular network-based SMS. This paper mainly deals with the leakage of domestic cooking purpose gas called LPG. LPG is a mixture of two gases called propane and butane is highly flammable. This paper proposes a system that notifies the gas leakage and contain sensor that can detect the presence of gas and gateway device like raspberry pi. Here the sensor we are using is mq6 module sensor. The raspberry pi deployed to user contain a program that is responsible the values from the ADC and also sending the alert and SMS. This app allows the user to add and modify the phone number to which the SMS will be sent. As soon as the user log in to the android app, sensor reading will be displayed. This is made possible by taking input from the user through the terminal device app and having a server that acts as a bridge between the raspberry pi and the android app.

[13] Here the paper deals with leakage repair on multi agent. Multi-agent has the ability to co-operate with each other to solve the practical task of the comprehensive and complex system as to make nap the constraints between the individual agent and the lack of their own functional range, so multi agent come into being. In multi agent system each agent can perform its own duties according to his own attributes and abilities. Here the multi agent system is mainly used to solve complex problem of single agent can't solve. Here the time scheduling algorithm and optimum Time scheduling algorithm is used. In this paper the multi agent time scheduling algorithm is applied to the gas leakage in the repair process. This paper, an agent time algorithm is proposed to reduce the operation time. Here the maintenance time s reduced to 20% when the number of maintenance personnel is reduced.

[14] This existing paper says Gas insulation equipment is widely used in high voltage electric field which is sf6 gas as insulated medium. This gas contains advantage like low maintenance and High reliability. Here the traditional way to recognize leakage region is realize by human observing of the acquired infrared video image, which may lead to High false rejection rate and false detection rate.

Here this process includes step such as

1. Read the original video data, extract time series image and convert each image to grey image.
2. Image processing t each grey image including image cropping image enhancement, image de- housing etc.
3. Use moving target detection algorithm to detect sequence image motion area.

To solve the problem that the existing online sf6 leakage detection method is unable to effectively recognize the leakage region a method based in infrared video image processing techniques is used.

[15] From the base paper besides the detection of leak it is important to quantify the emission. The quantification of emissions is necessary to estimate the economic loss and effect of the effluent gases on the atmosphere. The renewable energy production has increased in the last years. One form of the renewable energy is bio gas. Typical sensor used for the inspection of bio gas plant and infrared cameras for gas visualization also known as gas camerassensor based on the principle of tunable diode laser absorption spectroscopy. Here the gas detection sensors are connected along the Arduino board. In this work approach to quantify Methane gas flow rates by remote sensing were presented. The result shows that the quantification of methane volume flow rates is possible.

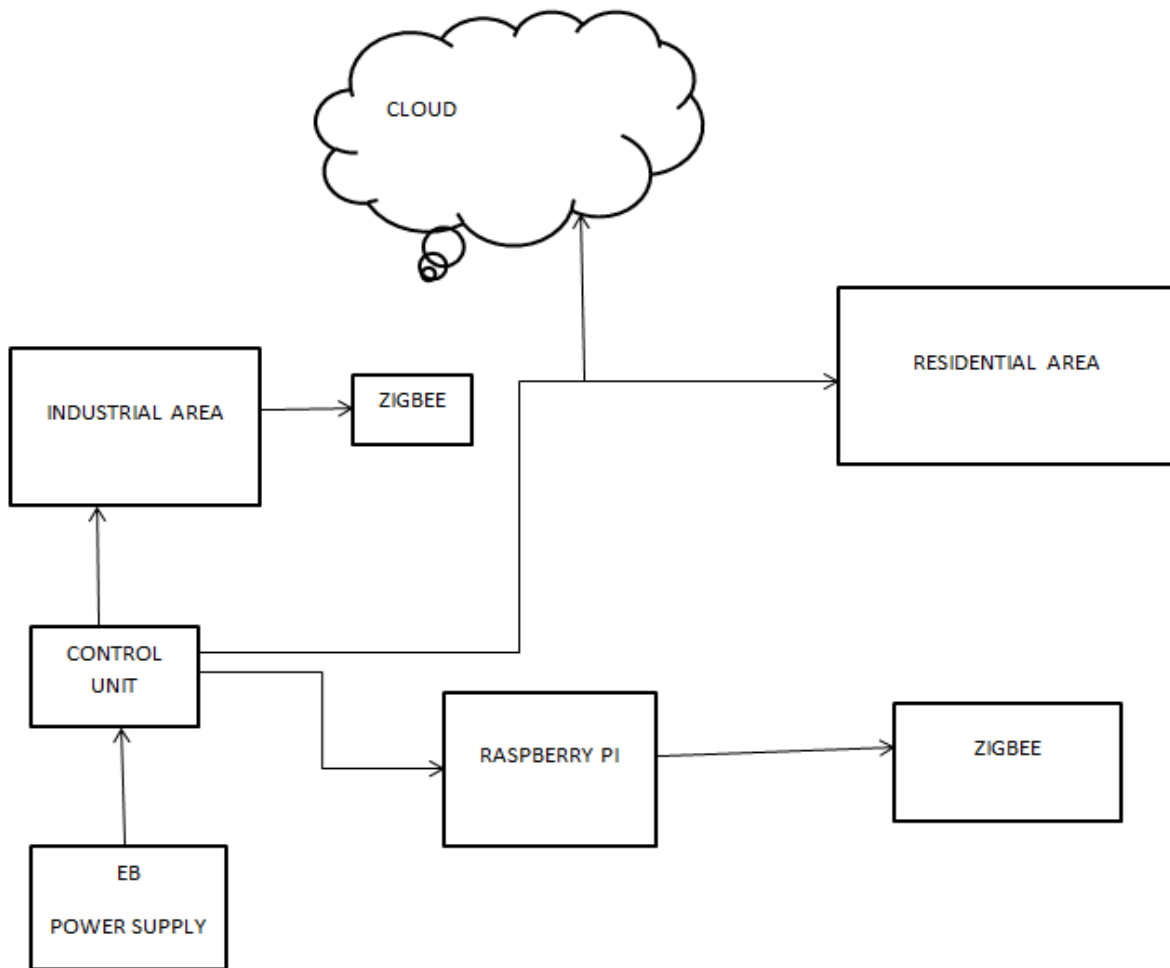
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III. ARCHITECTURE DIAGRAM



IV. OVERVIEW OF PROPOSED WORK

In this section we briefly going to discuss about the proposed solution of poisonous gas leakage in both industrial and residential area. Proposed solution makes use of MQ5 sensor, Raspberry pi, Zigbee and android application. This device used to alert user about the gas leakage using android app. First, an area has the potential to be affected by the leakage of gas and it is identified in specific industrial plant. The sensor is deployed at the suitable place depending upon the user sensitivity. The sensor is connected with raspberry pi by wired means then it is connected to Wi-Fi which provides specific information about poisonous gas leakage. The user has to install our android app with the mobile phone using unique ID.

The Implementation of the proposed solution is discussed in the following sequence. Here we are going to discuss about how the server is going to fetch the data and sense where there is a leakage in the particular location and they also make use of android app to find the out whether there is any leakage in residential area. The solution has been built and tested for the leakage of gases such as carbon dioxide and carbon monoxide. The system has been tested using sensor called MQ5 sensor. Here the sensor requires a power of 5V. The system uses raspberry pi3 model as a gateway device. This module raspberry pi comes with a build in microprocessor. Raspberry pi has general purpose input outputs which

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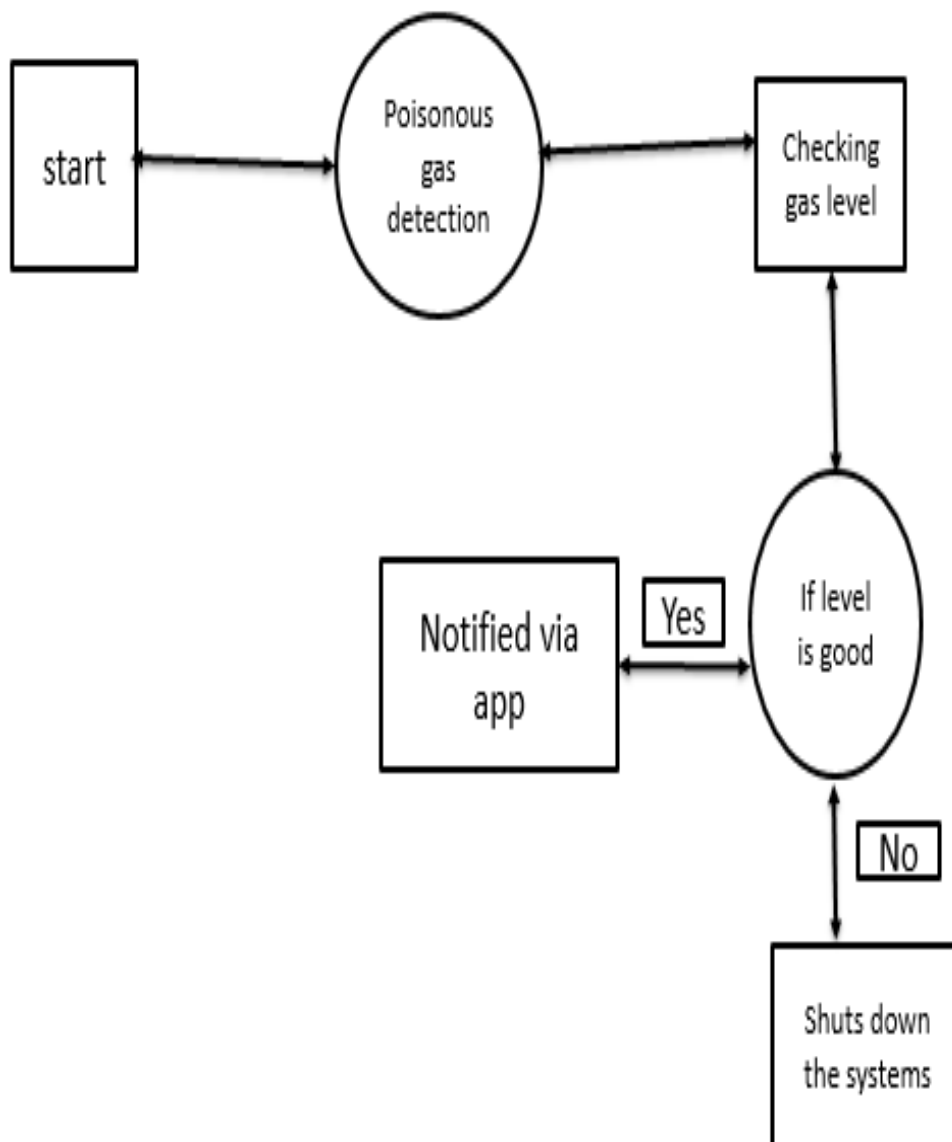
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Vol. 8, Issue 3, March 2019

allow interfacing with sensor and another device. Here the output of the sensor is passed to an analogue to digital converter before connecting to raspberry pi. The raspberry pi deployed to the user contain a program that is responsible for reading the values along gas leakage but MQ5 sensor work in the range of 200 to 1000. In order to detect and alert for gas leakage a threshold value has to be hard coded into the program. If the threshold value exceeds beyond the limit then the android app will notify that there is a poisonous gas present in the environment. The system will have a server maintained by the developer which is responsible for storing user credentials. The testing was done on a pc and the program was implemented in Linux. The server interacts with both the raspberry pi and android application. Mobile application also allows to switch between two modes. The app is basically user friendly and it provide simple interface to the user. In case of gas leakage then the user will be alerted by the sensor and then automatically the EB power cut off then entire process gets shut down.

Module diagram

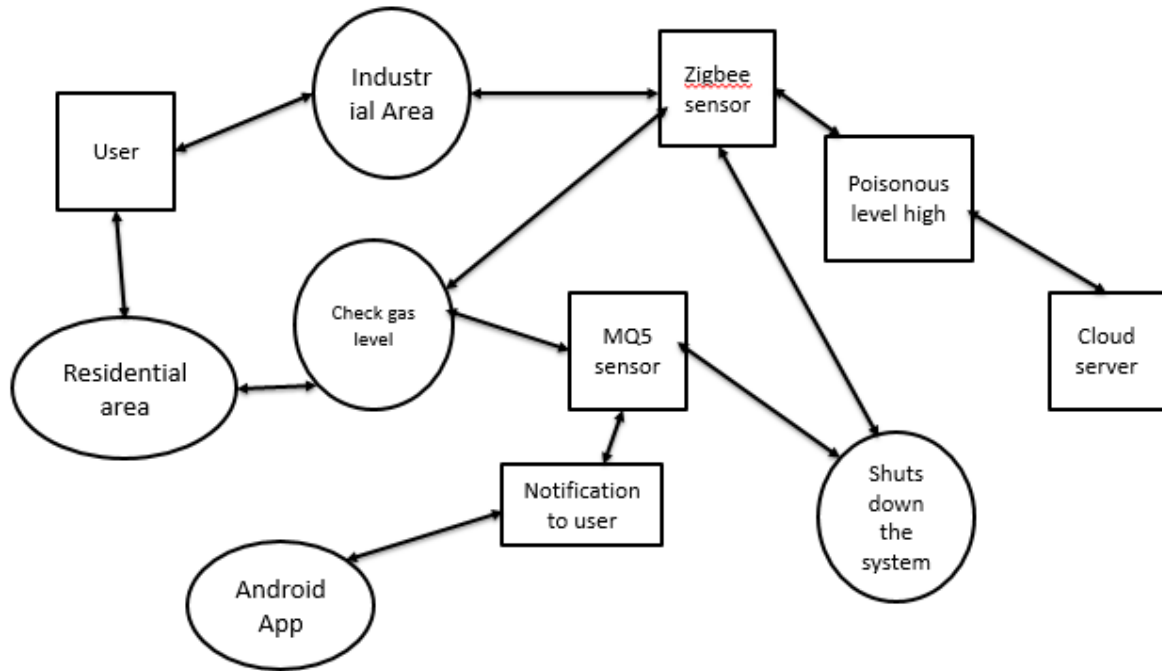


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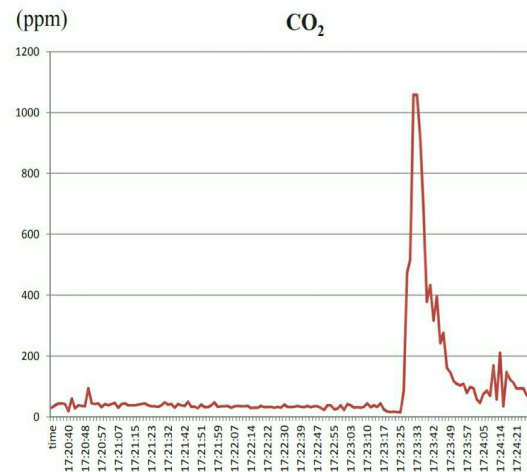
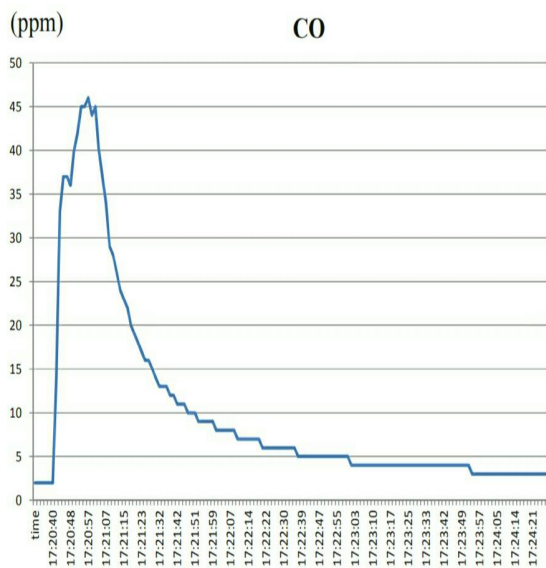
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GRAPH



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V. CONCLUSION

Nowadays air pollution became a major problem in all over the area so as to avoid such problems we are made to propose a system. This system mainly consists of sensors which sense and detect the gas leakage technology etc. They use sensor of various types to detect various types of gases. In future these sensors have various scopes in determining the user interface at anywhere and anytime. This system mainly proposed an advance technology in sensing the leakage of gas in industrial plant. It allows user to customize the system as well as allow future enhancement. This is made possible by taking input from the user through a device application and having a sensor that acts as the bridge between the raspberry pi and the mobile Android application.

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