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Low Cost Air Pollution Monitoring Machine Using Internet Of Things (Iot)

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Abstract

Air pollution monitoring sensor using Internet of Things (IOT) determines the concentration of the various gases released into the atmosphere. The gas sensors in the air pollution monitoring sensor is placed hanging in midair within a PVC pipe and is connected to the (PIC) Programmable interface Microcontroller, (GSM) Global System for Mobile communications using wires, the Inlet fan is fixed on top face of the PVC pipe which sucks air into the PVC pipe for the gas sensors to sense. For operating the system we have to first insert the SIM card into the GSM (Global System for Mobile communications) then we have to login into the Thing speak account in the computer after which we have to connect the battery to circuit and run the circuit and inlet fan after which the LCD (Liquid Crystal Display) will show the concentration of the various gases present in the atmosphere in analog at the same time this reading will be received by the Thing speak account in the computer using IOT and it will plot concentration of gas v/s times graph for various gases present in the atmosphere. This gas sensor can be used to determine the concentration and presence of gases like CO, Methane, Butane, Carbon, Nitrogen dioxide, LPG, CNG, Combustible gases, etc. This system can run in any location for long duration as it is powered using a battery. The conductivity of the gas sensor is directly proportional to the concentration of the harmful gases in the atmospheric air, so the presence of the harmful gases in the air causes a change in the conductivity of the gas sensor which produces a corresponding change in the harmful gas concentration value and hence the concentration of the various harmful gases is determined.

Key words: (IOT) Internet of Things, (PIC) Programmable interface Microcontroller, (GSM) Global System for Mobile communications, (LCD) Liquid Crystal Display, (CO) Carbon Monoxide

Introduction

This chapter overviews various technologies and techniques that have been employed for use in this monitoring system. We have selected this project to increase more awareness for air pollution among population with proper result and statistics. In the era of industrialization, pollutants in the air are increasing at an alarming rate causing serious threats to mankind. This has raised a need of measuring and recording pollution levels to initiate planned actions so as to protect the environment.

There are various pollution monitoring machines in the market but they can take concentration value of single gas only and cannot run independently and always require external power supply, they cannot send the gas concentration values to electronic devices hence we cannot use them to take readings in harmful locations as it can cause harm to the operator. These pollution monitoring machines cannot work under all kinds of climatic conditions .Hence we have to construct a more advanced Air pollution monitoring machine.

Internet of Things (IoT)

In this area we will discuss about the essential rule of Internet of things (IoT), its engineering and structure.

IoT Vision

Internet of Things (IoT) is nothing but a thought and a perspective that takes into account mainly proximity on earth through remote and wired affiliations and noteworthy tending to plans of various things can speak with other objects and can arrange to form applications to accomplish shared target. A presence where the authentic, modernized and the virtual are converging to make splendid circumstances that make imperativeness, transport, urban regions and various diverse regions progressively canny. The goal of the Internet of Things is to engage things to be related at whatever point, wherever, with anything and anyone ideally using any way out and any organization.

IoT Architecture

IoT configuration contains different suite of advances supporting it. It serves to demonstrate how unique advances relate to each other and to grant the versatility of action of IoT associations in different circumstances.

Sensor Layer is the most reduced layer is comprised of brilliant articles incorporated with sensors. The principle capacity of this layer is to acquire the different sorts of static/unique data of this present reality through different kinds of sensors and to impart to Internet get to. Portals and Networks were a tremendous volume of data will be made by these sensors and this requires a solid and first class wired or remote framework system as a vehicle medium. Application Layer is at the most noteworthy use of the stack is in command of transport of assorted applications to completely different customers in IoT.

Methodology

The different components that are used for constructing this device are Programmable interface controller microcontroller(PIC), Global system for mobile communications chip(GSM), Liquid crystal display Sensors (LCD), Power supply Unit, Inlet Fan and PVC Pipe Proposed Air Pollution Monitoring Machine can be described on the basis of the given block diagram. As we are using 12volt battery for the system so the entire system can run for a longer time-period. An inlet fan is used for suction of atmospheric air into a PVC pipe where all the gas sensors are kept. The data of air pollution is processed by MQ9, MQ4, MQ3, MQ135 and MQ6 gas sensor. So, these gas sensors can be used to determine the concentration and presence of gases like CO, Methane, Butane, Carbon, Nitrogen dioxide, LPG, CNG, Combustible gases, etc. When these gas sensors are connected to the (PIC) Programmable interface Microcontroller then all the sensors will sense the gases and will send voltage to the PIC, PIC will convert the voltage to percentage .We are using (GSM) Global System for Mobile communications module which is connected to PIC using wires. The function of GSM is to transfer all the captured data by the system in the cloud space for that we have created an account on the website of Think Speak.

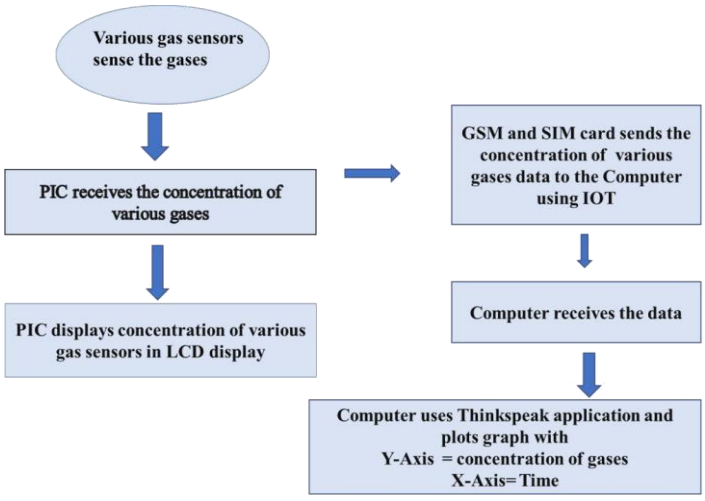

Fig 1: Flow Chart showing working principle.

Description

Here we are using 5 gas sensors MQ3 (detecting alcohol), MQ4 (detecting Methane), MQ6 (detecting LPG), MQ9 (detecting CO & SO2) and MQ135 (detecting Ammonia, NOx) each having 3 pins Vcc, Gnd, OUT. The Gnd pins and OUT pins are connected in series to the corresponding Gnd and OUT pin of main PIC. 12Volt battery is connected through with each of the Vcc pins.

The working principle used here is Ohm's law, which states that voltage difference is directly proportional to current. Gas sensors used here having various outer layer coating like SnO2 which has a high sensing character in fresh air due to very high resistance. But in the presence of various gases its conductivity increases logarithmically due to decrease in resistance. This change in conductivity will be sensed by our PIC used and it will process the data and send to webpage through cloud.

The gas sensors sensed the gases and send the output signal to PIC. The PIC then receives signals from gas sensors and amplify received signals to suitable form and send to the GSM module and to the LCD for display. The GSM send the response to our cloud, from which we received the data in our mobiles and pc.

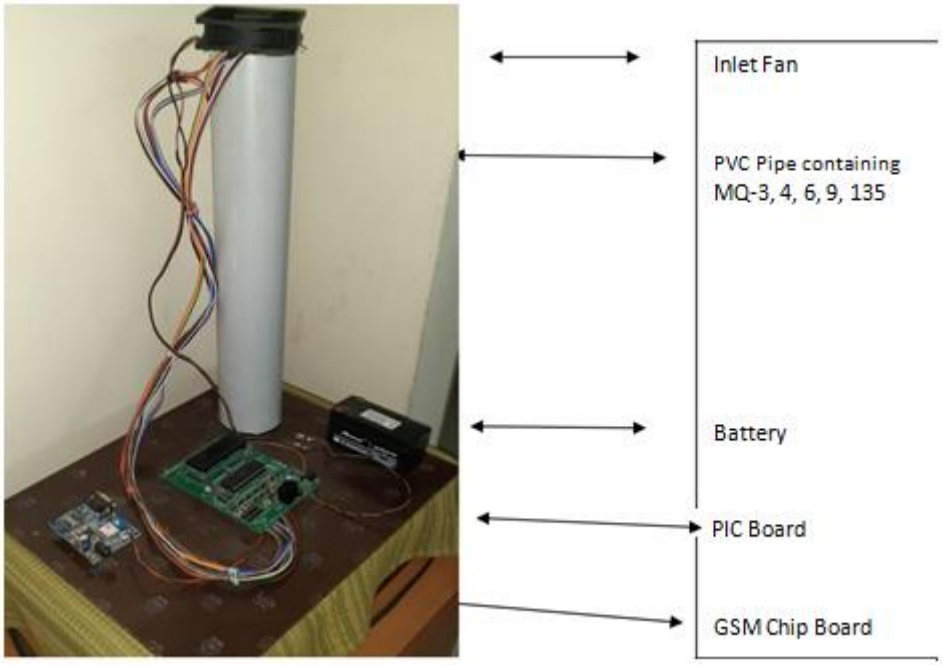

Fig: 2 Isometric view of working model

Fig: 2 Isometric view of working model

The above shown images are the various views of the Low cost air pollution monitoring machine in which the components like GSM, PIC and the various gases sensors are connected in a closed circuit.

Results

Hence, we have designed a pollution monitoring sensor which is capable of determining the concentration of various gases in the atmosphere at various timings. Below is the graphical representation of the readings of the various gas sensors.

The instrument was placed in industrial area in the city and the following data was retrieved.

Percentage of gas= (ADC value/1024)*100; ADC Value is displayed by gas sensor when it detects gas. 1024 is the total bits.

The Final observations are plotted in the graph.

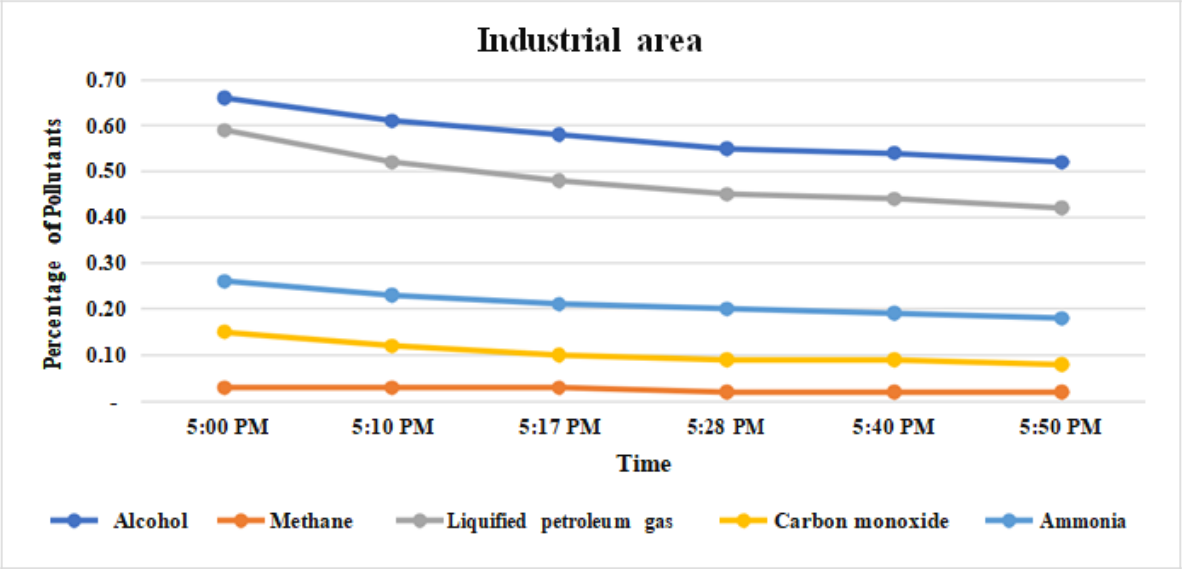

Fig 3: Graphical representation showing variation of gases with time (Industrial Area)

The above graph shows the concentration of various gases in the Industrial region during different timings.

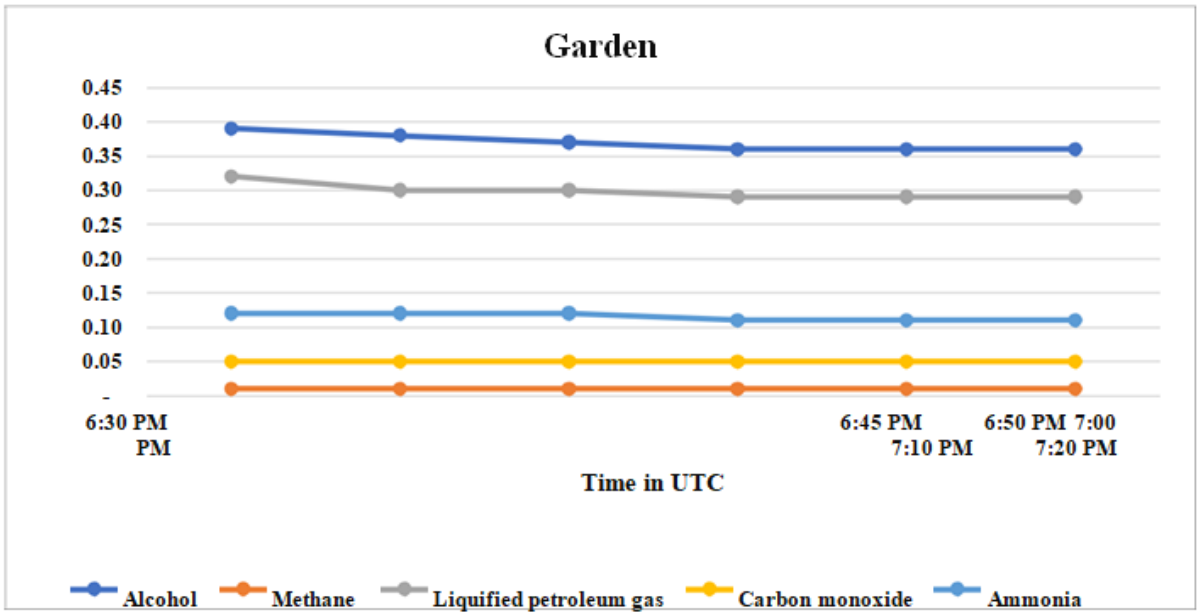

Fig 4: Graphical representation showing variation of gases with time (Garden)

The above graph shows the concentration of various gases in a Garden during different timings.

Conclusion

The created system screens progressively the centralization of harmful gases noticeable in an area. The values monitored are displayed on the LCD screen and using the GSM chip and the IoT technology the results are also displayed on the website that was created. This monitoring system can be found useful as the results are instantaneous and the real time pollution levels can be monitored and action can be taken..

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