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Air Pollution Prediction using IOT

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Abstract: ***A model for Greenhouse farming Air Pollution Monitoring System for the concentrations of majorair pollutant gases has been developed. Air pollution in greenhouse farming is caused due to various elements in which the major constituent are fertilizers. This system uses IOT based Air Quality monitoring system and prediction framework. This device measures the concentration of harmfull gases like CO, LPG, Ammonia, Methane using gas sensors. The sensors will detect the environmental conditions of the farm and will send the data to Arduino. The device is connected to Cloud using Thing Speak via WiFi module. This system provides information about the air quality in the farm with the help of Android application which helps the farmers to maintain the air conditions in the farming land. The motivation of this project is to provide a cheaper monitoring systems which is beneficiary to all users***

Keywords : Android application, greenhouse, IOT, pollution.

I. INTRODUCTION

The atmosphere of the Planet is full of air that includes gases such as nitrogen, oxygen, argon, carbon monoxide, etc. Plants require an air quality, free from pollutants. That's really essential for plant life and health. Any change in the air's internal composition will destroy its survival. Air pollution is the existence of one or even more toxins in the atmosphere in combination with gases in a quantity which may harm people, flora and fauna. Environmental contaminants are assessed in the millions (ppm) or ug / m3 of elements. Main toxins get introduced onto the environment without further delay. Secondary contaminants are created when the main pollutant reacts with other chemical compounds in the atmosphere.

Air quality has a bearing on public health. The effect of air contaminants stages from breathing difficulties, coughing, aggravation of asthma and emphysema. Agricultural air pollution contribute to environmental conditions in the form of greenhouse fuels and aerosols emissions. Additionally, animal air pollution adds to the odor. Pollution has threatened agriculture for over a century. Sulfur oxides are formed by burning coal and petroleum. Fluorides are the outcome of smelting, and the processing of glass and ceramics.

The air contains increasing amounts of arsenic, CO gas and oxides of nitrogen.Automobiles and increasing population generate photochemical radiation that not only affects city clusters yet also contiguous countryside areas too. Impurities across all forms, including farming, have emitted pollutants such as aldehydes, hydrocarbons, organic acids, pesticides and radionuclides into our environment. Such contaminants have varying effects on fruit, betting on present values, geography and climatic conditions. The goal of this paper is to map and incorporate a clever air pollutant control programme. It addresses how the level of airborne contaminants can be tracked by a gasoline sensor, an Arduino microcontroller and a WiFi module.

Important goal here is to develop a clever inexperienced house fuel monitoring gadget which could monitor, examine and log information approximately air first-rate to a faraway server and preserve the records updated over the net and to show it through an android application.

II. RELATED WORKS

A mobile distributed pollution monitoring system was recorded in 2013. Advances in networking and sensor technology shift the emissions control paradigm very rapidly. In 2014, an outsized number of sensors were assisted by a real-time pollution monitoring program that employed IoT. Using neural network, the data collected is analysed. Thanks to the use of an outsized number of sensors, the device achieved much greater monitoring accuracy. The use of IoT devices allowed a smart and scalable pollution monitoring system.

An IoT- pollution technique that combines IoT with Wireless Sensor Network (WSN) using Single Board Computers (SBC). Through the use of SBC, processing complexity was reduced,it rendered warning process smartly. Results determine that the program provided a very versatile and scalable, low- implementation. The model does not have a sufficient area of coverage however.

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A. *Block Diagram*

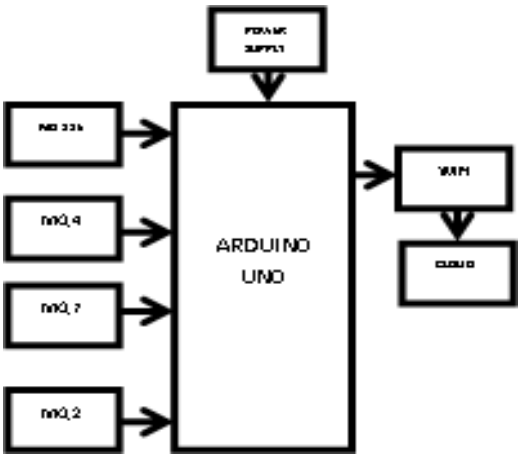


Fig.1.Device block diagram

III. AIRPOLLUTION MONITORING

B.1 The Internet of Things

The word Internet of Things seems to have been introduced by an individual from the RFID improvement network around 2000, who referenced the probability of finding data a couple of labeled article by perusing a web address or database passage that compares to a chose RFID. Daily papers include not only the technological devices that we experience routinely, and not only the effects of upper mechanical advances such as vehicles and equipment, but things that we do not usually consider as technological in any ways, for example, nourishment,garments,safe house; materials, parts, and subassemblies; wares and extravagance things; tourist spots, limits, and landmarks; and each one the variety of trade and culture

B.2 Cloud Computing

Cloud computing, or something being in the cloud, is an enunciation used to depict a wide scope of sorts of figuring thoughts that incorporate a tremendous number of PCs related through a steady correspondence framework, for instance, the Internet. In science, disseminated processing is a proportionate word for passed on figuring over a framework and means the ability to run a program on many related PCs all the while. The articulation is in like manner all the more commonly used to insinuate orchestrate based organizations which have all the reserves of being given by certified server gear, which in truth are served up by virtual hardware, reenacted by programming running on at any rate one veritable machines. Such virtual servers don't really exist and can right now moved around and scaled up (or down) on the fly without affecting the end customer—apparently, rather like a cloud. The pervasiveness of the term can be attributed to its use in elevating to sell encouraged advantages in the sentiment of utilization organization provisioning that run client server programming on a remote territory.

B.3 Android Application

The primary objective of this assignment is to layout a clever inexperienced house gasoline monitoring gadget which can monitor, examine and calculate statistics approximately air pleasant to a far off domain and hold its statistics updated over the net and to show it through an android application.

B.4 Hardware

Fig.2:Air pollution Monitoring device

IV. PROPOSED WORK

The device consists of Arduino UNO,WiFi module,Gas sensors (MQ-135,MQ-7,MQ-4,MQ-2),transformer.The device gets activated when placed in a correct place under normal temperature inside the greenshouse farm.The gas sensors starts to detect the hazardous gases that are found there.The datasheet values for the provided gas sensors are given below.

MQ-135:
It detects NH3, NOx, Alcohol, Benzene, Smoke, CO2.

MQ-7:
It detects Carbon Monoxide

MQ-4:
It detects Methane, CNG Gas

MQ-2:
It detects Methane, Butane, LPG, Smoke

The read information is transmitted to the cloud via ThingSpeak and is linked to a mobile application.The application is given privileges to only authorized users.Values for each gas sensor is shown here. The Parts Per million (ppm) Value is used to measure the range of hazardous value.So a range of hazardous value are shown in the UI.The user by reading the values can detect whether harmfull gases are emerging in the greenhouse.The output is shown continuously in a regular interval of time.So this makes the farmers to monitor the farm easily.

The particular hazardous gas values depicts the percentage of gas that is found more than the normal values.This device helps in maintaining the farm and helps the farmers to increase the cultivation as the greenhouse farming is the faster farming culture in the present world.This device is more compatible and is eco friendly.A fan or external cooling agent is required to cool down the system as it requires high voltage by the usage of more number of gas sensors.It is also cost efficient as less components are used and are more affordable by the users.

V. METHODOLOGY

C. Hardware

C.1 Arduino Uno

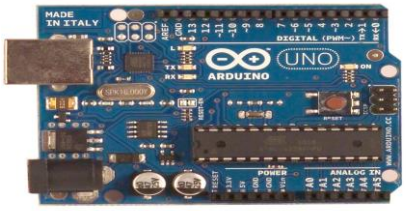


Fig.3.Arduino UNO board

The Arduino Uno is a ATmega328 Microcontroller. It has 14 propelled Input / Yield pins (of which 6 can be used as PWM yields), 6 straightforward data wellsprings, a valuable 16 MHz stone oscillator, a USB affiliate.It includes all the microcontroller that are supposed to support.

C.2 Transformer

The transformer used here will do the step down of force supply voltage from (0-230V) to (0-9V and 15-0-15) level. On off chance that the auxiliary has less turns in the curl, at that point the essential, the optional loop's voltage would diminish and AMPS will increment.It is known as a STEP-DOWN transformer.

C.3 Wifi Module

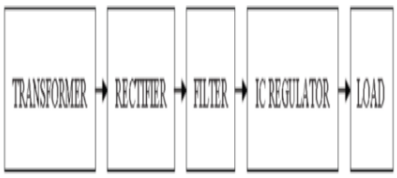
ESP-12E is a low force utilization of the UART-WiFi module, with serious costs in the business and ultra low force utilization innovation, structured explicitly for cell phones and IOT applications, client's physical gadget can be associated with a Wi-Fi remote system, Internet or intranet correspondence and systems administration abilities. ESP-07 the utilization of little clay radio wire bundle can bolster IPEX interface. clients have an assortment of establishment choices.

C.4 Gas Sensors

A gas identifier is a contraction that identifies gas closeness in a region, consistently as an element of a system of protection. This kind of tool is used to discern a gap in gas and communicate with a management system, so that a technique could be suppressed.

C.5 Working Principle

- This circuitry is classified as extension rectifier it consists of several diodes which are included in figure as approached. This circuit's contribution is made onto the slantingly different corners of the network,yield is extracted from the twin corners which is remaining.
- Let us conclude that the transformer works correctly,that point A has a positive potential and B has a potential negative. Point A positive potential will increase predisposition D3 and invert tendency D4
- The negative potential of point B will drive forward tendency D, turn around D2. From now on, D3 and D1 are one-sided forth and enable electric flow to move between them.
- The current stream is from point B via D1, up via Load, through D3, returning to point B through the transformer .
- One bit of leeway of an extension rectifier over conventional full-wave rectifier is the scaffold rectifier provides a voltage yield about twice that of the standard half-wave circuit with a provided transformer.
- Because of the diode this link rectifier continuously decreases 1.4Volt of the data current. We use 1N4007 PN intersection diode in the above process.



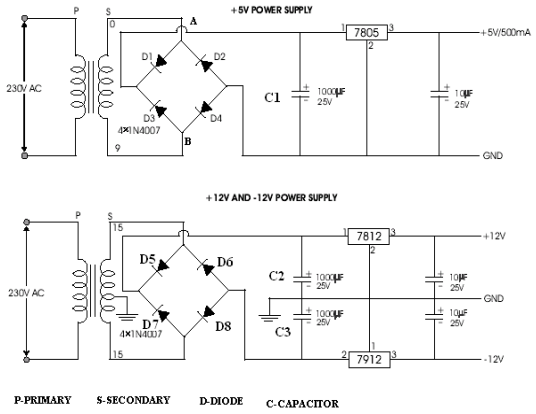


Fig.4.Schematic Diagram

D.Software

D.1 Arduino IDE

Arduino Environment is a multi-stage framework written in programming languages such as C and C++ for platforms such as windows, mac, linux. It is used to make and move undertakings to Arduino great sheets, yet furthermore, with the help of pariah focuses, other shipper headway sheets.

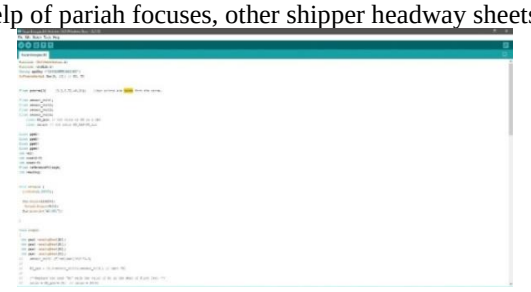


Fig.5.Arduino IDE workspace

D.2 Eclipse IDE

It is an integrated development environment (IDE) used in PC programming. This includes base workspace and an expandable earth redoing module structure. It is usually written in Java and its important use is to build Java applications, but it may also be used to build applications in other programming dialects through modules such as C, C++,C #

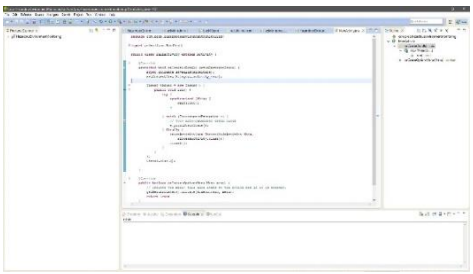


Fig.6.Eclipse java IDE

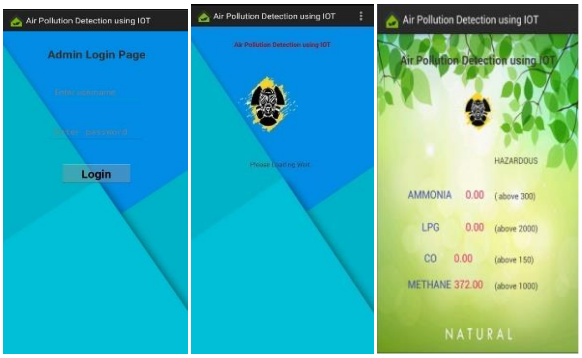


Fig.7.Application slides

D.3 ThingSpeak

This is an open-source IOT program and an application program interfaceI.It is used to store and retrieve information from objects that use HTTP and MQTT on the Web or via a local area network.

Fig.8.ThingSpeak Platform

D.4 Cloud Deployment

Cloud deployment refers to the enabling of SaaS, PaaS, IaaS methods which end-users or consumers may access on request.Here we use the SaaS solution as we are initiating the use of public cloud for storing and retrieval of data.

VI. RESULT

Fig.9.Result page

This page in the app shows the hazardous values of the gases that are mentioned to the left side. The four gases measured here are ammonia, LPG, CO, methane. To the right of the values, the range of toxicity is provided for checking purposes.

VII. CONCLUSION

This study suggested a smart monitoring device for Greenhouse air emissions that keeps track of the gas level in an environment continuously. It also sends calculated data to platform "ThingSpeak." The program is helping to raise concern about greenhouse gas efficiency. This monitoring instrument will provide real-time measurements of the content of greenhouse gases.

FUTURE WORK

The sensors used here can only sense limited gases,by adding many gas sensors we can calculate more gas values.To increase the range of gas sensing we can upgrade to Raspberry Pi.By collecting the gas values we can predict the future outcomes by feeding the data into machine learning algorithms.

REFERENCE

1. Arun Raj V., Priya R.M.P., and Meenakshi, V., "Air Pollution Monitoring In Urban Area," International Journal of Electronics and Communication Engineering , 2017 .
2. Matthews V.O., Uzairue S.I., Noma-Osaghae E., and Nwukor F., Design and Simulation of a Smart Automated Traffic System in a Campus Community.", International Journal of Emerging Technologies and Innovative Research ,ISSN:2349-5162, 5 (8), 2018, pp. 492-497,
3. Priyanka, V., "Review: Air Quality Monitoring System," International Journal of Advanced Research in Computer and Communication Engineering, 5(6), 2016.
4. Matthews, V. O., Noma-Osaghae, E., and Uzairue, S. I., "An Analytics Enabled Wireless Anti-Intruder Monitoring and Alarm System," International Journal of Scientific Research in Science, Engineering and Technology, 4, 2018, pp. 5-11.
5. Nghi Dam, Andrew Ricketts, Benjamin Catlett, Justin Henriques , "Wearable Sensors for Analyzing Personal Exposure to Air Pollution," IEEE , 2017.
6. Etinosa, N.-O., Okereke, C., Robert, O., Okesola, O. J., and Okokpujie, K. O., "Design and Implementation of an Iris Biometric Door Access Control System," in Computational Science and Computational Intelligence (CSCI), 2017, Las Vegas, USA, 2017
7. Al-Ali, A.R., Zualkernan, I. and Aloul, F., 2010. A mobile GPRS-sensors array for air pollution monitoring. IEEE Sensors Journal, 10(10), pp.1666-1671.
8. Snyder, E.G., Watkins, T.H., Solomon, P.A., Thoma, E.D., Williams, R.W., Hagler, G.S., Shelow, D.A., Kilaru,P.W., 2013. The changing paradigm of air pollution monitoring.
9. Matthews, V. O., Uzairue, S. I., Noma-Osaghae, E., Enefiok, M. K., and Ogukah, P. J., "Implementation of a Community Emergency Security Alert System," International Journal of Innovative Science and Research Technology, 3, 2018, pp. 475-483.

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