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IOT based Air Quality Monitoring System

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Abstract: ***Air pollution is contamination of air with poisonous substance where the air is unfit to breathe and not only affect humans but also all living things in the environment 90% of the people in the world breathe polluted air at present air pollution is the thread to human life the entire pollution is affected by it. Some gases which causes air pollution are nitrogen oxide,carbon monoxide, carbon dioxide and sulphur oxide. The combusion of fossils at power plant and industries are responsible for air pollution. Sulphur dioxide which leads to heart disease and gases like carbon dioxide which leads to stopping of oxygen also leads to death thus to make human aware of air the air they breathe and to know about their environmental situation the proposed solution is used where an arduino which is attached to a gas sensor the gas sensor collects all the gases and transmits to arduino this stores all the value in cloud as soon as the value reaches high the user will receive an alert in webpage about the level of pollution in the particular area and also if the pollution level is to high an alert message will be displayed and the pollution level for the future is being displayed to the user to aware of the current situation.***

Keywords: Wi-Fi connection, nodeMUC, gas sensor, GSM, GPS, cost-effective, arduino, AIR pollution monitoring, efficient, Internet of things and health management.

I. INTRODUCTION

IoT interfaces all the gadgets of the web and grant them to talk with one another over the web. IoT could likewise be a huge system of associated gadgets – all of which assembles and share information about how they are utilized and furthermore the situations during which they work t is to apply most recent ICT (Information and Communication Technologies) into the condition observing structure contamination. In IoT-based savvy checking framework is made for observing the Air Quality Index an incentive with the assistance of sensors (Gas Sensor, Arduino, Wi-Fi module) and long-term presentation to contaminated air can have changeless wellbeing impacts, for example, accelerated maturing of the lungs.

Loss of lung limit and diminished lung work. Advancement of maladies like asthma, bronchitis, emphysema, and perhaps malignant growth so it gives wellbeing related proposals. Because of worldwide environmental change and different elements, contamination designs are changing in a few urbanized territories of the world, with a monster impact on respiratory wellbeing both freely and synergistic-partner with atmosphere.

The fundamental instruments of those collaborations don't appear to be known; the wellbeing outcomes fluctuate from diminishing in lung capacity to unfavorably susceptible illnesses, new beginning of sicknesses, intensification of incessant respiratory ailments, and sudden passing.

II. LITERATURE SURVEY

IoT – Mobair App for managing the pollution specifically industry based, streamline and integrate environmental processes, including emission analyses, managing water and energy and waste reduction. Such apps provide visibility for users, industries into the risk of incident such as oil spills,chemical leaks etc.

The App had Air Quality Monitoring with features like air quality dips related to health risks,air quality maps generation,specific reports for air quality measures based on location etc[1].

Pollution caused by automobiles and provides a solution to control the areas which are highly polluted the hardware device is developed and placed along the road which transfers hair quality information to server so this information is used for controlling the traffic in the area the drawback is that placing along the road may cause damage to the hardware at any time[2].

It is based on IoT based air quality monitoring here by using smart devices air quality is accessed and analysed and by using android application the quality of air is known the drawback of this is that only analyzing[3]part can be done but to overcome or to reduce the risk factors no measure is being suggested.

Next is about pollution detection and monitoring where wireless sensors are used to calculate the levels of harmful gases and warning messages is send to the affected area so that they can take the safety measures this paper mainly focuses on chemical industry the drawback is that some chemical industries present in the rural area so that the rural people may not be aware of the smart solutions and smart devices[4].

It is based on designing a hardware to monitor and analyse the air quality and the data is being updated on the internet these values are taken accurate and with any smart mobile device we can access those values which can be accessed via cloud[5].

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III. EXISTING SYSTEM

IoT is an overall arrangement of gadgets that can detect and associate with their environment and interface with different client frameworks. Worldwide air contamination is one of the significant worries of our time. Existing checking frameworks have sub-par accuracy, low affect-ability. In this manner, improved checking frameworks are required. To defeat the issues of existing frameworks, we propose a three stage air contamination observing framework.

An IoT pack was readied utilizing gas sensors, Arduino IDE (Integrated Development Environment), and a Wi-Fi module. This unit can be genuinely put in different urban communities to observing air contamination.

The gas sensors assemble information from air and advance the information to the Arduino IDE. The Arduino IDE transmits the information to the cloud through the Wi-Fi module. We additionally built up an Android application named IoT-Mobair with the goal that clients can get to important air quality information from the cloud.

On the off chance that a client is venturing out to a goal, the contamination level of the whole course is anticipated, and an admonition is shown if the contamination level is excessively high.

The kid for monitoring the air pollution along with the integrated mobile application id useful for people suffering from respiratory diseases the existing system faces complexity during computation while dealing with big sensor data. The system suggested to use fog computing instead of cloud computing to reduce the complexity.

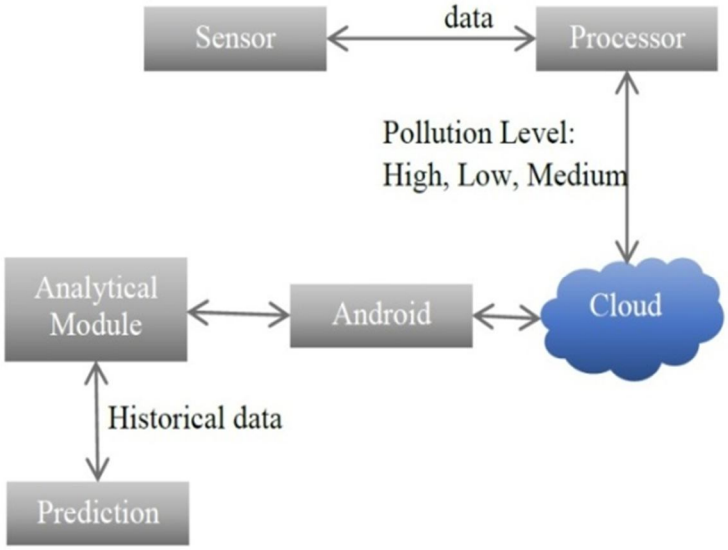

Fig.4.1 System overview

IV. DRAWBACKS OF EXISTING SYSTEM

As sensors are utilized in some devices and obverse and measures the values from the surrounding environments, those values are defines a Air Quality Index value which shows the polluted air in our environments. It doesn't give solutions to protect ourselves from the polluted environment.

V. PROPOSED SYSTEM

Internet of Things is being used in Environment Pollutions, generally for monitoring the environmental protection. Here, we use IoT for monitoring and detecting the air condition in environment. Gas sensors where gases like SO2.,NO2,CO,CO2, are to be measured is interfaced with the ardunio this gas sensor measures all the gas levels and those are send to the ardunio.

Ardunio which transmits this data to the cloud by node mcu an alert is being send if the level goes high so the user gets the pollution level details displayed on the webpage and by using machine learning the future prediction of the level is predicted and displayed on the webpage so that user knows it prior and take measures according to that and an alert is given if the level exceeds too high.

Future level of pollution is predicted then and there and displayed to the user. The details are visible and displayed through the webpage easily. So that the user will be aware of the pollution level and take necessary steps to keep them away from the air pollution.

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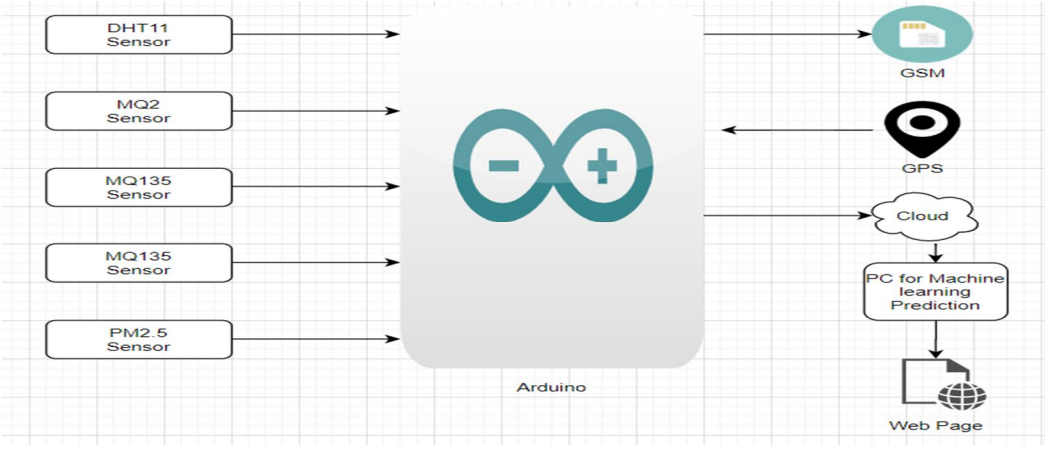

Fig 6.1 Proposed system overview

VI. IMPLEMENTATION

At first we use the Gas Sensor to count or measure the polluted AIR around our Environment, those values are stored in ardunio board and then by using the serial communication the values that is being got is send to the node mcu and those values are given to the cloud and is predicted by using learning algorithm so that the future outcomes are predicted. The data is retrieved from cloud by using API Key, which is auto generated KEY for developers purpose. Learning algorithm is used to find or predict the future values. Then by using the threshold values we will be comparing the values if the values that are got is high an alert message will be given to the user.

VII. COMPONENTS

Hardware interface is the initial Module in the project. This module comprises of sensors and other hardware components. The PIC or Arudino Microcontroller is used to provide efficient sensor interface. There are multiple sensor interface that are implemented in this model. All the sensors are being embedded with the LCD for the purpose of offline communication. Microcontroller is connected with the power supply unit which is a solar powered battery.

The hardware interface includes the following components: Arduino uno, Gas sensor, GPS, GSM, Node MCU and the Mechanical setup.

A. Interfacing Arduino

A littler scope controller is a little PC on alone facilitated circuit containing a processor community, memory, and programmable data/yield peripherals The huge part for us is that a scaled down scale controller contains the processor (which all PCs have) and memory, and some data/yield sticks that you can control. (GPIO - General Purpose Input Output Pins).

We will use the Arduino Uno board. This joins a little scope controller close by the aggregate of the extra things to make it straightforward for you to develop and investigate your exercises. The Uno is a microcontroller board subject to the A Tmega328P. It has 14 propelled information/yield pins (of which 6 can be used as PWM yields), 6 straightforward wellsprings of data, a 16 MHz quartz valuable stone, a USB affiliation, a power jack, an ICSP header and a reset get.

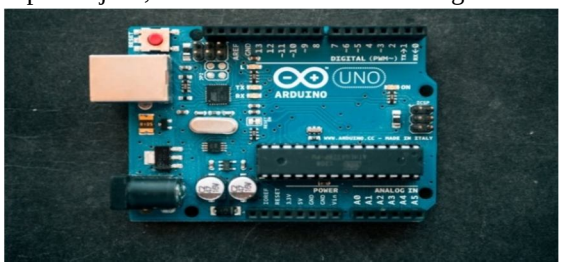

Fig.7.2 Arduino board

It contains everything expected to help the microcontroller; basically partner it to a PC with a USB connection or power it with an AC-to-DC connector or battery to start.. You can tinker with your UNO without anguishing significantly over achieving something inaccurately, most critical result possible you can swap the chip for two or three dollars and start again.

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B. Interfacing GPS Module

The Global Positioning System is an area tracker. It , tracks the present area as longitude and scope. The GPS Coder Module will utilize this data to look through a definite location of that area as the road name, close by intersection and so on which is straightforwardly associated with USART of the microcontroller gives dependable situating, route, and timing administrations to overall clients on a persistent premise in all climate, day and night, anyplace on or close to the Earth. . On the off chance that in the event that GPS is impaired, at that point the framework will just send the longitude and scope through SMS. Thus, Internet is required.

Fig.7.3 GPS Module

C. GSM Module

A GSM module or a GPRS module is a chip or circuit that will be utilized to set up correspondence between a cell phone or a processing machine and a GSM or GPRS framework. The modem (modulator-demodulator) is a basic part here.These modules comprise of a GSM module or GPRS modem controlled by a force supply circuit and correspondence interfaces (like RS-232, USB 2.0, and others) for PC. A GSM modem can be a devoted modem gadget with a sequential, USB or Bluetooth association, or it very well may be a cell phone that gives GSM modem capacities.

Fig. 7.4 GSM Module

D. Aurdino IDE

The Arduino fused progression condition (IDE) is a cross-organize application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to form and move activities to Arduino board. The source code for the IDE is released under the GNU General Public License, variation 2.The Arduino IDE supports the tongues C and C++ using unprecedented measures of code sorting out.

The Arduino IDE supplies an item library from the Wiring adventure, which gives various ordinary data and yield approach. Customer created code just requires two basic limits, for starting the sketch and the standard program circle, that are amassed and associated with a program stub crucial() into an executable cyclic authority program with the GNU tool chain, also included with the IDE transport.

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E. DHT 11

The DHT 11 is a fundamental, ultra ease advanced temperature and mugginess sensor. It utilizes a capacitive stickiness sensor and a thermostat to gauge the encompassing air, and lets out a computerized signal on the information pin (no simple info pins required). Its genuinely easy to utilize, however requires cautious planning to snatch information. The main genuine drawback of this sensor is you can just get new information from it once at regular intervals, so when utilizing our library, sensor readings can be as long as 2 seconds old. Contrast with DHT 12, this sensor is less exact, less precise and works in a littler scope of temperature/dampness, yet its littler and more affordable.

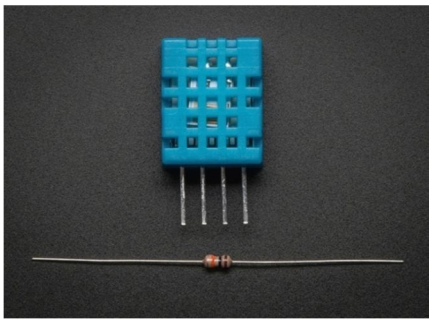

Fig. 7.5 DHT 11

F. Interfacing MQ2 Gas Sensor

MQ2 gas sensor is an electronic sensor utilized for detecting the convergence of gases noticeable all around, for example, LPG, propane, methane, hydrogen, liquor, smoke and carbon monoxide. MQ2 gas sensor is otherwise called chemi-resistor. It contains a detecting material whose opposition changes when it interacts with the gas. This adjustment in the estimation of opposition is utilized for the discovery of gas. Convergences of gas in the gas is estimated utilizing a voltage divider arrange present in the sensor. This sensor takes a shot at 5V DC voltage. It can identify gases in the convergence of range 200 to 10000ppm.

Fig. 7.6 MQ2 Gas Sensor

G. Interfacing PM 2.5 Sensor

This sensor utilizes laser dispersing to emanate suspending particles noticeable all around, at that point gathers dissipating light to acquire the bend of dissipating light change with time. This sensor utilizes laser dissipating to transmit suspending particles noticeable all around, at that point gathers dissipating light to get the bend of dissipating light change with time. Due to its small size particles can travel deep into the human lung and cause a variety of health issues. The microchip ascertains proportionate molecule measurement and the quantity of particles with various distance across per unit volume.

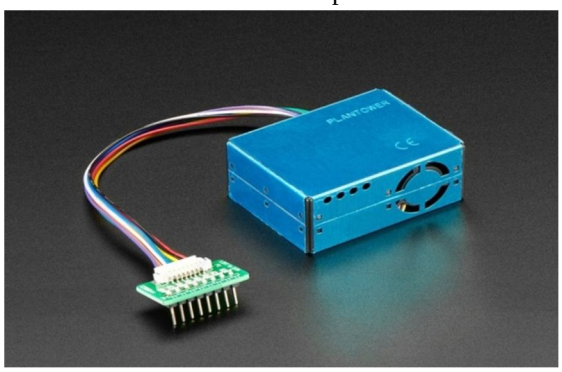

Fig. 7.7 PM 2.5 Sensor

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H. Interfacing MQ 135 Sensor

Air quality sensor for distinguishing a wide scope of gases, including NH3, NOx, liquor, benzene, smoke and CO2. Perfect for use in office or manufacturing plant. MQ135 gas sensor has high affectability to Ammonia, Sulphide likewise delicate to smoke and other unsafe gases. It is with ease and especially reasonable for Air quality checking application.

Fig.7.8 MQ 135 Sensor

VIII. CONCLUSION

The proposed structure will manage environment pollution by measuring and analyzing environment and will assist with comprehending them with innovatively solid hardware and thoughts. The value of this work is it not just measuring the air quality index and it additionally gives information about environment by methods of prediction algorithms. Values and suggestions are displayed on the webpage to the user so that it helps people to keep themselves safe from pollution. analyzing environment and will assist with comprehending them with innovatively solid hardware and thoughts. The value of this work is it not just measuring the air quality index and it additionally gives information about environment by methods of prediction algorithms. Values and suggestions are displayed on the webpage to the user so that it helps people to keep themselves safe from pollution.

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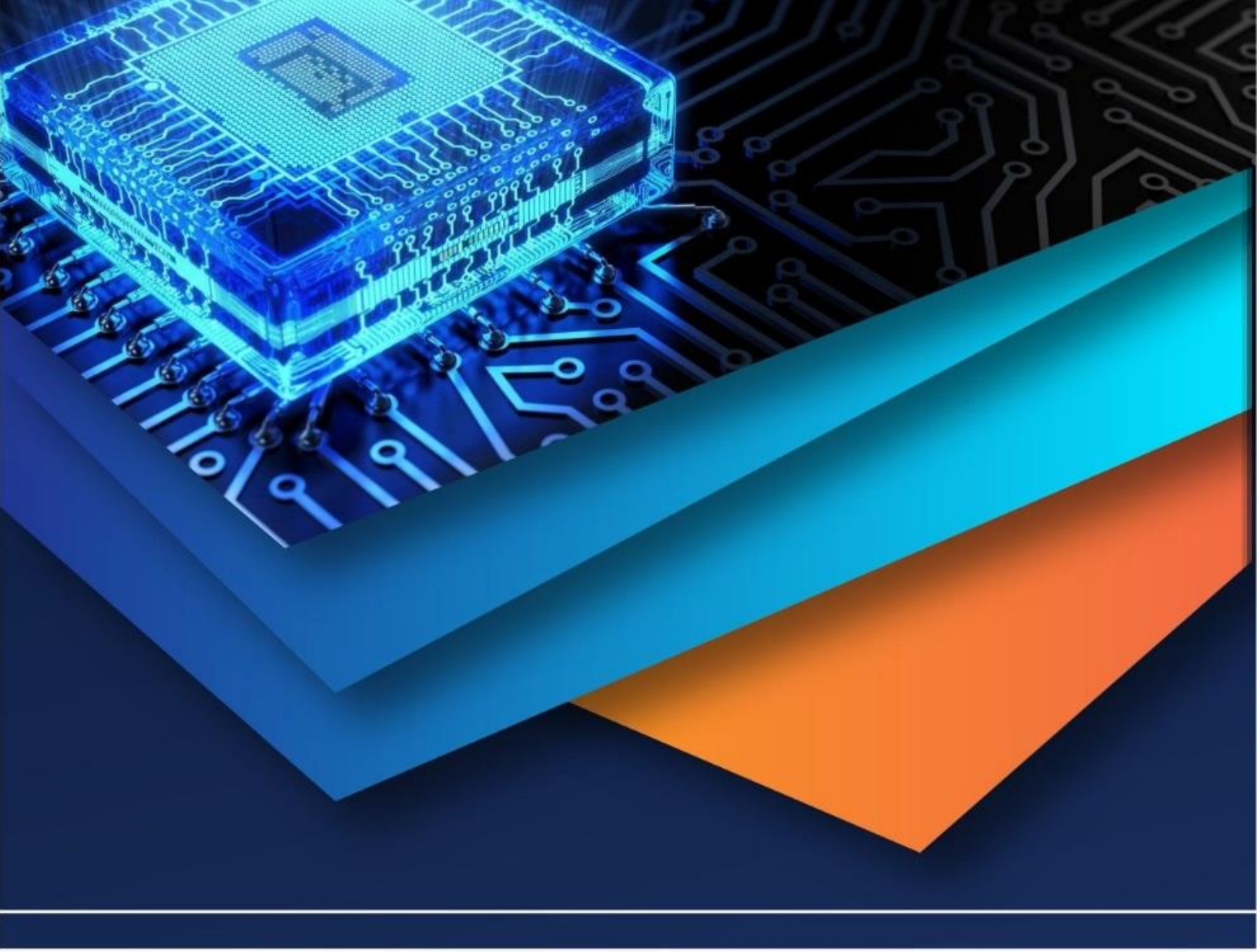

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