

IOT Based Air Filter

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Abstract- As we probably are aware, air contamination is perhaps of the most serious ecological issue in the 21st hundred years.

It increments quickly everyday by many explanation. There are many reasons because of which air contamination causes in the world. The primary explanation of the air contamination is individuals, there are numerous synthetic things because of which air contamination causes, for example, vehicles, fireplace, thermal energy station, deforestation and so on yet in addition there are some regular reason because of which air contamination causes, for example, volcanic ejection, expanding temperature, rapidly spreading fire and so on.

In air contamination, there are a few unsafe gases like CO₂, NO₂, SO₂, dioxins and so forth which influence the body portions of the human being in various manner and furthermore there are particulate matter in the air which influence people.

According to WHO statics, a few unexpected passing cases are accounted for because of air contamination consistently around the world. In this manner, we have made a gadget named as "IOT based Air purifier with Contamination checking framework". It distinguishes the destructive gases and residue particles which are available in air and furthermore tells about the temperature and dampness for that we are utilizing DHT11 temperature and moistness sensor.

After location, it sends the information to the LCD and ThingSpeak cloud server utilizing Wi-Fi module (Esp8266-01). Thingspeak cloud server is an open-source cloud stage on which information can be put away and recovered through HTTP over the web. In the event that the information is low, it just sends the information to the LCD and ThingSpeak however in the event that the information is high, it sends the information to the LCD and ThingSpeak cloud server as well as it begins the fan what begin purging the air through HEPA channel.

This gadget permits the observing of air quality, moreover refine it and show the constant outcomes on the cloud server.

I. INTRODUCTION

Nowadays, recent technologies were able to provide a glimpse of hope in overcoming the challenges caused by rapid urbanization. A new strategy is introduced to solve the problems caused by the population growth and rapid urbanization. This strategy is to transform cities into what is called smart cities. A smart city is an environment that uses communication and information technologies intensively, in order to make cities more efficient. Leading smart cities have integrated efficiency into buildings and infrastructure using technological advancements.

Increasing livability and productivity. The concept of smart cities must have the capability to provide stable connectivity to every device that will produce information. Traditional cities suffer from high traffic, crowded roads, inefficient use of lighting systems, loss of water resources, pollution, etc. Hence, the focus on smart cities has evolved to be a focus on a better life and the quality of life. This aim has introduced the concept of sustainability. Smart cities can still find itself wasting resources, using devices that require high power consumption and not be able to fully cope with the natural environment.

The main vision of a smart sustainable city is to maintain the balance between the technological advance, saving resources, low power consumption and coping with the environment without neglecting any of these factors. One of the most challenging issues in cities is the pollution especially air pollution. Air pollution is hard to prevent in crowded cities. It has a direct effect on the health of humans, animals and plants. Third world countries are an example of cities suffering from air pollution for decades due to heavy traffics, industries.

II. RELATED WORK

Monitoring environmental conditions in homes have been inspected in [4]. A framework is proposed by author to monitor temperature, humidity and light intensity, which is based on a combination of pervasive distributed sensing units, information system for data aggregation, and reasoning and context awareness. The reliability of the sensing information is

encouraging. Several monitoring system have been proposed recently for environmental pollution monitoring. While, some of the monitoring systems are specific for monitoring of CO₂ (carbon-di-oxide).

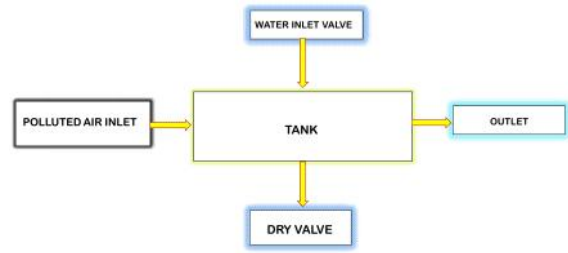
In [5] a monitoring system is developed which gives the concentration of Carbon-di-oxide of remote area. The system also report temperature humidity and light intensity of the outdoor monitoring area. Similarly, an urban CO₂ monitoring system presented by author in [6]. The system operates outdoor at an urban area around 100 square kilometers.

To monitor VOC pollution levels in indoor environments a low-power ZigBee sensor network is proposed in [7]. A WSN based system is presented for indoor and outdoor air quality monitoring in [8]. An array of sensors is present at each node which is connected to the central monitoring unit either hardwired or wirelessly. In [9], a realtime indoor air quality monitoring system is proposed. The system has seven sensors monitoring seven different gases.

III. EXISTING SYSTEM

1. The commercial meters available in the market are Fluke CO220 carbon monoxide meter for CO, Amprobe CO2 meter for CO₂, Forbix Semicon LPG gas leakage sensor alarm for LPG leakage detection.
2. The researchers in this field have proposed various air quality monitoring systems based on WSN, GSM and GIS.
3. Now each technology has limited uses according to the intended function, as Zigbee is meant for users with Zigbee trans-receiver, Bluetooth.
4. GIS based system is designed, implemented and tested to monitor the pin points of air pollution of any area.
5. It consists of a microcontroller, gas sensors, mobile unit, a temporary memory buffer and a web server with internet connectivity which collects data from different locations along with coordinate's information at certain time of a day.
6. The readings for particular location are averaged in a closed time and space.

EXISTING BLOCK DIAGRAM

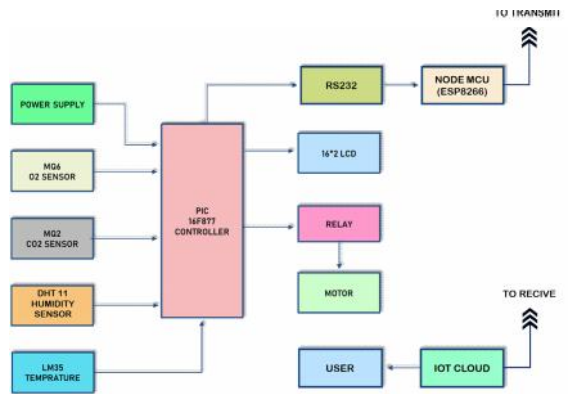


IV. PROPOSED SYSTEM

The main contributor to the air pollution is gases releasing from industries like carbon dioxide, unburned hydrocarbons etc.

- Our proposed system focused on minimizes generation of such polluting agent.
- In this air filter the unwanted gases is sedemented onto the water while pure air is come out from the water .
- Environment harmful gases are absorbed efficiently within the air filter and keep environment friendly.
- Here we use O₂ and CO₂ sensor to sense the gas level of these gases.
- This system is controlled by the Pic controller and IOT is interface to get all the data about gases from the industry.

PROPOSED BLOCK DIAGRAM



V. THEIR DRAWBACKS

1. High cost of installation and maintenance: The cost of installation and maintenance of these systems is very high, as it requires high-end hardware and software components.
2. Limited coverage: These systems have a limited coverage range and can only cover a small area at a time.

3. Inaccurate readings: The readings from these systems can be inaccurate due to the limited range of sensing devices used.
4. Unreliable data: Due to the lack of data validation mechanisms, the data collected from these systems may not be reliable.
5. Low battery life: These systems require frequent battery change, which can be expensive and time consuming.

VI. SYSTEM DESIGN

The air quality in cities is degrading as a result of a complex interaction between natural and artificial environmental conditions. With the increase in urbanization and industrialization and lack of control on emissions and use of catalytic converters, a great amount of particulate and toxic gases are produced. The objective of this project is to monitor air pollution on roads and track vehicles which cause pollution over a specified limit. Increased use of automobiles is a serious problem that has been around for a very long time. An embedded system is a controller with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today. Our air pollution monitoring System is an automated version of monitoring the quality of air and sending the information to a distant database wirelessly. Our system has got almost all things automated so that we get an advantage of this concept ie the real time direct measurement of the parameters (here air quality) through IOT. Maintaining backup of sent data is easy and can be done within a few seconds. In this project we are going to design the new ECU (Engine Control Unit) device which consist of CO2 sensor, micro controller, LCD display, IOT and accelerometer. All the things will be monitored through IOT. We are going fix this ECU device, all upcoming vehicles. Where co2 sensor continuously measures the co2 level exhausted from the vehicles. Along with the polluted information about vehicle will be transmitted to RTO via IOT. Whenever that level crossed the threshold limit, it will intimate the person to rectify the problem like by doing Service maintenance. If the person ignores the process RTO will gives the warning message to the particular person. Again he doesn't take care means, they will deactivate you vehicle ECU wirelessly. Once they locked ECU unit we can't run our vehicles whatever situation may appear, if we did any malfunction means our system will helps the RTO to find out the vehicle. After correcting the pollution level we need to get the certificate from RTO. Then only they will unlock your vehicles without their permission we can't access our vehicles.

Transformer: 12-0-12 5Amp Center Tapped Stepdown Transformer is a general-purpose chassis mounting mains transformer. The transformer has 230V primary winding and center-tapped secondary winding. The transformer has flying-colored insulated connecting leads (Approx. 100 mm long). The Transformer act as a step-down transformer reducing AC - 230V to AC - 12V.



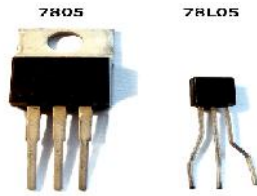
Temperature sensor: Temperature sensors are low-cost, precise, and extremely reliable in repeated experiments. They are desirable for both embedded and surface mount applications. They have a faster response time because of the lower thermal mass. The vibrating wire type is normally full interchangeable.



Humidity sensor: Humidity sensors work by detecting changes that alter electrical currents or temperature in the air. There are three basic types of humidity sensors: capacitive, resistive and thermal. All three types will monitor minute changes in the atmosphere in order to calculate the humidity in the air.



Voltage Regulator: Electronic voltage regulators operate by comparing the actual output voltage to some internal fixed reference voltage. Voltage Regulator (regulator) usually having three legs, converts varying input voltage and produces a constant regulated output voltage. They are available in a variety of outputs. The most common part numbers start with the numbers 78 or 79 and finish with two digits indicating the output voltage. The number 78 represents positive voltage and 79 negative one. The 78XX series of voltage regulators are designed for positive input. And the 79XX series is designed for negative input.



Microcontroller–PIC16F877A: PIC has only 35 single word instructions. All are single cycle instructions except for program branches, which uses two-cycle. The Operating speed of PIC in DC is 20 MHz and clock input in DC is 200 ns instruction cycle. The PIC has 8K x 14 words of flash Program Memory, 368 x 8 bytes of Data Memory (RAM).



LCD –Liquid Crystal Display: An LCD consists of two glass panels, with the liquid crystal material sandwiched in between them. The inner surface of the glass plates is coated with transparent electrodes which define the character, symbols or patterns to be displayed. Polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules maintain a defined orientation angle. One each polarizer is pasted outside the two glass panels. These polarizers would rotate the light rays passing through them to a definite angle, in a particular direction. When the LCD is in the off state, light rays are rotated by the two polarizers and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent. When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by polarizers, which would result in activating/highlighting the desired characters.

The LCD's are light weight with only a few millimetres in thickness. Since the LCD's consume less power, they are compatible with low-power electronic circuits, and can be powered for long durations.



GSM: This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily. The modem can either be connected to PC serial port directly or to any microcontroller.



It can be used to send and receive SMS or make/receive voice calls. It can also be used in GPRS mode to connect to internet and do many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload files for data logic. This GSM modem is a highly flexible plug and play quad band GSM modem for direct and easy integration to RS232 applications. Supports features like Voice, SMS, Data/Fax, GPRS and integrated TCP/IP stack.

MCB: Magnetic circuit breakers use a solenoid (electromagnet) whose pulling force increases with the current. Certain designs utilize electromagnetic forces in addition to those of the solenoid. The circuit breaker contacts are held closed by a latch. As the current in the solenoid increases beyond the rating of the circuit breaker, the solenoid's pull releases the latch which then allows the contacts to open by spring action. The core is restrained by a spring until the current exceeds the breaker rating. During an overload, the speed of the solenoid motion is restricted by the magnet. The delay permits brief current surges beyond normal running current for motor starting, energizing equipment, etc.

Magnetic circuit breaker Short circuit currents provide sufficient solenoid force to release the latch regardless of core position thus bypassing the delay feature. Ambient temperature affects the time delay but does not affect the current rating of a magnetic breaker. The circuit breaker contacts must carry the load current without excessive heating, and must also withstand the heat of the arc produced when interrupting the circuit. Contacts are made of copper or copper alloys, silver alloys, and other materials. Service life of the contacts is limited by the erosion due to interrupting the arc. Miniature and molded case circuit breakers are usually

discarded when the contacts are worn, but power circuit breakers and high-voltage circuit breakers have replaceable contacts.



When a current is interrupted, an arc is generated. This arc must be contained, cooled, and extinguished in a controlled way, so that the gap between the contacts can again withstand the voltage in the circuit. Different circuit breakers use vacuum, air, insulating gas, or oil as the medium in which the arc forms. Finally, once the fault condition has been cleared, the contacts must again be closed to restore power to the interrupted circuit.

VII. CONCLUSION AND FUTURESCOPE

It educates us regarding the hurtful gases which is available in air around us. This gadget take all the worth of residue molecule as well as any remaining gases present in encompassing are addressed in advanced from as well as in graphical from and show the AQI esteem by which we can decide the nature of air. On the off chance that the AQI esteem is more noteworthy, standard worth then we can say that air around us is contaminated. It enlightens us regarding the information of temperature and moistness present in encompassing which are addressed in advanced from as well as in graphical from. On the off chance that the temperature esteem is expanded, moistness is diminished.

1. With the right libraries and codes utilized we had the option to consolidate the codes, we have likewise made the parts to fill in as one with a cycle that work how we would have preferred to.
2. After a progression of investigating and code altering, we were able to make an IoT Empowered Air Purifier that purges the air in an exceptionally proficient manner and gives the continuous examination of the carbon monoxide and the LPG gas level fixations in the air at that spot and can be worked from anyplace in the world.
3. Our IoT Empowered Air Purifier has much more things to move along. For additional and more profound research, they can put more functionalities in our IoT Empowered Air Purifier like putting an

extra sensor with the goal that we can ready to gauge other significant gas fixation and furthermore an another sensor which is being utilized inside is utilized outwardly (at the gadget outlet) gives us a method for deciding the effectiveness of the gadget.



VIII. RESULT COMPARISON

PARAMETERS	EXISTING SYSTEM	PROPOSED SYSTEM
CO2	80	20
O2	70	90
TEMPERATURE	60	30
DUST	75	30

- This system works more effectively more pollution reduction.
- It has some other advantages like it require cheap pollution reducing agents like water.
- It's construction is simple it does not require any costly processes. This system can be used in industries.
- The paper presented an IOT based Air pollution Monitoring System for Smart Cities...

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