IOT Based Noise And Pollution Monitoring System

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Abstract – *In infrastructure of todays societies and industrial plants the increase in environmental issues like pollution(Air, Noise etc.),climate change, malfunctioning causes great consequences and which gives rise to demand for an, operationally adaptable, efficient, cheap and smart monitoring systems. In this Paper a solution to monitor air and noise pollution in industrial areas as well as public society is proposed. Now a Days technologies which provides an ease of using softwares and devices are in demand and IOT is such a platform which provides Real time access to the devices through the internet which is attracting the younger generation. Therefore the technology like Internet of Things (IoT) is included in the form of solution which is outcome of merged field of computer science and electronics. For two or three parameters like noise, Air Quality, LPG ,Alcohol, Temperature and Humidity levels the implementation is tested with respect to the normal behavior levels or given specifications which provide a monitoring over the pollution control to make the environment smart and ecofriendly. The basic mission of the Air Quality Planning and Standards is to preserve quality of air and pollution monitoring on real time slot .*

*Key Words***: Node MCU, IOT, Relay, Sensor(noise, Air quality), Blynk.**

1.INTRODUCTION

For the purpose of controlling and monitoring different activities and parameters which is focus of Innovation in todays technology, For reaching the Human Needs and Demands of Ease of use of any technology. To monitor and assess the conditions in case of exceeding the prescribed level of parameters (pollution, humidity levels) an efficient environmental monitoring system is required. In an environment when by use of sensors devises an object is equipped with it making the environment self monitoring and self defending then that environment is known as smart environment.

Our proposed model focuses on Real time monitoring of noise and air pollution in the industrial and public areas where the users can access the data and monitor the quantity of different harmful gases, noise pollution in that area as well as humidity and temperature level. All these different parameters data can be accessed by users through an app which we provide namely as "Blynk" which is user friendly and easy to use. This is made possible by the use of concept of IOT which refers to accessing the devices through internet .Also Node MCU is used to make the model compact and easy to built with less complexity which increases the ease of handling the devices, the advantages of node mcu over ardiuno is discussed in paper later. So a solution for monitoring the noise and CO levels i.e., any parameter value crossing its threshold value ranges, for example CO levels in air in a particular area exceeding the normal levels etc., in the environment using wireless embedded computing system is proposed in this paper.[1]

2. Existing Model

Many pollution monitoring systems are introduced in todays generation on of those models are a pollution monitoring system using Zigbee based wireless sensor networks shown in Figure 2.1 which is used to monitor physical and environmental conditions with thousands of application in different fields. In this existing model sensor nodes directly communicate with the moving nodes deployed on the object of interest which avoided the use of complex routing algorithm but also here use local computations are very minimal. In the existing model RFID is used for the storing and retrieving data through electromagnetic transmission to an RF compatible integrated circuit. It is basically used to track and label items in supermarkets and manufactories. The two main components of RFID systems are tags and readers where tag has an unique identification (ID) number and a memory used to store additional data such as manufacturer, product type etc. This provides an advantage where through wireless communication a reader is capable to write and/or read data to tags also for purpose of identification or tracking, tags are embedded or attached into objects in a typical RFID application.

Also in this modern Era where technology is growing rapidly more projects were introduced where the wireless communication was used for interaction of devices and users could read and access data through internet servers using ip addresses using computers and mobile phones. These projects included the monitoring system where local servers were used also projects came into play where global servers were used. In this modern era cloud access system are introduced where memory can be stored and hence smartphone application came into play and the demand of this type of technology increased which is also used in our proposed model.[2]
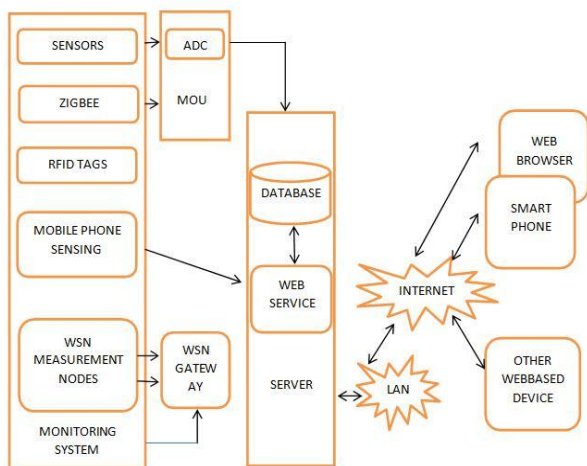
Figure 2a : Existing Model

3. Related Work.

Sample Many ideas came into play when we talk about air and noise pollution monitoring where evolution started from a wired monitoring system to wireless monitoring system. Previous work where zigbee nodes and RFID technology were used after which projects came into play where Sensors were interfaced with Arduino Or AVR Microcontroller and data was accessible through local servers. After this Global Servers and IOT Came into play and the data was accessible globally. But in previous models introduced the complexity was more and the computation was minimal, also devises had to handled manually.

In the proposed model the proposed design reduces the man handling as manually the maintenance and corresponding action are required.[3]

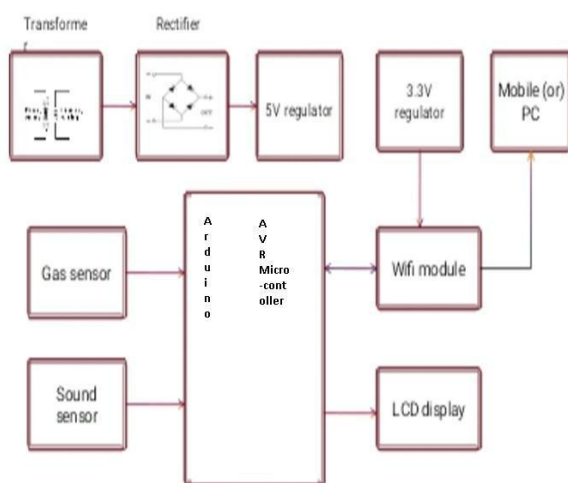A brief example through a previous project is shown in the figure .

Figure 3a : Previous Work

4 . Propesed Model

In our proposed model we are using gas sensors(MQ-135,MQ-7 etc.), noise sensor, temperature and humidity sensor(DHT 11) to interface it with Node MCU by using relay as it provides to read more than one analog values which overcome the limitation of Node MCU of having only one analog pin. Here the cloud internet global server is used where the information is sent to the cloud server and is accessible by any user around the world using there smart mobiles through an app that we introduced in our model i.e Blynk-IOT for Android/IOS. The Device has to only be installed in the areas whose pollution monitoring has to be done and the people or authorities of that area can access the data and info about the quantity in there apps through notification. And the threshold values when crossed a alert notification is send to the authority and then a corresponding action can be taken for that issue.[4]

In this Model the sensor will sense the air quality and noise where the data is analyzed by the sensors and is send to the Node MCU i.e Microcontroller where an analog value for each sensor is generated with help of Relay , the ppm value will be generated for the gases and value in db will be generated for noise, also the degree Celsius for temperature and humidity is expressed in percentage. The information is then send to the cloud memory where the data is stored which then be accessed by the users through the app which is installed in there respective smart phones or computers.
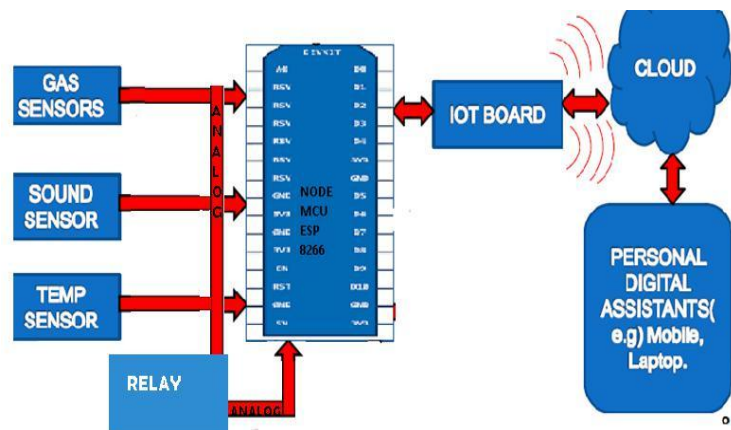

Figure 4a : Proposed Model

5. Working

The gas sensors senses the value then sends the analog value through relay to the Node MCU where the Microcontroller reads the value and sends it to the cloud server. The gas sensor works on the principle of resistance where two resistance are present in the sensor one which senses the heat(Rh) and one is sensor(Rs) , when the gas enters into the sensor the resistance values Rh and Rs changes. The sensor gives the ratio of Rs/Rh which varies with different gases as the Rh and Rs values varies as different gases follows different properties hence the resistance value is given through a formula where Rs, Rh and Vout Value of sensor is

used then the final Ro is given in ppm as its unit. The values are in analog which is made possible through use of Relay as Node MCU only posses one analog pin, the Relay provides 200ms delay which make the reading of 5 different analog reading possible through one analog pin of Node MCU The corresponding values are then send to Microcontroller where with the help of coding a threshold values are set which compares the data from the sensors to the set threshold values. The data from the Noise sensor is also compared with the threshold values and same goes with the temperature and humidity sensor. Then these data are send to the server where the server app token is included in the coding done where the server cloud is defined. The app is customized in user friendly way where a gauge for each sensor value is designed showing the level of gases in ppm, level of noise in dB, and degree Celsius for temperature. Its done in such a way that user can easily understand the effect of the pollution in their or any other area.[5]
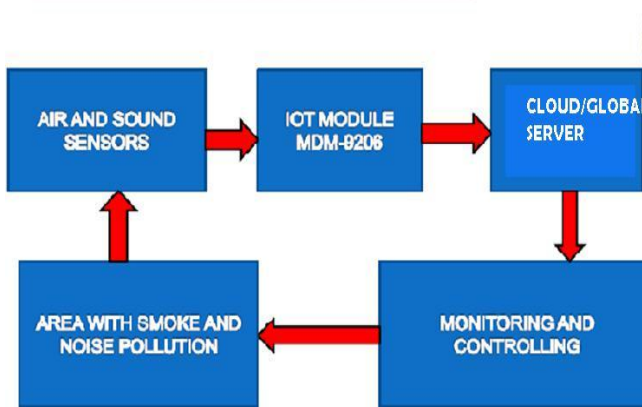

Figure 5a : Working Block Diagram

6. COMPONENT REQUIRED

6.1 Mq-7 Gas Sensor

This semiconductor gas sensor detects the presence of Carbon Monoxide at concentrations from 10 to 10,000 ppm. The sensor's simple analog voltage interface requires only one analog input pin from your microcontroller. This Carbon Monoxide (CO) gas sensor detects the concentrations of CO in the air and outputs its reading as an analog voltage. The sensor can measure concentrations of 10 to 10,000 ppm. The sensor can operate at temperatures from - 10 to 50°C and consumes less than 150 mA at 5 V. Advantage of MQ sensor are:[6]

- Simple, compact & Easy to handle.

- Sensors have long life time & less cost.

- Quality of air can be checked indoor as well as outdoor.

Figure 6.1 : MQ-7

6.2 Sound Sensor Module

A mic used to capture the sound signal. Sound sensitive material which converts sound energy in to electrical energy. An amplifier used to amplify the PM358 to amplify electrical signal produced. It has features like:

- Easy to use sound sensor module
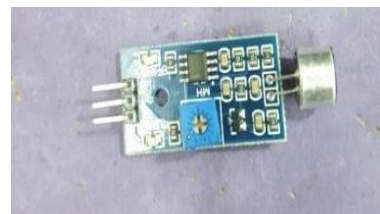- Provide analog or digital output signal

Figure 6.2 : Sound Sensor

6.3 DHT 11 Temperature and Humidity Sensor.

This DH11 (Temperature & humidity sensor) has features a calibrated digital signal output with the temperature and humidity sensor complex. Its technology ensures the high reliability and excellent long-term stability. It has excellent quality, fast response, anti-interference ability and high cost performance advantages. Each DHT11 sensor features extremely accurate calibration of humidity calibration chamber. The calibration coefficients stored in the OTP program memory, internal sensors detect signals in the process, we should call these calibration coefficients.[9]
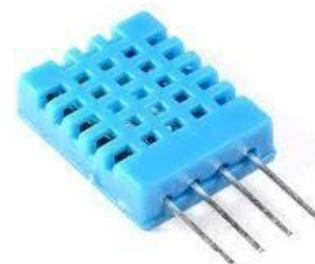

Figure 6.3 : DHT11

6.4 MQ-135 Gas Sensor

The MQ series of gas sensors utilizes a small heater inside with an electro chemical sensor these sensors are sensitive to a range of gasses are used at room temperature. MQ135 alcohol sensor is a Sno2 with a lower conductivity of clean air. When the target explosive gas exists, then the sensor's conductivity increases more increasing more along with the gas concentration rising levels. By using simple electronic circuits, it converts the charge of conductivity to correspond output signal of gas concentration. The MQ135 gas sensor has high sensitivity in ammonia, sulfide, bonze steam, smoke and in other harm full gas.[6]

Figure 6.4 : MQ-135

6.5 RELAY

A relay is an electrically operated switch. Some relays use an electromagnet to mechanically operate a switch. The first relay was used in long distance telegraph circuits as an amplifiers: Basically the main work of relay is to repeat the signal coming in from one circuit and to re-transmit it on another circuit. A simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core, an iron yoke which provides a low reluctance path for magnetic flux, a movable iron armature, and one or more sets of contacts.

The application of relays was in long telegraph lines, where the weak signal received at an intermediate station could control a contact, regenerating the signal for further transmission.[7]

Figure 6.5 : Relay

6.6 Node MCU

NodeMCU is an open source IoT platform.It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.The term "NodeMCU" by default refers to the firmware rather than the development kits.
The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266.[8]

Features:

- **Type :** Single-board microcontroller
- **Operating system :** XTOS
- **CPU :** ESP8266(LX106)
- **Memory :** 128kBytes
- **Storage :** 4MB
- **Power :** USB

Figure 6.6 : Node MCU

7. Result Discussion

The Data is sensed through sensor and an analog reading is send to the microcontroller which after comparing the value sends its to the cloud server after which the value f quantity of gas in ppm, noise in dB and temperature in degree Celsius is visible on the app in the gauge view. Also a notification Tab is available where notification is send as an alert on the app itself.
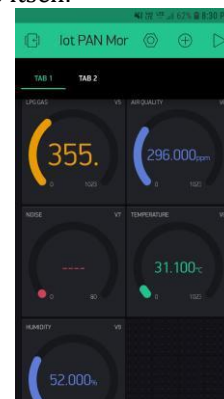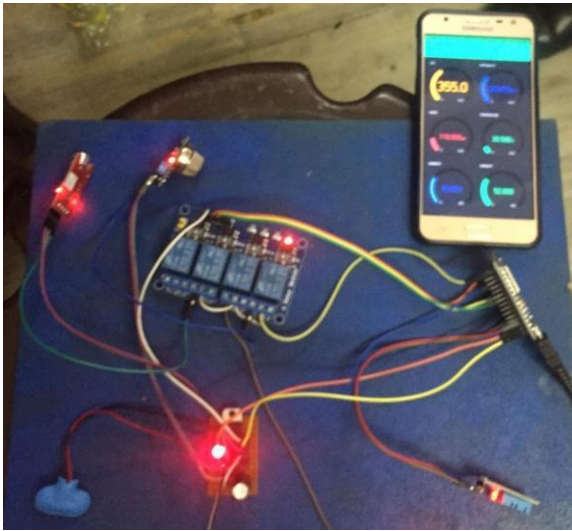

Figure 7a : Value on APP In Mobile

Figure 7b : Result Analysis

8. Conclusion

This research proposed a smart air pollution monitoring system that constantly keeps track of air quality in an area and displays the air quality measured on an application named Blynk Through IOT platform where a device connects with internet on real time slot. The system helps to create awareness of the quality of air that one breathes daily. This monitoring device can deliver real-time measurements of air quality in a user friendly way.

9. Applications:

- Roadside pollution Monitoring.
- Industrial Perimeter Monitoring.
- Site selection for reference monitoring stations.
- Indoor Air Quality Monitoring.
- Design server using IoT and upload data on that server with date and time.
- To make this data available to the common man.

10. ACKNOWLEDGEMENT

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