MONITORING AND MEASUREMENT OF AIR POLLUTION USING INTERNET OF THINGS

R. BHUVANESWARI¹, M. ALEKHYA¹, N. DINESH¹, SUNITA PANDA², KAMALANATHAN CHANDRAN³

¹UG Student, Department of Electrical, Electronics and Communication Engineering,
²Assistant Professor, Department of Electrical, Electronics and Communication Engineering,
³Associate Professor, Department of Electrical, Electronics and Communication Engineering,

GITAM School of Technology, GITAM Deemed to be University, Bengaluru.

ABSTRACT:

Now a days, due to increase in emission of smoke from vehicles, smoke emitted from industries pollution in air density is increasing rapidly and creating health issues day by day in the environment. Since we are unable to control the pollution as an individual, we propose a model which will help the individuals to have a control on themselves and protect them with their smart phones with the help of an application called Blynk.

More than 35% people reside in urban cities in India. The proportion of urban population is constantly climbing and is expected to cross 50% in next decade. This will call for more traffic, more construction and more industrialization. In addition to this, the pollutant can cause acid rain, global warming and distressing the herbal progress. Mostly, a humanoid cannot forecast or decide whether the airborne is good or bad. Therefore a measuring tool is required to check the air quality. The proposed research design is to measure air quality by using esp8266 module and sensors for detecting gases (MQ135) and measuring temperature (LM35) in PPM. The final results of the air quality can be displayed in a smartphone by connecting to Wi-Fi through ESP8266. The recent tech trends based on Internet of Things (IoT) in our research on air quality monitoring plays a significant part. A BLYNK app is created in smartphone where values are directly monitored easily by the users and receives a notification or warning when the quality of air worse.

Keywords: IOT, ESP8266 module, BLYNK, Air quality monitoring, Air quality index.
1. INTRODUCTION:

Air pollution has far more impact on environment than quality of air itself and has become 4th largest cause of death worldwide. Globally, air pollution reduces life expectancy rate by more than 1.5 years. It leads to change in climate, ozone depletion, water quality, acid rain, change in biodiversity and global warming. Chemical pollutants released in air such as suspended particulate substance, nitrogen monoxide, benzene, ethylene, sulphur dioxide, carbons oxide have significant adverse impact on human health and leads to diseases like lung cancer, bronchitis, asthma, artery disease, pulmonary diseases. It leads to premature deaths of more than 2 Million Indians. Globally more than 5 Million people die directly because of air pollution. As compared to the average death due to air pollution in the world i.e. 64 per 10,000. India clock much higher rate of 134 per 10,000. India has slow per capital greenhouse gas emission show ever it still remains third in the world post China & US. There is a mounting economic costs of air pollution. While USA bears $600 Billion, China & India bear $900 billion & $150 billion respectively. Monitoring of air pollution is one of the biggest challenges in tackling air pollution is lack of facilities of monitoring. As suggested by Satellite data, there are several cities which could fall in critical air quality however they are not under monitoring presently. Most of the cities have manual monitoring systems which provide data with lag and are subject to human error. Robust air pollution monitoring systems are required to alert people for taking appropriate action when the air quality worsens. Several people have started buying air purifiers show ever most of the solutions which are put into place for monitoring air pollution are brought in from abroad. Such instruments and solutions are tuned to the climatic conditions of other countries. A recent Assocham-Tech Sci research joint study on air purifiers in India projects that the market is expected to grow from the current $14.14 million $38.99 million by 2023 alone. In order to improve air quality various steps to be taken care by Indian government, Indian Government is taking the matter of improvement in air quality very seriously and implemented the National Clean Air Program to focus on diminishing particulate matter (PM) stages by 20-30% by 2024.
The Internet of Things (IoT) plays a vital role to find application in integrating interrelated computing devices by bringing the mechanical and digital aspects together. A Unique Identifier method and enables transfer of data without human intervention or inputs. IoT has found applications in various fields such as real time analytics, machine learning, home automation, wireless sensor networks, control systems etc. Present monitoring systems for air pollution involve equipment’s which are difficult to install, heave and expensive. It is now believed that IoT tools can deliver a system to quantify and report air quality with devices that are efficient and deliver accurate data constantly. This would involve usage of light weight sensors which can be attached to streetlight, public benches or even people. These sensors are part of low power wide area networks. These are specifically shaped sensors which observe ambient air for Nox, particulate matter& Co2. Decibel meters are also connected for measuring noise pollution. This generates a stream of data which can be converted into a heat map which plots air quality across the city. This stream of data is crunched using analytics and mapped against other variables such as traffic volume etc. for creating actionable.

Several countries have started implementing IoT for the purpose of monitoring air pollution. For instance, In South Korea, the administration has tossed the ‘Air Map Korea Project’ that targets to log extensive statistics via displays connected on 4.5 million telephone poles and 4,000 central offices. The sensors installed under this program measures fine dust particles, volatile organic compounds, humidity, noise levels etc. Chongqing City in China is now functioning with China Mobile to discover how allied device scan increase the checking of air quality, while cities like Brazil, Spain, Portugal and Spain are working with Orange and Telefonica for similar objects.

2. LITERATURE REVIEW:
Jenifer and Dr. D. John Aravindhar (2019), authors proposed Iot based Air Pollution Monitoring System Using Esp8266-12 with Google Firebase based on internet application using HTTP protocol.

Kumar, S. And Jasuja, A. , (2017), authors proposed Air quality monitoring system based on IoT using Raspberry Pi using ATMEGA-32P interfaced with Raspberry Pi.

Chanthakit S. and Rattanapoka C. (2018), authors proposed MQTT based air quality monitoring system using node MCU and node-RED based on the air quality measurement using ESP8266 node MCU, node-RED.
Phala, K.S.E., Kumar, A. And Hancke, G.P., (2016), authors proposed Air quality monitoring system based on ISO/IEC/IEEE 21451 using electrochemical method and electromagnetic sensor.

Enigella SSR, Shahnasser H. (2018), authors proposed Real Time Air Quality Monitoring based on low power devices and sensors using cloud and android application.

Nikolova B, Marinov M, Nikolov G. (2006), authors proposed Air Quality Monitoring System based on tin dioxide gas sensor, integrated temperature and humidity sensors, portable modular data acquisition system and graphical programming language.

EXISTING SYSTEM:
In the existing system we observed that the Air quality monitoring system is done using Raspberry Pi, DSM501A sensor, MQ9 sensor, DHT22 sensor and MQ135 sensor using IoT. MQTT protocol is used for the establishing communication between sensors and client. Node-RED and IBM Blue mix platforms are also created. Later the values are monitored on the dashboard of IBM Blue mix.

3. PROPOSED FRAMEWORK:
The above frame work indicates the new proposed system of the Air monitoring System. The ARDUINO IDE plays a key role in controlling the entire system. MQ135 and LM 35 are the sensors for identifying dissimilar ecological factors like alcohol, NOx, CO2, benzene, ammonia, smoke, sulphide steam and moisture. Major sensors are linked with NODE MCU board and also LCD unit connected to the output of the NODE MCU. Then the connectivity is made amid hardware components through software application that is ARDUINO IDE. The programming is done for sensing unit to the NODE MCU according to the user requirement. The data identified from sensors is exhibited on the LCD and then information transmitted continuously and the user receives the notification or warning of air quality with the created BLYNK App.

4. PROPOSED SYSTEM:

The proposed system carries into parts namely hardware and software part.

HARDWARE: The hardware part consists of NODEMCU and Sensors (MQ 135 and LM35).

NodeMCU is an open source IoT development board. One of its unique future is that it has built in support for Wi-Fi connectivity and hence makes IoT application development much easier.
The NodeMCU is an open source software and hardware development environment that is built around a very inexpensive system on cheap that is associated with ESP8266. In simple NodeMCU is defined as open source lower base firmware developed for ESP8266 Wi-Fi chip. The open source for NodeMCU hardware design is open for edit, modify or build new NodeMCU development board it is like any anyone can edit producer it and market their modified MCU development boards. Generally we can see NodeMCU development boards of Amica and DOIT in the market. The whole setup is connected to a software which is designed to be light weighted embedded scripting language that is just a programming language. A form where is a programming language that is written to a hardware devices non-volatile memory. The non-volatile memory is a form of static random access memory whose contents are saved whenever hardware devices turned off for processes external power source by exploring functionality with ESP8266 chip. NodeMCU firmware comes with ESP8266 development board that is NodeMCU development board. There are two node MCQ versions like ok NodeMCU 0.9 and NodeMCU 1.0. The NodeMCU development board consists of ESP8266 chip, it is a Wi-Fi enabled system and chip model developed by expressive system it is mostly used for development of IOT embedded applications. In ESP8266 the ESP-12E is the model embedded with 10 silica L1R6 32 bit microcontroller and this ESP8266 with cap volts of 2.4GH Wi-Fi , general purpose input, output pins and i2c serial communication it is inter integrated circuit and analog to digital conversion and serial peripheral interface that is SPI serial communication protocol and UART and pulse with modulation. The external SPI flash memory saves the users data .The NodeMCU board is featured with Wi-Fi capabilities, unlock pin, digital pins and serial communication protocol.
Proposed Structure Diagram:

The proposed work is the setup of Air Quality Monitoring System bases on IoT. It consists of a microcontroller i.e., NodeMCU, sensors namely Mq135 (Air Quality Sensor), LM35 (Temperature Sensor), LCD 16x2 i2C, Breadboard to make all the connections, Jumper wires for connecting.
Software Implementation: (ARDUINO IDE)

- This Arduino IDE platform consists of two main part:
  1. Editor: used to writing the required code.
  2. Compiler: used for compiling and uploading the code.
- Arduino IDE is available for many operating systems.

Software Working Part: (BLYNK App)

Introduction:

BLYNK is a platform which is used to control micro controllers, Arduino, Raspberry Pi and many others on the internet. It has IOS and Arduino Apps to control. It is a digital dashboard that helps in building graphic interface for projects. It is a simple drag and drop method.

Step 1

Download the App.

Create and Account and Login.

Later you will have to install the BLYNK Arduino libraries which helps in generating a firmware when running the ESP8266.
Step2

i) Create New Project to build a new BLYNK Project.

ii) Enter the project name.

iii) Select NODE MCU.

iv) Select the connectivity type and choose Wi-Fi.

v) Select Dark theme and press the Create button.

vi) Auto token will be generated and sent to respective mail ID that has been registered.

vii) Auto token must be saved and copied for time being.
Step3

i) Opened new project page.

ii) Click on the right top of the project window which show widget box.

iii) Add the required widgets to the project.

iv) By sliding down to find the LCD option, click on it and do the necessary settings.
Step 4

Blynk is done. Open the Arduino IDE and circumnavigate the file.
**Step 5**

Authorization sign into auth [] to be pasted before uploading of code mark that has been noted down.

```cpp
#define BLYNK_PRINT Serial

#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>

// You should get Auth Token in the
// Go to the Project Settings (not char auth[] = "YourAuthToken");

// Your WiFi credentials.
// Set password to "" for open net
char ssid[] = "YourNetworkName";
char pass[] = "YourPassword";

void setup()
{
  // Debug console
  Serial.begin(9600);

  Blynk.begin(auth, ssid, pass);
}

void loop()
{
  Blynk.run();
}
```

**Step 6**

To receive message, open the serial monitor setting after uploading of code.

Then on the right top corner of the Blynk app screen click the run button. Now observe the values being displayed on the LCD.
5. CONCLUSION AND FUTURESCOPE:

The proposed Air Quality Monitoring System is a good device that helps to measure the air quality and temperature in the atmosphere. This device can be used in areas viz markets, bus stations, railway stations etc. The system is IoT based and it uses a smart phone for give alerts or messages depending on the concentrations and temperature. IoT will enhance the artificial intelligence in the world, so that the system can be used in automated systems in industries and factories. The system needs to monitor the air of environment using microcontroller. IoT Technology is proposed to improve quality of air, with the use of IoT technology enhances the process of monitoring various aspects of environment such as air quality monitoring issue proposed. Here the usage of MQ135 gives the concentration of different dangerous gases like Carbon Monoxide, Methane and LPG gas as it has a small sensing material whose conductivity is lower in clean air and higher in polluted air. NODE MCU is the heart of the project and it controls the whole project with Wi-Fi and LCD to display the values.

Real time deployment of the proposed system is to be done in future. Maintenance of the equipment in all weather conditions and effective data transmission must be taken care.

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