A MODEL ON AUTOMATIC AIR POLLUTION SENSING METER

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ABSTRACT

The world is going through a detrimental change and one of the factors responsible for this is the seriously high levels of menace causing contamination of air. India is one among the top three most polluted countries in the world after USA and China. 21 among top 30 most polluted cities are Indian cities. There are many factors lending a hand to this menace like rapid population explosion which is a serious concern in India. The other factor is primitive methods of farming causing extremely high levels of PM2.5 emission in the atmosphere.

India has one of the largest middle-class populations hence giving rise to a huge number of personally owned vehicles. This causes 5% of the pollution in India. In this paper, we created an Internet of things-based air pollution meter aimed at sensing and monitoring air pollution. We will be using an android app and an Internet of things enabled development board for pushing data to the cloud. We have used DHT11 and MQ135 sensors for our data acquisition sensors.

Introduction

Air pollution is causing a menace and is the sole reason for deteriorating health issues of many. Some research show sustained exposure to and are as small as 2.5 micrometres could reduce lung health and elevate respiratory illness. These miscreants are also responsible for causing incessant inflammatory response irrespective of age. Due to this there is increase in risk of targeting the respiratory tract infected people[1].

A new study shows an unusual case of Netherlands. A data of more than 350 Dutch cities was collected and analysed and it showed that the south east region of the country had most number of cases even when the population density of the region is very less and the region is mostly rural or semi urban[2].

Interestingly it was observed that these regions had one of the highest PM2.5 concentrations over the years due to intensive livestock production causing in interesting amount of Ammonia release and hence causing pollution. This could not be possibly a coincidence and even if it is, we should ponder over controlling Air pollution.

Now if we talk about India, out of top 30 populated cities, 21 cities were Indian cities in 2019.Over 14 crores of people in India breathe air that is not within the safe limits proposed by WHO. Also Air pollution is said to cause over 20 Lakhs premature deaths in India. Considering the above situation, it becomes necessary to monitor air quality and collect data for correlations and minimizing advent of diseases resulting in better quality of life[3].

Internet of Things

To understand IOT better we need to understand what a “thing” is. A thing is any inanimate object or object that cannot verbally communicate with humans like car, television, Air-conditioner, light bulb, animals etc. In IOT we add a sensor or an actuator to a thing along with a processing element like a microcontroller unit which is connected to a communication unit like WiFi, Bluetooth , BLE , 6LoWPAN, GSM , 4G ,Zigbee etc to send data to a remote or local server or vice-versa. Now, when many of these things are connected to a remote or local server that controls or that monitors those things, the name Internet of Things was coined[4].

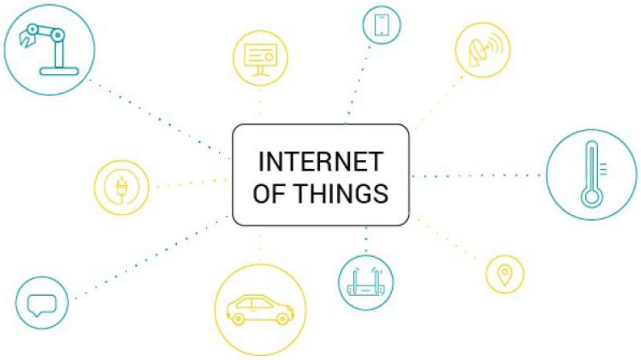

Figure 1: Internet of Things.

The Internet of Things is a group of computing devices that are interlinked with each other, mechanical and digital machines that can exchange data and related information without the need of human to computer interaction. IOT not only makes businesses efficient but also automates homes using smart devices. IOT enables companies to automate processes and reduce labor cost. With the help of Internet of things we can access the data from anywhere in
the world. It helps in effective and efficient communication between connected electronic devices. Internet of things helps make processes economical and scheduled[5].

Proposed Method

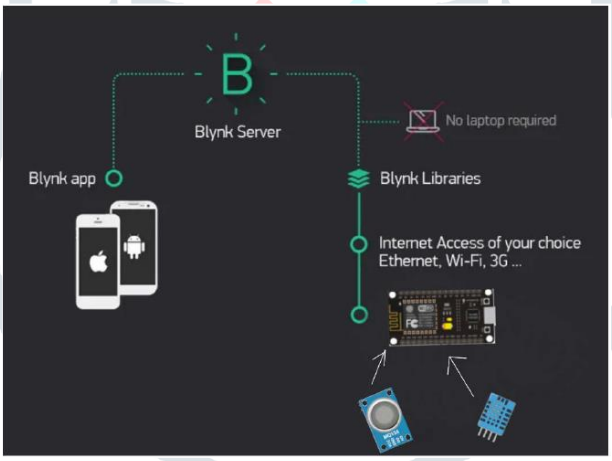

Figure 2: Architecture of the Paper

In this paper we are using two sensors that are at the lowest position in the Architectural stack namely MQ135 and DHT11. These sensors are responsible for reading values of parameters like Air quality, temperature and humidity respectively.
After that, the next thing on the stack is the ESP12E microcontroller which has inbuilt Wi-Fi
capability and several peripherals like UART, ADC, SPI, I2C etc which is used for communication with sensors, displays and actuators[1-6].
The ESP12E is loaded with firmware comprising of pre-compiled libraries and application specific code for air quality measurement. These API's and firmware are further connected to
the server via a secure and unique token id. Hence, the data is pushed at intervals set by the user to the mobile application via the Blynk server[7-9].

Step 1: Setting up the Hardware Model

 The hardware model consists of a ESP12E, MQ135, DHT11 and a printed circuit board.

 The components were soldered on the printed circuit board.

 The firmware for the application was written and compiled on the Arduino IDE

 The code was then uploaded to the ESP12E via Universal Serial bus cable.

 The printed circuit board was then deployed to view the air quality data.

 The internet connection to the ESP12E was provided through a nearby local Wi-Fi access point.

Step 2: Configuring the App

 The data collected by the sensors was processed by the microcontroller and sent to the Blynk server through an Access Point.

 The data is sent every 2 seconds to the application

 The Gauge and data visualization charts were created in the blynk app

 Access token was generated and added to the Arduino sketch.

 Virtual pins where the sensors are connected were created on the application interface in the app.

Conclusion

Air pollution is causing a menace and is the sole reason for deteriorating health issues of many. Some researches show sustained exposure to PM2.5 which is also called fine particulate matter and are as small as 2.5 micrometers could reduce lung health and elevate respiratory illness. These miscreants are also responsible for causing incessant inflammatory response irrespective of age. Due to this there is increase in risk of contracting critical conditions if advent of viruses targeting the respiratory tract infected people.

In this Paper we created an Internet of things based air pollution meter aimed at sensing and monitoring air pollution. We will be using an android app and an Internet of things enabled development board for pushing data to the cloud. We have used DHT11 and MQ135 sensors for our data acquisition sensors.

Our motive for this Paper was extending the monitoring sites to every nook and corner of the country with low cost solution to get an insight of the situation. This will help people become more aware and apply stringent measures against any unnecessary act of pollution.

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