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Octabrix based IoT device for neighboring locality air purity monitoring system

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ABSTRACT

Internet of Things (IoT) is evolving to be a revolution in the field of technology both in terms of hardware and software. Various market opportunities and rapid increase in number of connected devices witness the growth of IoT. In this paper, an IoT enabled device is implemented for monitoring the pollution level at a specific location. Octabrix device is utilised to manipulate the MQ-2 sensor data to analyze the pollution level. An Octabrix is a pair of low cost Wi-Fi module with minimal space requirement standalone application. The proposed system uses MQ-2 sensor, which monitors air purity in and around its neighboring location. In-turn, Octabrix is programmed to notify the air purity among the authenticated users automatically through an internet enabled smart-phones. Octabrix development board consists of an in-build LED ring that turns BLUE, RED when the air quality is below and above threshold value respectively. Also, the notification of the Air purity could be obtained through Google Allo on an internet enabled smart-phone via Blynk SMS. The proposed system is analyzed using Thinger.io a cloud platform for analyzing the sensor data. The experimental result is plotted and compared for different localities.

Type of Paper: Empirical.

Keywords: Internet of Things; Octabrix; MQ-2 Sensor; GOOgle ALLo; Thinger.io; Blynk

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1. Introduction

According to a report published by the World Health Organisation, air pollution now kills approximately seven million people annually, worldwide [1]. According to the report, the prolonged increase of air pollution might lead to death among one of eight people surrounding the environment.

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This is one of the high threat alarming situations for environmental health. In order to counteract this alarming statistic and take action against the air purity, it's important to understand that our responsibility is abruptly increasing intact to increase in pollution level. Among the pollutants, air monitors assess the amount of carbon dioxide (CO2), carbon monoxide (CO), LPG, methane and acetone as they are major threats to the environment. Objective of the proposed system is to monitor the air quality and to notify the user. The proposed system utilize MQ-2 sensor to monitor air purity in the neighboring location [2]. Initially, the MQ-2 Sensor output data is processed by Octabrix. Further, Octabrix is programmed to manipulate the received data and classify the pollution level. Finally, the analysed report will be notified to the authenticated users through an internet enabled smart-phone. Octabrix development board consists of an in-build LED notification, which turns BLUE, RED when the air quality is below and above the threshold value respectively.

2. Proposed System

An Iot enabled device is implemented for monitoring the pollution level at a specific location. Figure 1 demonstrates the flow of the proposed pollution monitoring system.

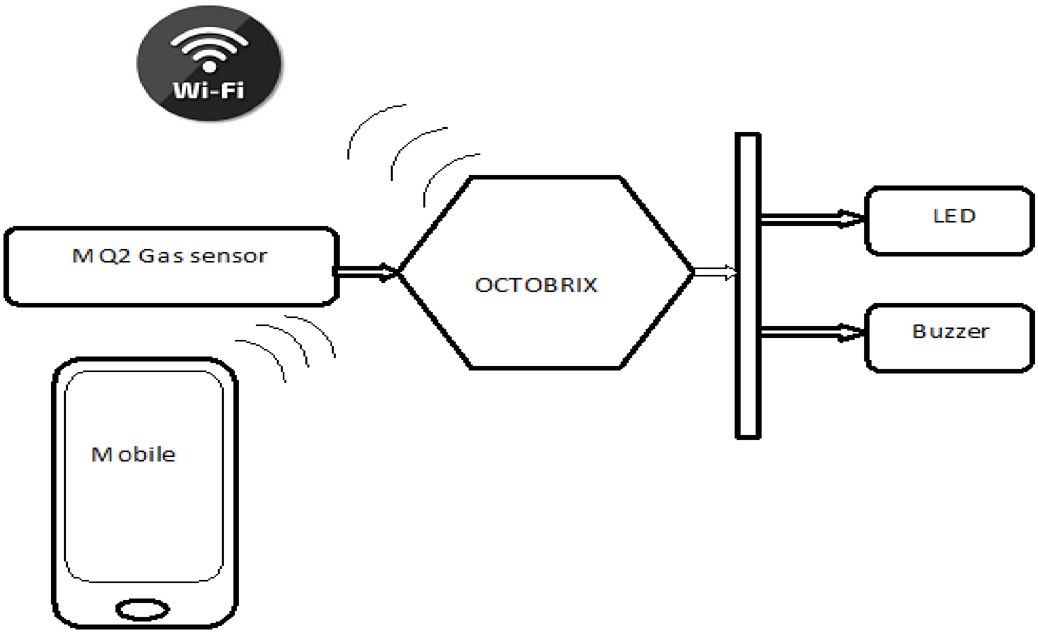

Figure 1: Block diagram of Air-o-meter

3. System Requirements

Following are the hardware, software and cloud platforms used in the proposed system

Hardware	:	1. Octabrix	2. MQ-2 sensor
Software	:	1. Arduino IDE	
Cloud platforms	:	1. Blynk	2. Thinger.io

Octabrix

Octabrix is a low-cost Wi-Fi development board based on the famous and low-cost Wi-Fi SoC, namely, ESP8266 [3]. ESP8266 is a wireless SoC that provides ability to embed Wi-Fi capabilities within other systems, or to function as a standalone application [4]. Figure 2 shows the ring arrangement of LED's in ESP8266 and ESP-12F version of ESP8266[5].

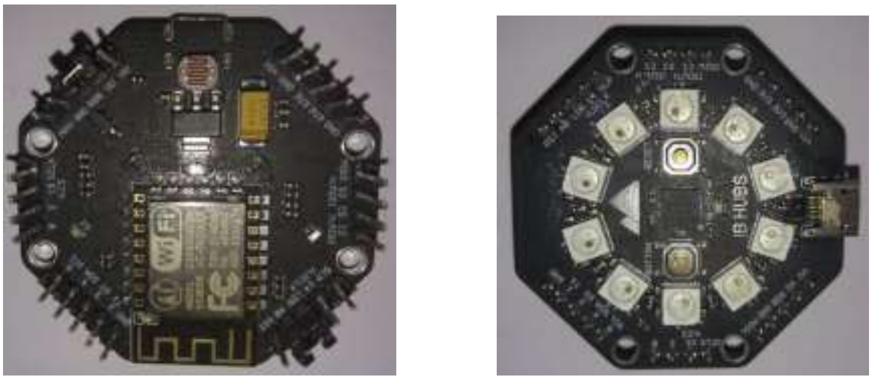

Figure 2: Hubs of OCTABRIX

In Octobrix, we have LED ring based on purity if the air quality is good it will blink Green otherwise for bad condition it will blink red color. Automatic notification will be sent to the authenticated user via Blynk.

The Real time sensed gas value is streamed from the sensor, a notification will be sent to the smartphone of the concerned authority, when the sensed gas value is more than the threshold value. The details of air quality can be monitored online from anywhere via a cloud dashboard. The dashboard gives the location of the device and graph on its gas levels with time. Automatic and On-request notification on authorized user’s smartphone.

MQ-2 gas sensor

The MQ-2 is one of the commonly used combustible gas sensors in MQ-2 sensor series [2]. Figure 3 shows the structure of MQ-2 gas sensor. This sensor mainly works on the basis of differences in the resistance of the sensing material during the contact of gas and the sensor material. Furthermore, it could also detect the smoke and flammable gas within the concentration range from 300 to 10,000 ppm. MQ-2 has its wide rage of application in detection of gas leakage within the residential as well as in the industrial areas.

Figure 3: MQ-2 gas sensor

Arduino IDE

It is a open source Arduino IDE software and compatible with Octobrix. Arduino IDE is easy to interface between the hardware. It runs on Linux and Mac OS X. The Arduino IDE is the platform to interface and to communicate between the through sensor easy environment.

BLYNK Application

Blynk is an Internet of Things enabled application interface with user friendly drag-n-drop mobile application platform [6]. This application allows to store and visualize sensor data to control electronic appliances remotely. Figure 4 shows the Blynk application interface.

Figure 4: Blynk application interface

When the sensed gas value is lower than the threshold value, the device sends an automatic notification to the user. Further, the authorized user may request for air quality via google Allo voice service, the device in turn will notify the air-quality on the user's Smartphone.

Thinger.io:

Thinger.io is one of the most popular Open Source platforms to control the connected IoT devices [7]. Various devices could be connected through its scalable cloud infrastructure platform. The user or the device manufacturer could control the equipment remotely with the advantage of internet connectivity without any further cloud infrastructure requirements[8]. Figure 4 demonstrates the block diagram of the proposed system.

4. Implementation

A. Notification Three ways:

The air quality is measured by the sensor and a threshold is set. If the sensed value is greater than the threshold value, the device notifies the user in 3 ways:

1. Turns the on-board LED to RED color.
2. Buzzer turns ON.
3. Automatic notification is sent to the authenticated user via Blynk.

B. Real time streaming of sensed gas value

The sensed gas value is streamed from the sensor, a notification will be sent to the smartphone of the concerned authority when the sensed gas value is more than the threshold 300 units.

C. A Cloud dashboard for the sensed value

The details of air quality can be monitored online from anywhere via a cloud dashboard.

The dashboard gives the following information.

1. Location of the Air-o-meter device
2. A graph on its gas levels with time

5. RESULT

1) Command from GOOgle ALLo

Figure 5 GOOgle ALLo command by voice

In smart phone we can check air purity in GOOgle ALLo using voice command and also get the notification if it reaches threshold value as we set in locality.

2) Notification through Thinger.io application

Figure 6 shows notification through thinger.io application The GOOgle ALLo voice command receives the Thinger.io send the notification to Blynk Application

3) Location of the device

Figure 7 Location of device through Thinger.io

Figure7 shows Location of the device where CO level is monitored, shown on Thinger.io.The purity of the environment sensing through MQ-2 sensor and The CO level of the location is identifying through Thinger.io.

4) Air Quality monitor through thinger

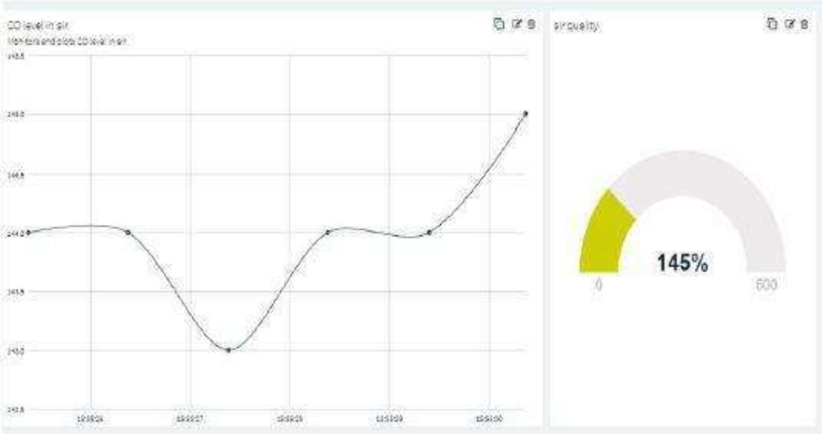

Figure 8 Graphs on Thinger showing CO level Vs Time(CO level below 300)

Above figure 8 shows the duration at which CO content in the perticular location as measured using MQ-2 sensor. If its less than 300 considered as good it will show in green color more than 300 it is harmful for the human body.

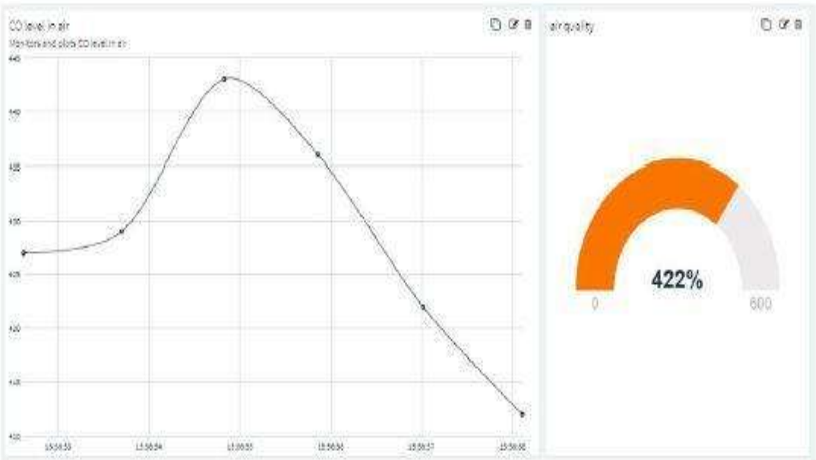

Figure 9 Graphs on Thinger showing CO level Vs Time(CO level above 300)

Above figure 9 shows the duration at which CO content in the particular location as measured using MQ-2 sensor. If its more than than 300 considered as good it will show in saffron color more than 300 it is harmful for the human body.

5. Conclusion

The environment pollution increasing rapidly to care of our health necessary. The proposed system check the environment pollution content for the particular location. It is feasible and easy to access and notify the data anywhere in the world.The pollution level reaches the threshold level notify easily through our smart mobile phone.The hardware and software it is easy to accessible to internet. The proposed system adopted in all the location its more comfortable life in the world.

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