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IOT Based Air Quality Monitoring System Result Analysis

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Abstract *- Air pollution affects our day to day activities and quality of life. It poses a threat to the ecosystem and the quality of life on the planet. The dire need to monitor air quality is very glaring, owing to increased industrial activities over the past years. People need to know the extent to which their activities affect air quality. This project proposes an air pollution monitoring system. The system was developed using the Arduino microcontroller. The air pollution monitoring system was designed to monitor and analyze air quality in real-time and log data to a remote server, keeping the data updated over the internet. Air quality measurements were taken based on the Parts per Million (PPM) metrics and analyzed using Microsoft Excel. The air quality measurements taken by the designed system was accurate. The result was displayed on the designed hardware's display interface.*

Keywords: Internet of Things, Pollution, Air, Parts per Million, Quality and Metrics.

1. INTRODUCTION

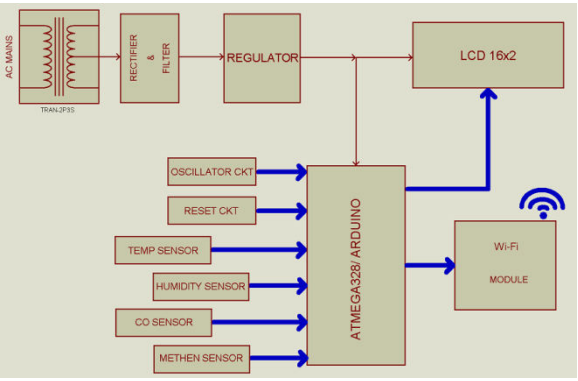
Air is one of the essential elements of man's surroundings. The earth's atmosphere is full of Air which contains gases such as Nitrogen, Oxygen, Carbon Monoxide and traces of some rare elements. Humans need an atmosphere of air that is free from contaminants. This is very crucial for human life and health. Any change in the natural composition of air may cause grave harm to life forms on earth. Air pollution is the presence of one or more contaminants in the atmosphere such as gases in a quantity that can harm humans, animals and plant [1]. Air pollutants are measured in Parts per Million (ppm) or ug/m3 [2]. Primary pollutants are released directly into the atmosphere. Secondary pollutants are produced when the primary

pollutant reacts with other atmospheric chemicals [3]. Air quality affects public health. The effect of air pollution ranges from difficulty in breathing, coughing, aggravation of asthma and emphysema [4]. Polluted air can also impair visibility. Air pollution is accountable for the death of 7 million persons worldwide each year or one in eight premature deaths yearly [5]. Almost 570,000 children under the age of five die every year from respiratory infection linked to indoor/outdoor pollution and second-hand smoke [6]. Children

exposed to air pollution have an elevated risk of developing chronic respiratory problems such as asthma. In the monitoring of air pollution, several researchers worldwide have developed models to monitor many of the pollution gases such as Sulphur Dioxide (SO2), Carbon Monoxide (CO), Carbon Dioxide (CO2), Nitrogen Oxides (NO) etc. This paper focuses on the design and implementation of a a IOT based air pollutant monitoring system. It discusses how the level of pollutants in the air can be monitored using a gas sensor, Arduino microcontroller and a Wi-Fi module. The main objective of this paper is to design a smart air pollution monitoring system that can monitor, analyse and log data about air quality to a remote server and keep the data up to date over the internet.

2. METHODOLOGY

The model was designed using an Arduino Uno microcontroller, Wi-Fi module 8266, MQ135 Gas Sensor and a 16 by 2 liquid crystal display (LCD) Screen. Figure 1 shows the proposed system overview and the functional block diagram .



The sensor collected data when operated by the microcontroller and forwarded it over the internet for analysis via the Wi-Fi module. Users were able to monitor measured parameters on their personal computers or smart phones. The design specification of
the proposed system is described in Table 1.

Table 1 The Design Specification

Sr. No	Component Required	Quantity
1	Arduino Uno	1
2	MQ 135 Sensor	1
3	16 by 2 LCD Screen	1
4	ESP 8266 Wi-Fi Module	1
5	Resistors	1
6	LM317 Regulator IC	2
7	DHT11	1
9	Connecting Wires	Any Numbers

2.1. Working Principle of Proposed Model

As described by Figure 3, the library in the Arduino was loaded and a message was sent to the LCD. Air quality data was collected using the MQ135 sensor. The calibrated sensor made the analog output voltage proportional to the concentration of polluting gases in Parts per Million (ppm). The data is first displayed on the LCD screen and then sent to the Wi-Fi module. The Wi-Fi module transfers

the measured data valve to the server via internet. The Wi-Fi module is configured to transfer measured data an application on a remote server called "Thing speak". The online application provides global access to measured data via any device that has internet connection capabilities. Data collected from the sensor was converted into a string and used to update the information sent to the remote server.

3. RESULTS AND DISCUSSION

The online application used to analyze air quality data got from sensors in this proposed system was "Thing-speak". Thing-speak is an open source internet of things application programming interface used to store and retrieve data from interconnected things using the hypertext protocol over the internet or via a local area network. It also provides access to a broad range of embedded devices and web services. This enables the creation of sensor logging applications that can be updated regularly.

"Things Speak" server was configured to receive data analyzed and published in the form of a scatter line graphs or bar charts on a channel. The channel corresponds to the air quality level as shown in Figure 2. The channel receives update every time from the remote sensor via the internet and represents the data received as a scatter line graph online.

The visual representation of data on "things speak "server corresponded with the quality. The rate at which data displayed on "Thing-speak" changes was dependent on the network traffic and speed of internet connection. The status of the air quality can be accessed at any time, with automatic updates occurring at defined time intervals.

4. 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 LCD screen. It also sends data measured to the "Thing speak" platform. 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.

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