ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering
(An ISO 3297: 2007 Certified Organization)
Website: www.ijircce.com
Vol. 5, Issue 5, May2017

Real Time Monitoring of Change in Temperature with CO2 using IOT

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ABSTRACT: The pollution levels in the environment are affecting the health of human life on a day to day basis. The rise in pollution levels in the atmosphere are a primary reason for this. This project aims at the detection of atmospheric pollutants and its analysis. The data collected here will be useful for commuters in any given area as it will let them take appropriate precautions and measures to protect themselves from harm. The aim of this project is to detect air pollutants like CO2, CO etc, at a local level against usual idea of wide span analysis. Wide span analysis doesn't focus on the levels of pollutants at given areas and the wide span details are approximated and do not give a clear representation of the pollutant levels at a specific area. The main aim of the project was to also check if the increase in CO2 also leads to increase in temperature.

KEYWORDS: Pollution, sensors, monitoring, Real time, CO2, Temperature

I. INTRODUCTION

India is a large country where many people are agrarian. The country is subjected to irregular monsoons, flooding, rising sea levels and higher temperature [1]. The monsoon season is vital to the Indian economy and the change in climate is going to create erratic extremes throughout the monsoon season. Any change poses a threat to agriculture which in turn affects the economy and food security [2]. The rise in temperature caused by the greenhouse gases like co2, methane, ozone etc is likely to affect crops differently from region to region. Increased frequencies of disasters like droughts and floods will change the variability of agriculture production [3].

According to Climate Central, Svante Arrhenius first calculated the impact that co2 would have on the temperature of our planet in 1895 and estimated that the greatest impact of increasing co2 is the rise in global temperature [4]. It is found that the co2 levels have increased by 24% from the first Earth's Day celebrated in 1970.

Greenhouse effect is the process of trapping the sun's warmth in the lower atmosphere of the earth.[7] According to NASA, water vapour and clouds contribute largely to the greenhouse effect but a study conducted by them also shows that the temperature of the earth actually depends on the levels of co2 in the earth's atmosphere[6].

Co2 and other non condensing greenhouse gases like methane, ozone etc providing support for the greenhouse effect was found by a study conducted by Andrew Lacis and his colleagues at NASA's Goddard Institute for Space studies (GISS) New York [8]. A study led by Gavin Schmidtt shows that CO2 accounts for 20% of the greenhouse effect.

It is to be noted here that CO2 acts as a thermostat regulating the temperature of the earth[9]. When Co2 increases, more water vapour returns to the atmosphere. This helped in melting most of the glaciers that covered the entire planet.

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II. LITERATURE SURVEY

The level of pollution has increased with times by lot of factors like the increase in population, increased vehicle use, industrialization and urbanization which results in harmful effects on human wellbeing by directly affecting health of population exposed to it. In order to monitor quality of air, a Wireless sensor network (WSN) based new framework is proposed which is based on data acquisition and transmission. The parameters of the environment to be monitored are chosen as temperature, humidity, volume of CO, volume of CO2, detection of leakage of any gas - smoke, alcohol, LPG. The values of these parameters are transmitted by using Zigbee Pro (S-2) to a base station where they are being monitored. The value of temperature and humidity are transmitted over Bluetooth also so that every person in the range of the system can check it over their smart phones and laptops as these parameters hold importance to everyone. CO, a dangerous parameter is monitored with an extra precaution. A text message is sent to the base station through GSM module whenever its volume exceeds a particular safe limit intended for a particular application [14].

III. PROPOSED METHOD

Implementation deals with issues of quality, performance, and delivering the end product. Implementation includes careful planning, investigating the system requirements, and designing the methods required in order to achieve the requirements. Our contribution to this project is that we are establishing a system that will process all the collected data acquired from the sensors and transmitting it to a display screen in the Department of ISE New Horizon College of Engineering. Also we will be sending the processed data to android devices, where the data will be available to them on a personalized level.. We provide a web portal where the user gets the details of the pollutants present in the air like CO, Smoke, CO2, Methane, Alcohol etc. For web portal HTML, CSS and Bootstrap is used. Here the user will have to connect to the common network of the arduino in order to access the details of the pollutants present in the air. We have also analysed how the change in CO2 changes the temperature.

IV. ALGORITHM/METHOD USED

Here we are making use of Arduino UNO R3. We have a file called Webserver.ino which includes all the library files like DHT11.h , MQ135.h, SPI.h and Ethernet.h and performs computation of the analog values of the sensors and presents the output in the form “ppm” so that the user understands.

1. DHT11.h :consists of library files for the DHT11 sensor.
2. MQ135.h :consists of library files for the MQ135 sensor.
3. SPI.h :connects to the Serial Peripheral Interface (SPI) that, is a synchronous serial data protocol used by microcontrollers for communicating with one or more peripheral devices quickly over short distances.
4. Ethernet.h :allows an Arduino board to connect to the internet.

This air quality analysis system consists of two parts:

1. Air quality analysis data (from admin and quality standards board)
- The admin handles configuration of the system.
- Provides Standard Quality Measures as conveyed

2. Quality report and warnings (conveyed to the user)
- Air quality report as analysed by the system is conveyed to the user end
- Common display portals and mobile notifications
- In event of unusual quality measures appropriate warnings are issued

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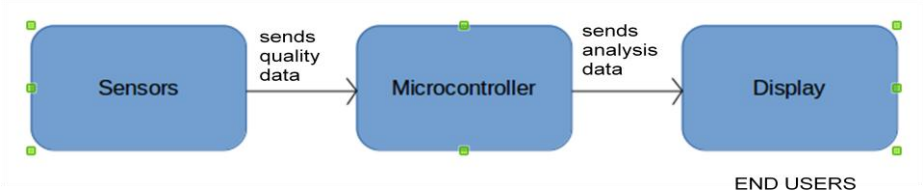

Fig: System Architecture

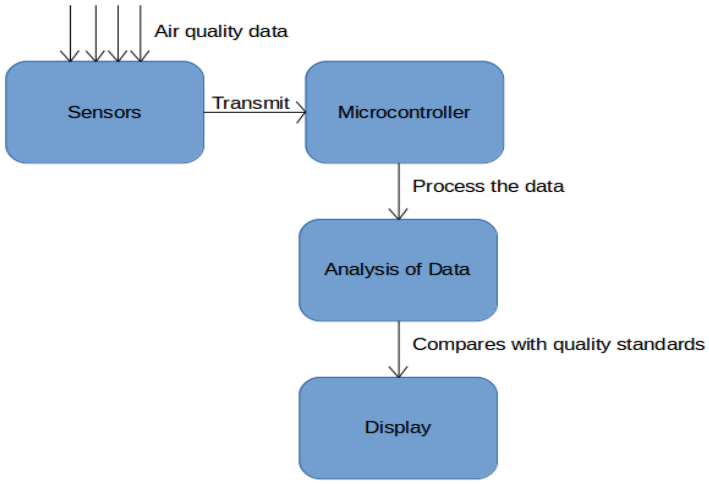

Fig: Data Flow Diagram

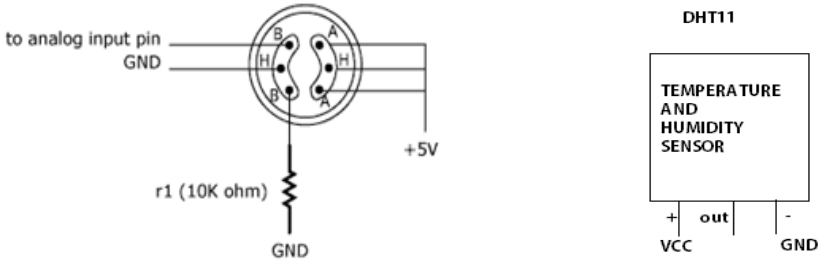

Fig: Connecting gas sensors and temperature humidity sensor to arduino UNO

V. EXPERIMENT

Our experiment is simple in design and shows the relationship between CO2 and temperature. This helps us to better understand how CO2 affects the global rise in temperature. This experiment was conducted to monitor the quality of air in the city of Bangalore, Karnataka. A place called the ORR was selected so that we could monitor the air in the polluted parts of Bangalore. For this purpose, we made use of 3 different types of sensors out of which two were gas sensors. These sensors are connected to Arduino board and the values of all the gases are measured in ppm(parts per million)[13]. The various sensors that were used are as follows:

- MQ135 - to measure CO_2, CH_4 and alcohol [10]
- MQ2 - to measure LPG, smoke and CO [11]
- DHT11 - to measure temperature and humidity [12]

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Though, in this experiment we are measureing different gases like CO, Ch4 and many others, The main point of interest was to find the relationship between temperature and CO_2 [14]. If the increase in CO_2, will result in increase temperature? The experiment was conducted and the output screen looks like the figure below.

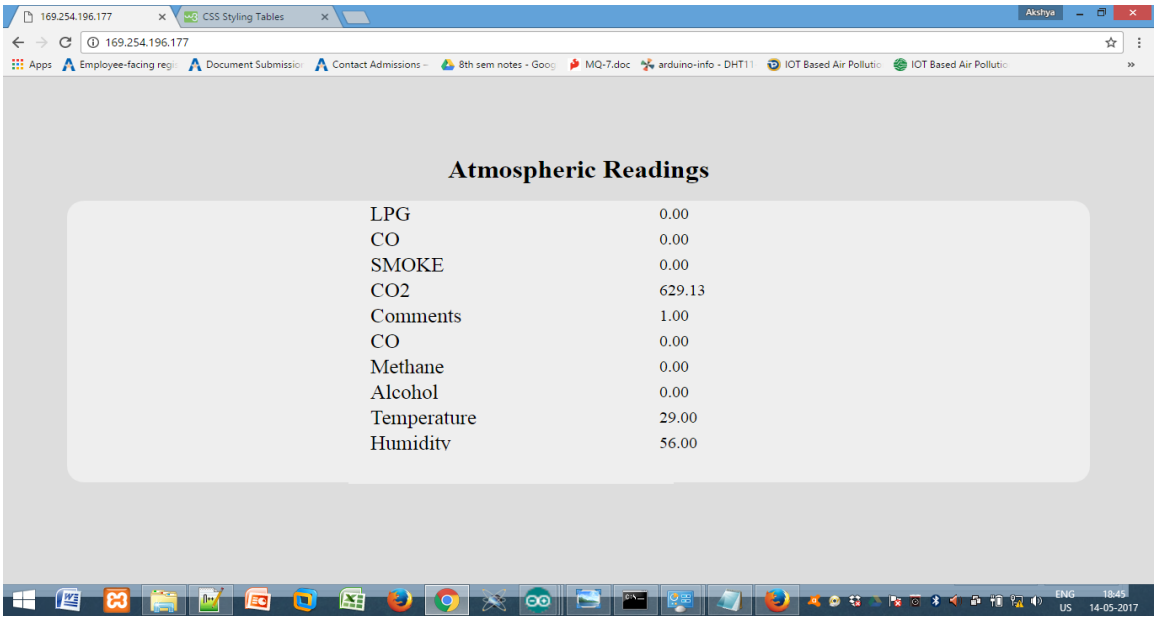

Fig 1:Snapshot showing the values of CO2 , temperature and hiumidity in our atmosphere.

The gas sensors has to be pre-heated (according to the data sheet) before it is connected to the Arduino UNO R3 board. The sensors have to be calibrated since they can only produce output that shows the analog voltage. We have calibrated these sensors so that they can show us the concentration of different gases in ppm (parts per million). This was the most inexpensive method to experiment and the measurements were also close to the actual values.
We have considered around 20 values from a range of values that we got by measuring CO2 and temperature in different environments. The consolidated values of the measurements are as follows:

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CO2(ppm)	Temperature (C)
591.94	26
593.24	26
595.96	26
597.29	26
598.34	26
598.56	27
600.01	27
605.24	27
607.32	27
615.00	27
625.13	29
626.54	29
627.03	29
629.45	29
631.57	29
632.42	30
635.22	30
637.45	30
639.67	30
655.15	31

Fig 2: Values of CO2(ppm) and Temperature(ºC)

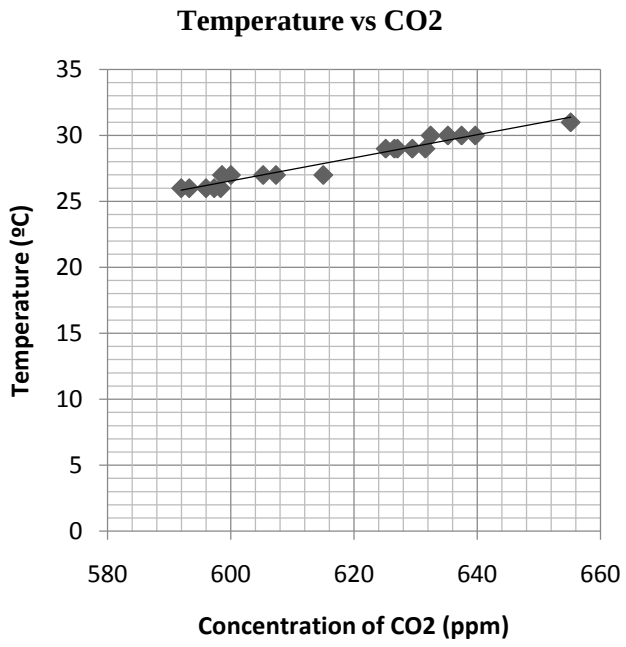

Fig 3: Graph showing the change in temperature with CO2

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From the graph above, it is found that with the increase in the level of CO_2, the temperature also increases. If the amount of CO_2 would not have increased in our atmosphere, the entire earth would have been covered by glaciers. CO_2 is one of the important factors to regulate the temperature.

VI. CONCLUSION

Recent scenario has been quite different. The temperature of our city was not like this before five to six years. There can be many gases and many other factors that can contribute to this change but we have considered CO2 to be one of the factors and checked if the temperature increases with CO2. This may not be the only contributing factor but is one of the primary contributors to this change.

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