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# IOT Based Environmental Monitoring System

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ABSTRACT

The level of pollution has increased with times by lot of factors like the increase in population, vehicle use, industrialization and urbanization which results in harmful effects on human wellbeing by directly affecting health of the people. This project is based on the wireless sensor networks for collecting information about Environment. In order to monitor, we will develop an IOT Based Environmental Monitoring System, it can monitor the Air Quality over a web server by using the Wi-Fi Technology. Recent advancements like Internet of Things provide support for the transmission of huge and accurate amount of data regarding the Environment. In this IOT project, we can monitor the pollution level from anywhere through computer or mobile. This system not only calculates the pollutants present in the air, by using this we can forecast to avoid future pollution and can send the warning message to that particular polluted area.

Keywords: IOT, WIFI

## 1. INTRODUCTION

An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. An embedded system is a microcontroller-based, software driven, reliable, real-time control system, autonomous, or human or network interactive, operating on diverse physical variables and in diverse environments and sold into a competitive and cost conscious market. An embedded system is not a computer system that is used primarily for processing, not a software system on PC or UNIX, not a traditional business or scientific application. High-end embedded & lower end embedded systems. High-end embedded system - Generally 32, 64 Bit Controllers used with OS. Examples Personal Digital Assistant and Mobile phones etc. Lower end embedded systems - Generally 8,16 Bit Controllers used with an minimal operating systems and hardware layout designed for the specific purpose. Examples Small controllers and devices in our everyday life like Washing Machine, Microwave Ovens, where they are embedded in.

## 2. LITERATURE SURVEY

In existing model, the Zigbee based wireless Sensor Networks used to monitor the physical and Environmental conditions. The system consists of a microcontroller, sensors and Zigbee which collects data from different locations along with coordinate's information at certain time of a day. The readings for particular location are averaged in a closed time and space. The Global Positioning System (GPS) module is attached to a system to provide accurate representation of pollution sources in an area. The recorded data is periodically transferred to a computer through a Zigbee receiver and then the data will be displayed on the dedicated website with user acceptance. As a result large number of people can be benefited with the large. Which avoided the use of complex routing algorithm but local Computations are very minimal.

Due to miscellaneous interactions, limited protocol standardization, security of data storage and complex identification systems to access data, problems arises in field of monitoring. By using this Zigbee protocol there

must be a one receiver end. It transmits the data over the 10-100m. To overcome these problems we are designing, 'IOT based environmental pollution monitoring system', to gain pollution free future live.

## 3. PROPOSED SYSTEM

In this proposed model the climatic changes are frequently monitoring through IOT using sensor nodes. Internet of Things (IoT) is a recent communication paradigm, in which the objects will be equipped with microcontrollers, transceivers and suitable protocol stack that will make them to communicate with one another and with user. This paper designs a prototype of wireless environmental monitoring system to upload information from array of sensors to the database. This application allows us to observe or measuring the environmental parameters from anywhere in real time. This system consist of main three modules namely sensor nodes, the wireless communication and the web server. The sensor nodes in remote location collect the information from surrounding environmental conditions and send the data wirelessly using Arduino microcontroller and ESP8266 Wi-Fi module to the server.

This paper presents a system that can be used to measure the toxic gases in surrounding area like Industrial area by using various sensor nodes. All sensors are connected on the arduino microcontroller and the status of the sensors is send to the control section continuously. The data uploading is done by ESP 8266 Wi-Fi module. The data is updated on internet. The values of sensors are displayed on LCD. The buzzer is used to make sound, if the sensor beyond its threshold value for saving the people immediately. The device developed in this project is based Arduino UNO. The Arduino board connects with Thing Speak platform using ESP8266 Wi-Fi Module. The Thing Speak is a popular IOT platform which is easy to use and program. The sensor data is also displayed on a character LCD interfaced in the monitoring IOT device. The sensing of data and sending it to the Thing Speak server using Wi-Fi module is managed by the Arduino Sketch. The Arduino sketch is written, compiled and loaded to the Arduino board using Arduino IDE.

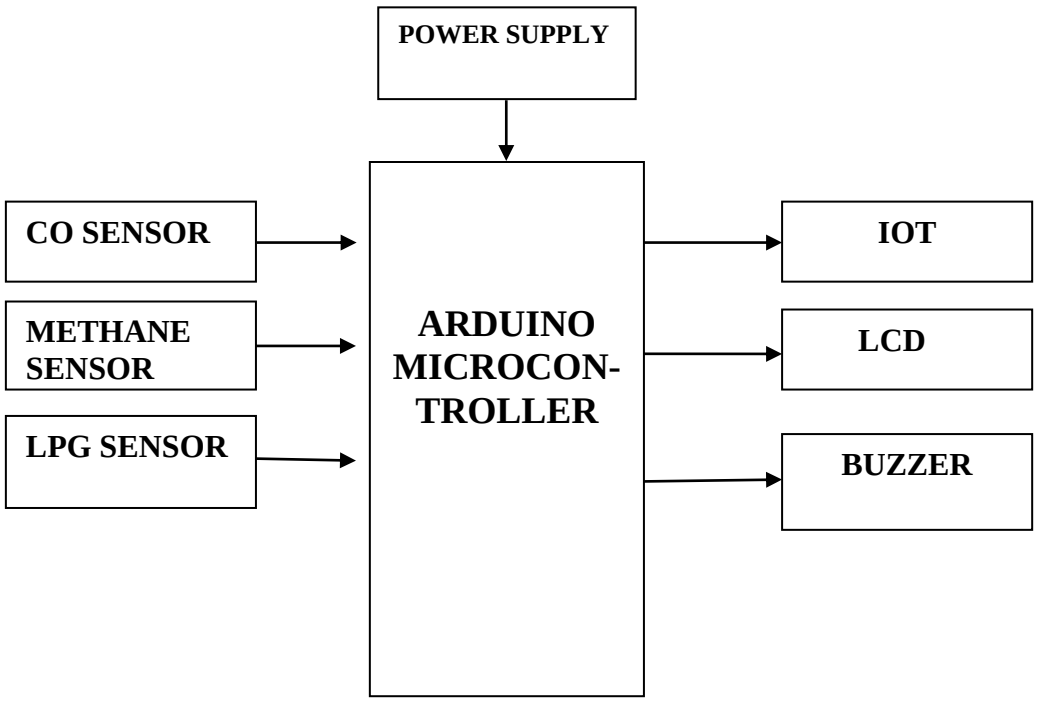


Fig. Block Diagram of Proposed System

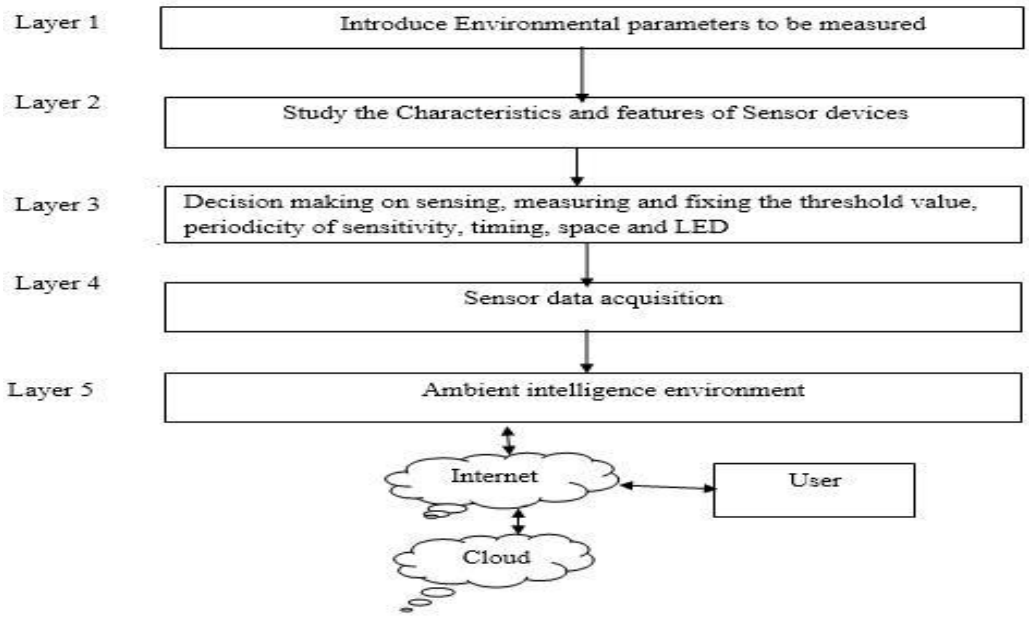


Fig. System Model

From the above model, process is divided in 5 layers. The environmental parameters which are to be measured are introduced in layer 1. Study of the characteristics and features of sensor devices is in layer 2. In layer 3, there is decision making on sensing, measuring and fixing the threshold value, periodicity of sensitivity, timing, space and LED.

Sensor data acquisition is done in layer 4. And layer 5 as ambient intelligence environment. The sensors can be operated by the microcontroller to retrieve the data from them and it processes the analysis with the sensor data and updates it to the Internet through Wi-Fi module connected to it. User can monitor the parameters on their smart phones as well as pc or laptop.


Fig. Top and Back view of Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button.

## 4. RESULT AND DISCUSSION

### *4.1. HARDWARE OUTPUT*

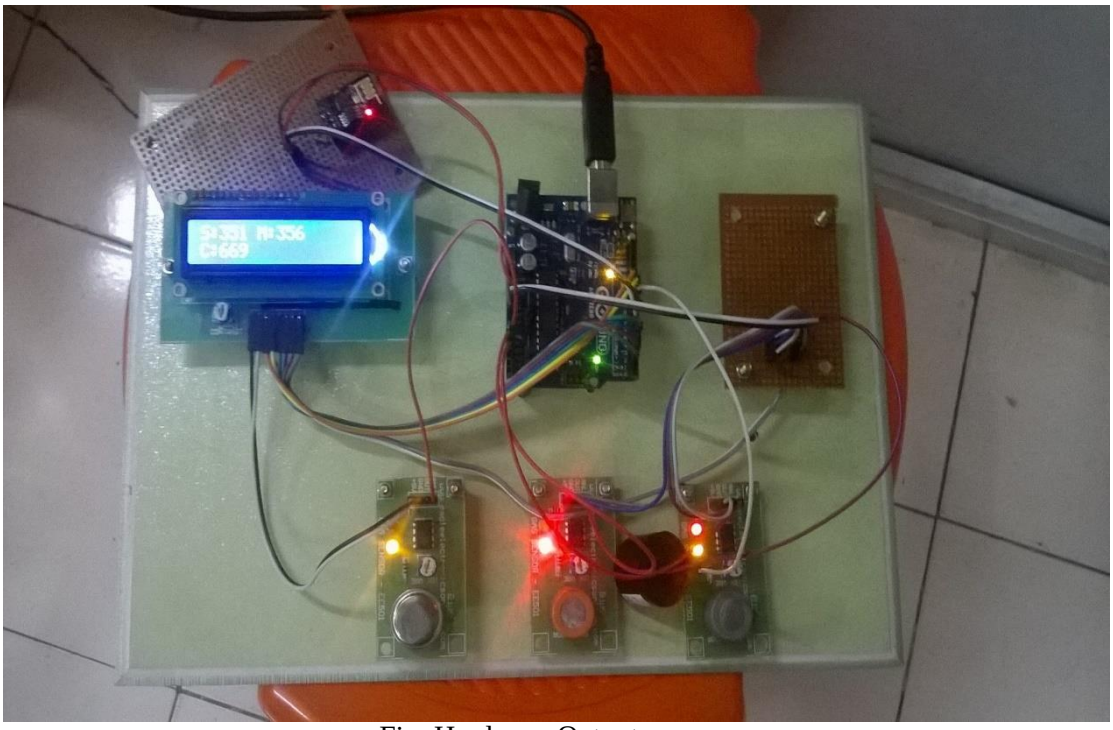

Fig: Hardware Output

Fig. represents the output we have obtained so far. The Hardware components used here includes Arduino microcontroller, ESP 8266 Wi-Fi module, LCD, Buzzer, CO sensor, SnO2 sensor and LPG sensor. LCD display indicates density of gases in the air. The Buzzer gave alarm when the gas level exceed the threshold value. ESP 8266 Wi-Fi module transmitted the data to the web server.

### *4.2. ARDUINO IDE*

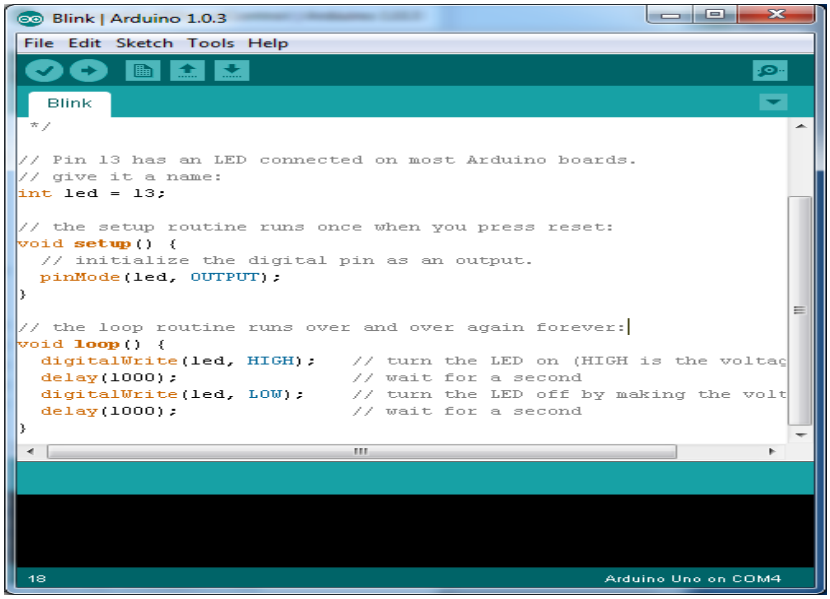


Fig. Arduino IDE Software

This is the software program of our project. The program was developed in the Arduino IDE software. Arduino IDE is the software used for Arduino applications. Then the program dumped with our hardware.

### *4.3. THINGSPEAK*

Thing Speak is the cloud based web server for IOT Applications. It is an open source. In which we created our own channel for IOT based Environmental monitoring by providing username and password. The output is obtained by setting the number of field we required for monitoring the Environment parameters. Then the sensors values are updated to the server using ESP 8266.It provided the graph to show the density of gases in the air.

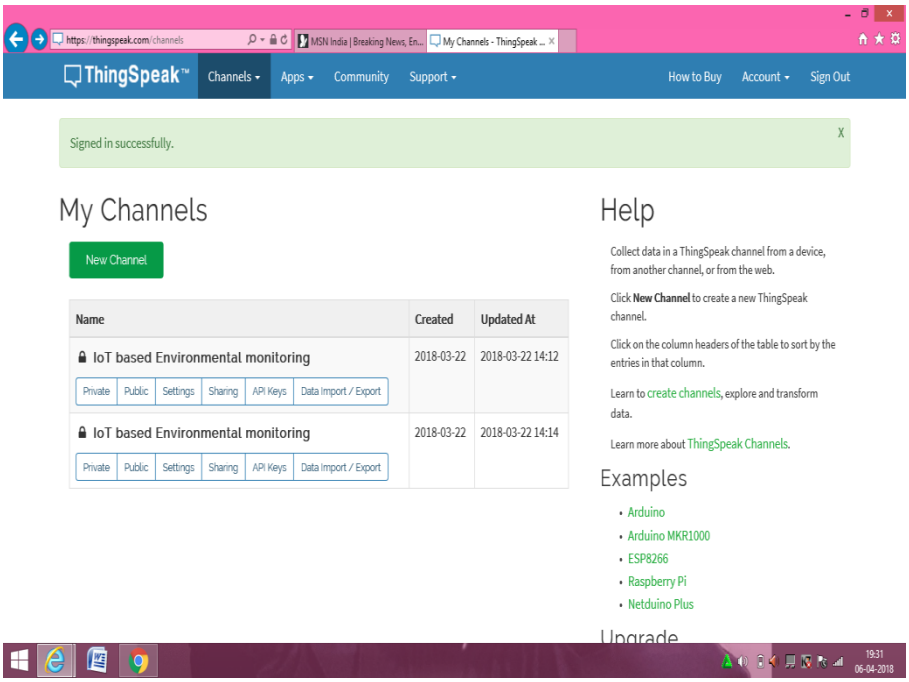


Fig. ThingSpeak

## 5. OUTPUT ON THE WEBSERVER

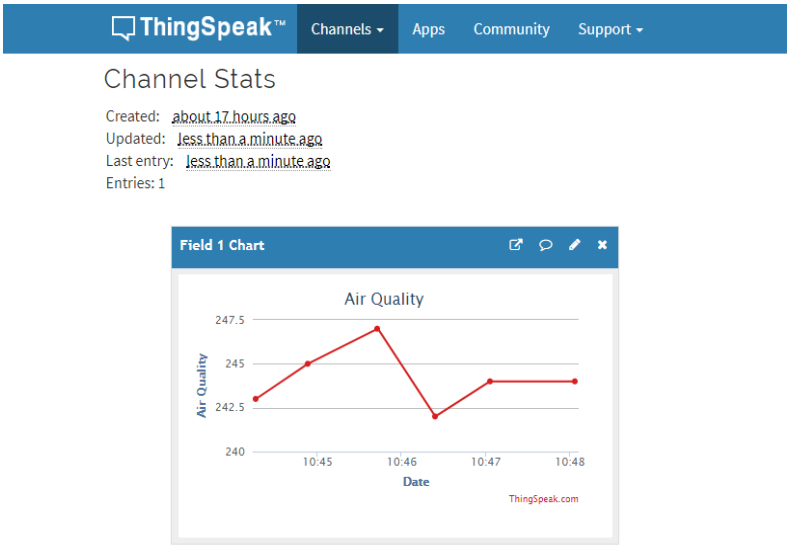


Fig.5.4: Output on the web server

## 6. CONCLUSION AND FUTURE WORK

Thus the IOT based Environmental Monitoring System has been designed and implemented. The Environmental parameters successfully transmitted via ESP 8266 Wi-Fi module. The density of the gases in the remote located area viewed through the ThingSpeak web server. This project will protect the people from the pollutant gases. It is more useful for the Industries to control the air pollution in the surrounding area and for the workers safety. In future we can implement this project with ESP 8266-12E Wi-Fi module and with the sensors which can sense the gas density in high level. ESP 8266-12E module has inbuilt Arduino microcontroller. It reduces the overall size of the device and simplifies the working mechanism.

## ACKNOWLEDGEMENT

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