Cloud Based Real Time Environmental Monitoring And Message Alerting System Using Raspberry Pi

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Abstract - With the headway in smaller scale controller advancement, web accessibility, circulated figuring and downsizing of electronic parts, and now ended up having ability to relate physically to the Internet making the World Wide Web an ' Internet of Things (IoT)'. Sharp conditions influenced using the Internet of Things to provide essential gainful responses for ordinary troubles. The paper has discussed the confirmation of thought for an IoT contraption that assembles data as to parameters, using a cutting-edge miniaturized scale controller organizes, from various types of sensors, through particular strategies for correspondence and after that exchanges the data to the Internet. The given contraption has been proposed for remote checking of atmosphere parameters. This paper centers around the methodology of exchanging picked up data on the web, with the goal that the contraption can be used to remotely screen atmosphere parameters and at last look at ecological change plans. This paper states the fundamental thought of Internet of Things and its potential applications, specifically for condition watch. Here we are going to use thingspeak cloud to update the data and store the data.

Keywords:- WSN, IOT, Web

I. INTRODUCTION

Air pollution is caused due to the presence of particulate matter, harmful materials and biological molecules in earth atmosphere. It has adverse impact on living organisms such as humans, animals, food crops and can also damage built and natural environment. It may result in allergies, harmful diseases such as cardio vascular diseases, lungs diseases and can also cause death. The environment group Greenpeace in January released a report that has estimated every year nearly 1.2 million Indian die because of air borne pollutants . Particulate matter is liquid or solid matter which is microscopic and suspended in Earth's atmosphere. We are exposed to this particulate matter which is continuously affecting our heart and lungs. Till now several studies have been done in environment monitoring domain using IoT, Researchers have monitored environmental parameters like Temperature, Humidity, Barometric air pressure, carbon monoxide, sulfur dioxide but the least attention is paid to the measurement of particulate matter . Air quality monitoring without knowing the concentration of particulate matter in the atmosphere is incomplete. Thus, to address this problem, a system consisting of DSM501A which is a PM sensor is being used for monitoring the particulate matter along with the sensors employed for sensing carbon monoxide, carbon dioxide, Temperature, Humidity and barometric air pressure using raspberry pi which is a low power, less expensive, highly flexible minicomputer is designed. It is a good platform for interfacing with many devices at the same time. Internet of Things and cloud computing are the most emerging technologies. Internet of Things is a concept or a paradigm in which without human interruption devices sense, identify, process and communicate with each other. Cloud computing is a practice of consuming the resource of remote servers such as storage, virtual machines, applications and utilities that are hosted on internet rather than building and maintaining infrastructure for computing in house. Internet of Things becomes very powerful when converges with Cloud computing. IoT cloud system provides a view on accessing IoT resources and capabilities in defined API, configuring and operating it on cloud . The data stored at the cloud can be retrieved any time and the scenarios can be analyzed in a better way leading to the solutions for controlling air pollution to some extent.

EXISTING SYSTEM

- Wired communication
- Can observe the values only at the particular location where we are sensing
- Installation cost is high

II. PROPOSED SYSTEM

- Proposed system is the wireless communication
- Can observe the values from where ever we want
- Installation cost is very less

III. BLOCK DIAGRAM

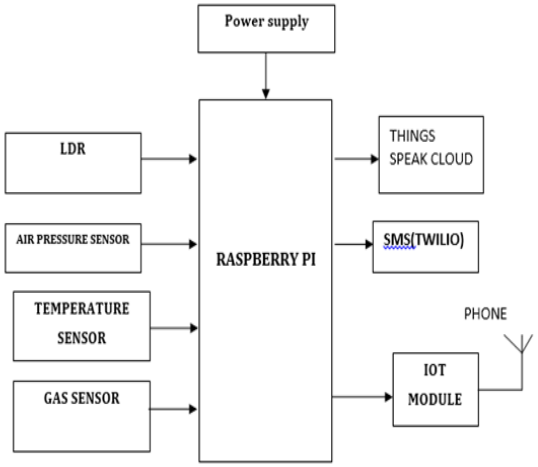


FIG3.1 :-BLOCK DIAGRAM

This system consists of raspberry pi, ARM11 microcontroller and parameters of global process. Raspberry pi is used here to control the sensors data. Here there is a LDR sensor, Gas sensor, Temperature sensor and pressure sensor. The values from all these sensors are in analog from but our raspberry pi will be purely digital. So here we are using mcp3208 ic which is used to convert the analog signal into the digital signal. That digital signal is fed to the raspberry pi controller and raspberry pi controller will monitor the air. If any dangerous exceeds. Those values are displayed

IV. HARDWARE TOOLS

4.1 RASPBERRY PI

Raspberry Pi Core Module

The core module of the system is realized using a Raspberry Pi 3 board; it's a $ 35 bare-bones computer designed and developed by the Raspberry Pi Foundation, the Pi 3 features a BCM 2837 System-on-Chip which includes a Quad-Core 64-Bit ARM Cortex A7 CPU clocked at 1.2GHz paired with 1 GB of RAM. It also has Video Core IV GPU for graphical processing applications, it also includes four USB ports for peripherals and 40 Pin General Purpose Input Output (GPIO) pins for interfacing the Pi with external electronic circuits, these GPIO pins are used to interface the Pi to the module. The Raspberry Pi is designed to run various Linux based operating systems and has Raspbian as its official operating system and Python as its official programming language.

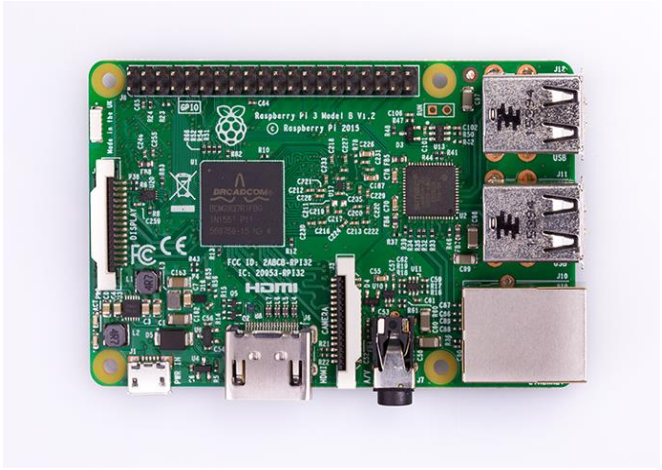


Fig. 4.1 Raspberry Pi 2 Module

4.2 TEMPERATURE SENSOR

LM35 related sensors are precision IC temperature sensing devices, whose resulting output voltage is producing the linearly varying scale to the Centigrade temperature Subtracting a big non deviating voltage from the output to get readable Celsius scaling is not advantageous and thus the LM 35 can be much useful which can be read directly in Celsius scale unlike other kelvin scales. There is no need of any external duty or reducing to give defined accuracy up to + or – of 0.25 % degree centigrade temperature and ±¾ degree centigrade on an full scale of −55 to +150°C temperature vary. Lower prices can be assured by trimming and activity at the wafer level. The LM35's low output electrical phenomenon, linear output, and precise inherent performance kept in interface to calculate or management of electronically induced circuit in particular straightforward. A temperature of 0.1 degree centigrade is produced in usual air. -55 degree centigrade to +150 degree centigrade temperatures are range for operating temperatures whereas the LM 35C can be made to operate between -40 degree centigrade to +110 degree centigrade . Hermetic TO-46 kind of packaging is used for the LM 35 series and there are also certain models of LM 35 series which are available in plastic TO-92 package. An 8-lead surface mount type of packaging is used for LM35 D which uses the both TO-220 package and small outline type.

Fig4.2 .Temperature sensor LM35

4.3 LDR SENSOR

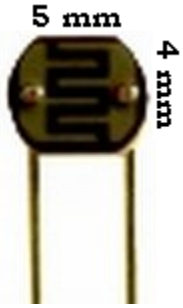


FIG4.3 :-LDR SENSOR

A **Light Dependent Resistor** (LDR) or a photo resistor is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells or simply photocells. They are made up of semiconductor materials having high resistance. There are many different symbols used to indicate a **LDR**, one of the most commonly used symbol is shown in the figure below. The arrow indicates light falling on it.

Working Principle of LDR

A light dependent resistor works on the principle of photo conductivity. Photo conductivity is an optical phenomenon in which the materials conductivity (Hence resistivity) reduces when light is absorbed by the material.

When light falls i.e. when the photons fall on the device, the electrons in the valence band of the semiconductor material are excited to the conduction band. These photons in the incident light should have energy greater than the band gap of the semiconductor material to make the electrons jump from the valence band to the conduction band. Hence when light having enough energy is incident on the device more & more electrons are excited to the conduction band which results in large number of charge carriers. The result of this process is more and more current starts flowing and hence it is said that the resistance of the device has decreased . This is the most common working principle of LDR.

4.4 GAS Sensor:

Ideal sensor for use to detect the presence of a dangerous LPG leak in your car or in a service station, storage tank environment. This unit can be easily incorporated into an alarm unit, to sound an alarm or give a visual indication of the LPG concentration. The sensor has excellent sensitivity combined with a quick response time. The sensor can also sense iso-butane, propane, LNG and cigarette smoke.

Fig4.4: Smoke sensor

4.5 PIEZO ELECTRIC SENSOR

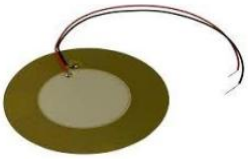


Fig4.5 : Piezo electric pressure sensor

A device that utilizes the piezoelectricity for measuring the changes in acceleration, strain, pressure, and force conversion helps to change into electrical charge is called as a piezoelectric sensor. Piezo may be a Greek word which suggests ‘presses or ‘squeeze’. Piezoelectric effect causes the prevalence of electrical dipole moments in materials due to the pressure applied to some kind of solid materials like electricity crystals, ceramics, bones, DNA, and some proteins that generates electric charge. This generated piezoelectric effect is responsible for pressure variations applied to the solid crystal materials. The most frequently used piezoelectric sensor application is the piezo sensor switch. The switch that works on the principle of piezoelectricity is termed as a piezo electric sensor. This electrical switch will be turned on, by activating the output of this switch is like a FET. Using the generated charge can be applied to the piezo switch element

which is used to make work. If the FET is on, the produced current will flow through the FET acts as a metal contact-like switch.

V. SOFTWARE TOOLS

5.1.Linux

Linux is a free open source working framework and it has a place with the Unix working frameworks. In reality Linux implies the piece itself which is the core of the working framework and handles the correspondence between the client and equipment. Regularly Linux is utilized to allude to the entire Linux dispersion.

Linux appropriation is a gathering of programming in view of the Linux Kernel. It comprises of the GNU-task's parts and applications. Since Linux is an open source venture, anybody can alter and circulate it.

5.2 Raspbian Wheezy

Raspbian Wheezy is a free working framework in view of Debian appropriation. It is made by a little group of designers who are enthusiasts of Raspberry Pi. Raspbian is improved for the Raspberry Pi's equipment and it accompanies more than 35 000 packag-es and pre-incorporated programming. Raspbian is still under dynamic advancement and it intends to enhance the solidness and execution of the Debian bundles

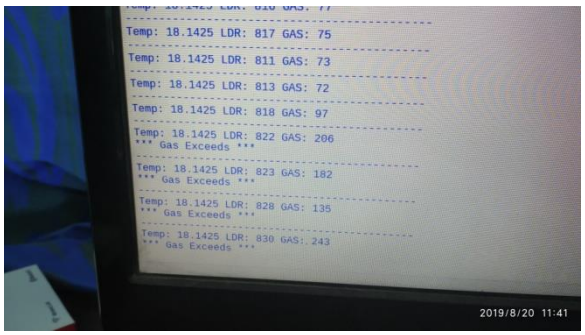
5.3.Python

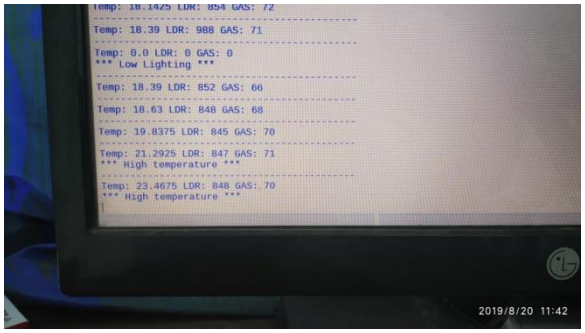
Python is a multi-worldview programming dialect: protest arranged programming and organized writing computer programs are completely upheld, and there are various dialect highlights which bolster practical programming and viewpoint situated programming (counting by meta programming and by enchantment strategies). Numerous different standards are bolstered utilizing expansions, including configuration by contract and rationale programming.

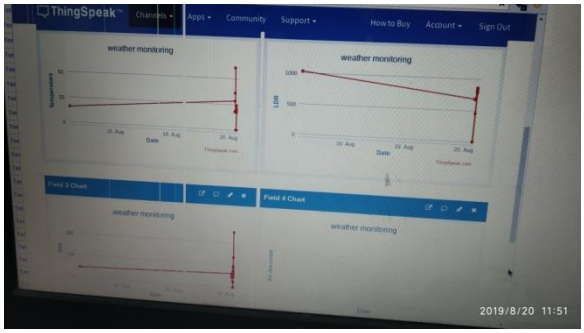
5.4.Open-cv

OpenCV-Python is the Python API of OpenCV. It joins the best characteristics of OpenCV C++ API and Python dialect. OpenCV Python is a universally useful programming dialect begun by Guido van Rossum, which turned out to be extremely mainstream in brief time fundamentally due to its effortlessness and code lucidness. It empowers the software engineer to express his thoughts in less lines of code without decreasing any clarity. Contrasted with different dialects like C/C++, Python is slower. In any case, another vital component of Python is that it tends to be effectively reached out with C/C++. This component causes us to compose computationally concentrated codes in C/C++ and make a Python wrapper for it so we can utilize these wrappers as Python modules. This gives us two favourable circumstances: first, our code is as quick as unique C/C++ code (since it is the real C++ code working in foundation) and second, it is anything but difficult to code in Python. This is the manner by which OpenCV-Python works, it is a Python wrapper around unique C++ execution. Furthermore, the help of Numpy makes the errand more less demanding. Numpy is an exceedingly upgraded library for numerical tasks.

6 RESULT







VI. CONCLUSION

The proposed system provides low cost, low power, compact and highly accurate system for monitoring the environment with the dedicated sensors remotely from any place in this world. A perfect tradeoff between accuracy and cost is achieved by making use of single board minicomputer Raspberry pi and appropriate sensors leading to a well grounded system. Air quality monitoring system can be more advantageous if pollutants like Sulfur dioxide, nitrogen dioxide, ground level ozone etc. are also monitored. Furthermore, long-term pollution patterns can be discovered and certain relationships between the air pollutants can be found.

VII. REFERENCES

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