IoT Based Weather Monitoring and Reporting System

ABSTRACT

The IOT based Weather Monitoring and Reporting System project is used to get Live reporting of weather conditions. It will Monitor temperature, humidity, moisture and rain level. Suppose Scientists/nature analysts want to monitor changes in a particular environment like volcano or a rain-forest. And these people are from different places in the world. In this case, IoT based weather monitoring system can be used to remotely monitor and store data which they can use it for study purposes and analytics

INTRODUCTION

Climatic change and environmental monitoring have received much attention recently. Man wants to stay updated about the latest weather conditions of any place like a college campus or any other particular building. Since the world is changing so fast so there should be the weather stations. Here in this paper, we present a weather station that is very helpful for any places. This weather station is based on IOT (internet of things). It is equipped with environmental sensors used for measurements at any particular place and report them in real time on cloud. To accomplish this, we used Node MCU and different environmental sensors like DHT11 and rain drop sensor. The sensors constantly sense the weather parameters and keeps on transmitting it to the online web server over a Wi-Fi connection. The weather parameters are uploaded on the cloud and then provides the live reporting of weather information. This paper also focuses on the IOT application in the new generation of environmental information and provides a new paradigm for environmental monitoring in future. The system has been development particularly in the view of building smart city by giving the weather update of any particular place like a particular office or room.

Internet of Things (IOT):

It is the future technology of connecting the entire world at one place. All the objects, things and sensors can be connected to share the data obtained in various locations and process/analyses that data for coordinating the applications like traffic signaling, mobile health monitoring in medical applications and industrial safety ensuring methods, etc. As per the estimation of technological experts, 50 billion objects will be connected in IOT by 2020. IOT offers wide range of connectivity of devices with various protocols and various properties of applications for obtaining the complete machine to machine interaction.

LITERATURE REVIEW:

In today's world many pollution monitoring systems are designed by different environmental parameters. Existing system model is presented IOT based Weather monitoring and reporting system where you can collect, process, analyze, and present your measured data on web server. Wireless sensor network management model consists of end device, router, gateway node and management monitoring center. End device is responsible for collecting wireless sensor network data, and sending them to parent node, then data are sent to gateway node from parent node directly or by router. After receiving the data from wireless sensor network, gateway node extracts data after analyzing and packaging them into Ethernet format data, sends them to the server. Less formally, any device that runs server software could be considered a server as well. Servers are used to manage network resources. The services or information provided through the Internet that are connected through LAN and made available for users via smart phones, web browser or other web browser devices to make the system more intelligent, adaptable and efficient.

SYSTEM DESIGN:
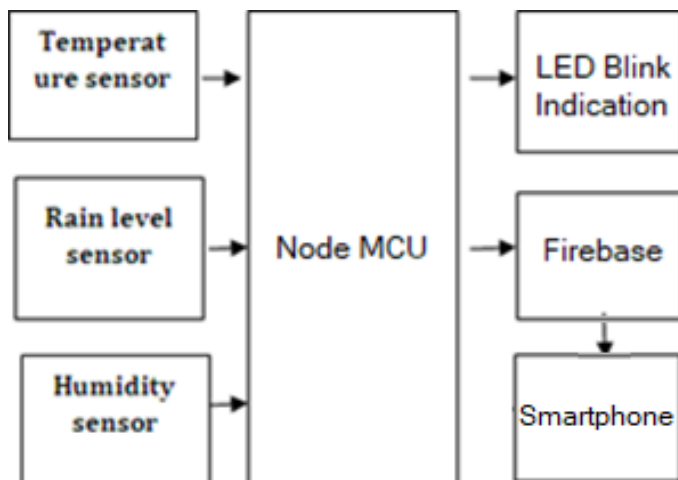
In IOT enabled weather monitoring system project, NodeMCU measures three weather parameters using two respective sensors. These sensors are temperature and humidity sensor, rain level sensor. These sensors are directly connected to Microcontroller. NodeMCU has inbuilt Analog to digital converter. It calculates and displays these weather parameters on Serial display. Then it sends these parameters to Internet using IOT techniques. The process of sending data to the internet using Wi-Fi is repeated after constant time intervals. Then the user needs to visit a particular website to view this weather data. The project connects and stores the data on a web server. Hence user gets Live reporting of weather conditions. Internet connectivity or Internet connection with Wi-Fi is compulsory in this IOT based weather monitoring reporting system project.

NodeMCU:

The NodeMCU ESP8266 development board comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.
NodeMCU can be powered using Micro USB jack and VIN pin (External Supply Pin). It supports UART, SPI, and I2C interface.

Rain level sensor:

The rain sensor module is an easy tool for rain detection. It can be used as a switch when raindrop falls through the raining board and also for measuring rainfall intensity. The analog output is used in detection of drops in the amount of rainfall. Connected to 5V power supply, the LED will turn on when induction board has no rain drop, and DO output is high. When dropping a little amount water, DO output is low,

the switch indicator will turn on. Brush off the water droplets, and where restored to the initial state, outputs high level. A rain sensor or *rain* switch is a switching device activated by rainfall.

Temperature & Humidity Sensor:

This DHT11 Temperature and Humidity Sensor features digital signal output .It is integrated with a high-performance 8-bit microcontroller. Its technology ensures the high reliability and excellent long-term stability. It has excellent quality, fast response, anti-interference ability and high performance. Each DHT11 sensors features extremely accurate calibration of humidity calibration chamber. The calibration coefficients stored in the OTP program memory, internal sensors detect signals in the process, we should call these calibration coefficients. The single-wire serial interface system is integrated to become quick and easy. Small size, low power, signal transmission distance up to 20 meters, enabling a variety of applications and even the most demanding ones. The product is 4-pin single row pin package. Convenient connection, special packages can be provided according to users need.

WiFi Module:

The NodeMCU is an microcontroller with an integrated WiFi module. The board is based on the ATmega328P with an ESP8266 WiFi Module integrated. The ESP8266 WiFi Module is a self contained SoC with integrated TCP/IP protocol stack that can give access to your WiFi network (or the device can act as an access point). One useful feature of NodeMCU WiFi is support for OTA (over-the-air) programming, either for transfer of Arduino sketches or WiFi firmware.

ADVANTAGES:
➢ IOT weather mentoring system project using NodeMCU is fully automated.
➢ It does not require any human attention.
➢ We can get prior alert of weather conditions
➢ The low cost and efforts are less in this system
➢ Accuracy is high.
➢ Self Protection
➢ Smart way to monitor Environment
➢ Efficient

APPLICATIONS:
➢ The weather forecasting plays very important role in the field of agriculture.
➢ It is also helpful at places like volcano and rain forests.
➢ It is quite difficult for a human being to stay for longer time at such places.

FUTURE SCOPE:
➢ One can implement a few more sensors and connect it to the satellite as a global feature of this system.
➢ Adding more sensor to monitor other environmental parameters such as CO2,Pressure and Oxigen Sensor
➢ In aircraft, navigation and military there is a great scope of this real-time system.
➢ It can also be implemented in hospitals or medical institutes for the research & study in "Effect of Weather on Health and Diseases", hence to provide better precaution alerts.

CONCLUSION:

By keeping the weather station in the environment for monitoring enables self-protection (i.e., smart environment) to the environment. To implement this need to use the sensor devices in the environment for collecting the data and analysis. By using sensor devices in the environment, we can bring the environment into real life. Then the collected data and analysis results will be available to the user through the Wi-Fi. The smart way to monitor environment an efficient, low-cost embedded system is presented in this paper. It also sent the sensor parameters to the cloud. This data will be helpful for future analysis and it can be easily shared to other users also. This model can be expanded to monitor the developing cities and industrial zones for pollution monitoring. To protect the public health from pollution, this model provides an efficient and low-cost solution for continuous monitoring of environment.

Group members (Nesamani apprenticegal):

Aishwarya (RA2011004010454) - (Documentation)

Anjana (RA2011004010436)   - (Algorithm)

Kanishk (RA2011004010226)   - (Idea and embedded C)

Kirtivas (RA2011004010233)   - (Pre-coding and implementation)