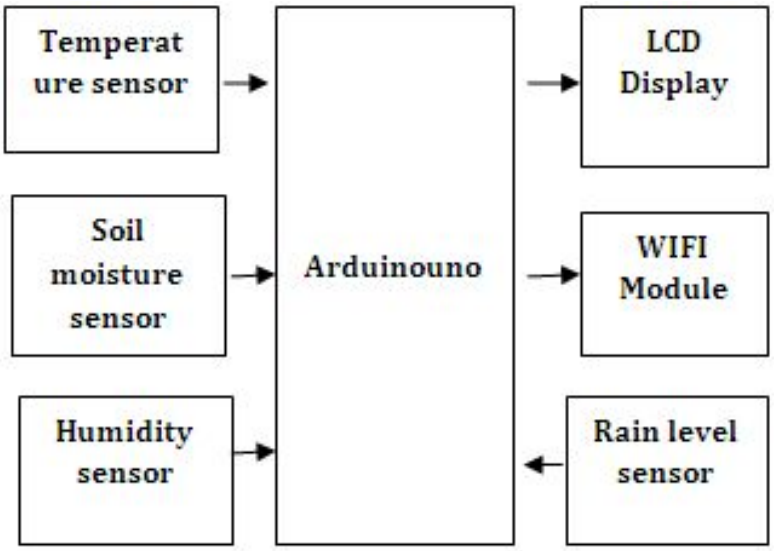
IoT weather reporting system
System Design

Introduction:

In today's world many pollution monitoring systems are designed by different environmental parameters. Existing system model is presented as an IOT based Weather monitoring and reporting system where you can collect, process, analyze, and present your measured data on a 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 the parent node, then data is sent to the gateway node from parent node directly or by router. After receiving the data from the wireless sensor network, the gateway node extracts data after analyzing and packaging them into Ethernet format data, and 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 the IOT enabled weather monitoring system project, Arduino Uno measures four weather parameters using four respective sensors. These sensors are temperature sensor, humidity sensor, moisture sensor and rain level sensor. These four sensors are directly connected to Arduino Uno. Arduino Uno has inbuilt Analog to digital converter. Arduino calculates and displays these weather parameters on LCD display. Then it sends these parameters to the 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 users get Live reporting of weather conditions. Internet connectivity or Internet connection with Wi-Fi is compulsory in this IOT based weather monitoring reporting system project.

Arduino Uno:

Arduino Uno is a microcontroller board developed by Arduino. Which is an open-source electronics platform mainly based on AVR microcontroller Atmega328. The current version of Arduino Uno comes with a USB interface, 6 analog input pins, 14 I/O digital ports that are used to connect with external electronic circuits. Out of 14 I/O ports, 6 pins can be used for PWM output. It allows the designers to control and sense the external electronic devices in the real world. This board comes with all the features required to run the controller and can be directly connected to the computer through USB cable that is used to transfer the code to the controller using IDE software, mainly developed to program Arduino. Programming languages like C and C++ are used in IDE. Apart from USB, battery or AC to DC adapter can also be used to power the board. Arduino Uno are the most official versions that come with Atmega328 8-bit AVR Atmel microcontroller where RAM memory is 32KB.

Rain Level Sensor:

The rain sensor module is an easy tool for rain detection. It can be used as a switch when a 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 the induction board has no rain drop, and DO output is high. When dropping a little amount of water, DO output is low, the switch indicator will turn on. Brush off the water droplets, and when restored to the initial state, output high level. A rain sensor or rain switch is a switching device activated by rainfall.

Temperature and Humidity sensors:

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 sensor features extremely accurate calibration of the 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 a 4-pin single row pin package. Convenient connection, special packages can be provided according to users' needs.

Soil Moisture sensor:

Soil moisture sensors measure the contents in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

Wifi Module:

The Arduino Uno WiFi is an Arduino Uno 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 Uno WiFi is support for OTA (over-the-air) programming, either for transfer of Arduino sketches or WiFi firmware.

LCD Display:

A Liquid Crystal Display commonly abbreviated as LCD is basically a display unit built using Liquid Crystal technology. When we build real life/real world electronics based projects, we need a medium/device to display output values and messages. The most basic form of electronic display available is 7 Segment displays – which has its own limitations. The next best available option is Liquid Crystal Displays which come in different size specifications. Out of all available LCD modules in the market, the most commonly used one is 16×2 LCD Module which can display 32 ASCII characters in 2 lines. To establish a good communication between the human world and machine world, display units play an important role. And so they are an important part of embedded systems. Display units - big or small, work on the same basic principle. Besides complex display units like graphic displays and 3D displays, one must know working with simple displays like 16x1 and 16x2 units. The 16x1 the display unit will have 16 characters and are in one line. The 16x2 LCD will have 32 characters in total 16in 1st line and another 16 in the 2nd line. There are two control pins, this gives the flexibility. The contrast bit and READ/WRITE are not often used so they can be shorted to ground. This puts LCD in the highest contrast and read mode. We just need to control ENABLE and RS pins to send characters and data accordingly.

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 the environment and an efficient, low cost embedded system is presented in this project. 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.