

IOT BASED WEATHER MONITORING SYSTEM USING ARDUINO

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Abstract:

Now-a-days many weather reporting applications are available which gives us information about climatic changes that are going to take place by which man can be aware of present and future climatic changes. Most of the weather reporting applications extract the data from accurate weather systems. Here we are building our own weather reporting system which would give us information about present temperature, humidity etc. We can setup this in our home and get time to time changes in climate which would help us in planning our daily work easily. Like it would be helpful for a farmer in this agricultural activity by which he can protect his crops from climatic changes. It would help in transportation giving information of weather conditions etc.

Keywords- Internet of Things, Node MCU, Weather reporting System,

Introduction:

Here we introduce a smart weather reporting system over the Internet. Our introduced system allows for weather parameter reporting over the Internet. It allows the people to directly check the weather states online without the need of a weather forecasting agency. The system uses temperature, humidity as well as rain with humidity sensor to monitor weather and provide live reporting of the weather statistics. The system constantly monitors temperature using temperature sensor, humidity using humidity sensor and also for rain. Weather monitoring system deals with detecting and gathering various weather parameters at different locations which can be analysed or used for weather forecasting. The aim of this system is achieved by technologies such as Internet of Things (IOT) and Cloud. The idea of internet of things is to connect a device to the internet and to other required connected devices. Using Internet the information from the IOT device can easily be transferred to the cloud and then from the cloud to the end user. Weather Monitoring is an essential practical implementation of the concept of Internet of Things, it involves sensing and recording various weather parameters and using them for alerts, sending notifications, adjusting appliances accordingly and also for long term analysis. Also we will try to identify and display trends in parameters using graphical representation. The devices used for this purpose are used to collect, organize and display information. It is expected that the internet of things is going to transform the

world by monitoring and controlling the phenomenon of environment by using sensors/devices which are able to capture, process and transmit weather parameters. Cloud is availability of computer system resources like data storage, computing power without direct active management of user. The data captured is transmitted to the cloud so that the data could be further displayed. Besides this, the system consists of components such as Arduino UNO board which is a microcontroller board consisting of 14 digital pins, a USB connection and everything used to support microcontroller; DHT11 is Temperature and humidity sensor which is used for detecting these mentioned parameters; WIFI module is used to convert the data collected from the sensors and then send it to the web server. So, in this way weather conditions of any location can be monitored from any remote location in the world. The system constantly transmits this data to the micro controller which now processes this data and keeps on transmitting it to the online web server over a wifi connection. This data is live updated to be viewed on the online server system. Also system allows user to set alerts for particular instances. 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.

Related Work

IOT has become a great area of interests for institutes, big tech companies and obviously users or customers also. Many IOT based concepts have gained so much attention like Smart wearable devices, smart home, smart city etc. Almost all the applications based on Internet of things include devices like transducers and sensors attached to the microcontroller with a wireless/wired flow of data to a remote cloud service or a local data storage which converts the raw data to a significant information which can further used in many areas. While working on this project we came across some works that have been accomplished in making smart applications using either Raspberry Pi boards or arduino board which are economical. Most of the applications were built using these boards for example smart city and other automation projects. In [1], it was said that for a smart city "Places can be equipped with sensors and monitor environmental conditions, cyclists or athletes can find the most "healthy" trips and the city can respond by adjusting the traffic or by planting more trees in some areas. The data will be accessible to all citizens to promote the creation of applications using real-time information for residents." So we can say that

this weather monitoring system will be helpful in some smart city projects also. In [2] the authors chose a single sensor ie. composite DHT11 sensor for reading both temperature and humidity. Earlier people staying at home and busy in their household works or people who work in offices had no idea about the environmental parameters outside their home or office. People have no idea if the temperature outside is quite low or high or normal or if it is raining or not or the value of the humidity in the environment. According to [3] the monitoring systems can provide self-protection to our environment such as protecting public health from the pollution or at least reducing the effects of pollution on the public. It will notify us whenever the temperature is lower than it should be or is higher than normal. It will also automatically notify whether it is raining so one can carry an umbrella or a raincoat. In [4] weather monitoring system was designed using a particle photon which is an Arduino Compatible Iot board. It will also give us morning, evening and night wish messages as it has a Light Sensor attached. The authors in [5] have mentioned a great thing that “By deploying sensor devices in the environment, we can bring the environment into real life.”

Proposed System

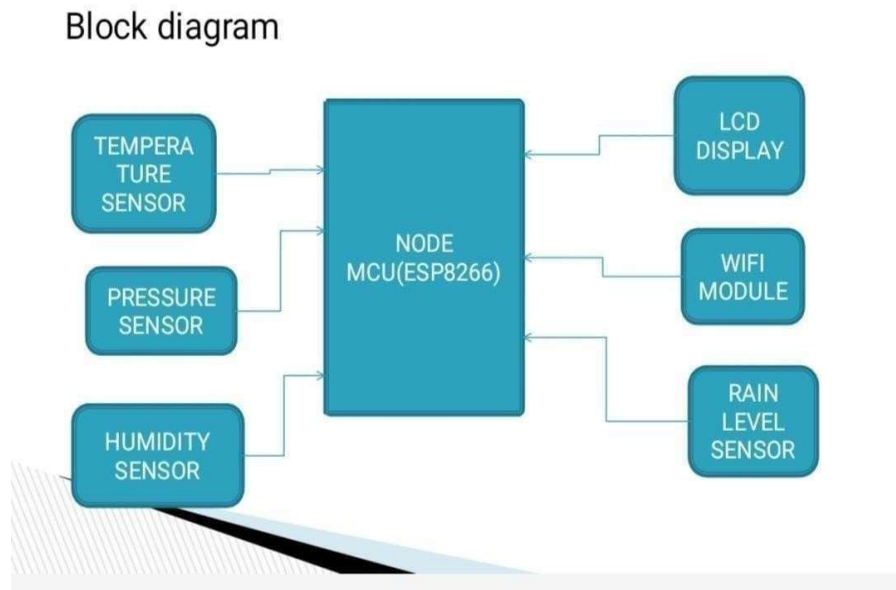


Fig Block diagram

In IOT enabled weather monitoring system project, NODEMCU 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 NODEMCU. NODEMCU has inbuilt Analog to digital converter. NODEMCU calculates and displays these weather parameters on LCD 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 IOT (Internet of things) based weather reporting system is such type of a system that forecast the report about all climatic conditions such as temperature, humidity and rain etc. through internet resources. Normally we know the weather condition through TV resources which present, that weather report whose offered by the space research centers, but it is the overall weather report of every country. Similarly, some time we want to know the humidity level or temperature level of any specific place then we must use a separate weather reporting system. So many systems are available in market, but they are so much costly as well as they are not so much precise, accurate and efficient. Beside this these systems do not have LCD display facility. This IOT Weather reporting system works on the principle of sensors working. Temperature and humidity sensor works on the principle voltage and current, means when temperature is increased then its producing voltage is increased similarly when humidity is increased then its producing current is increased.

Hardware Components:

NodeMCU

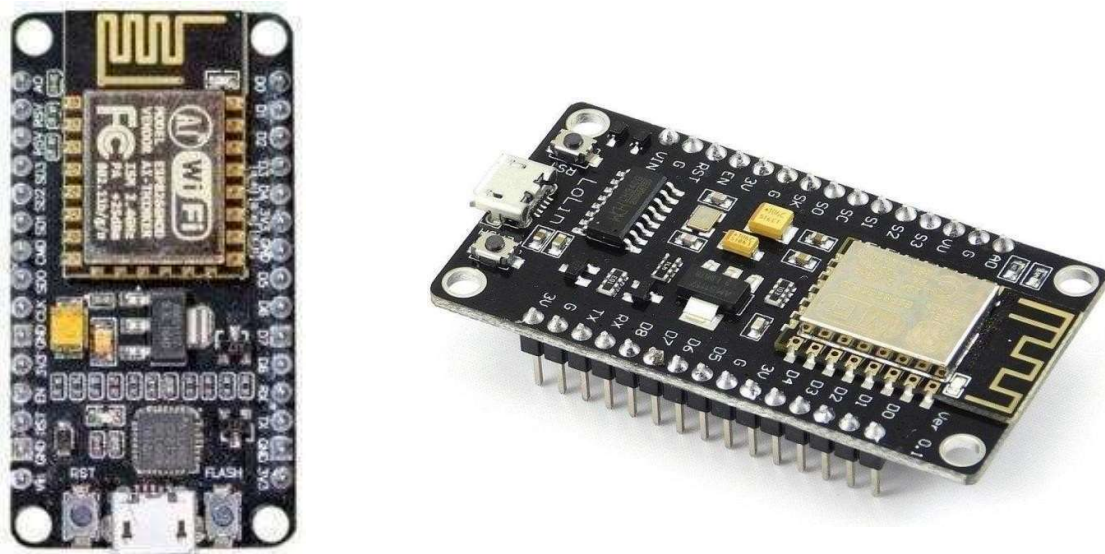


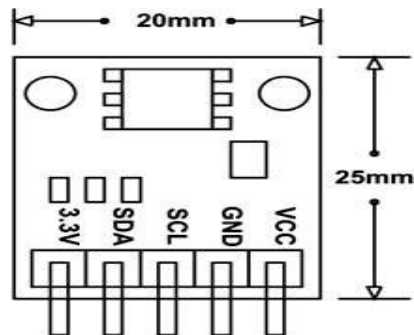
Fig NodeMCU

The NodeMCU (Node MicroController Unit) is an open-source software and hardware development environment built around an inexpensive System-on-

a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (WiFi), and even a modern operating system and SDK. That makes it an excellent choice for the Internet of Things (IoT) projects of all kinds.

2D-Model:

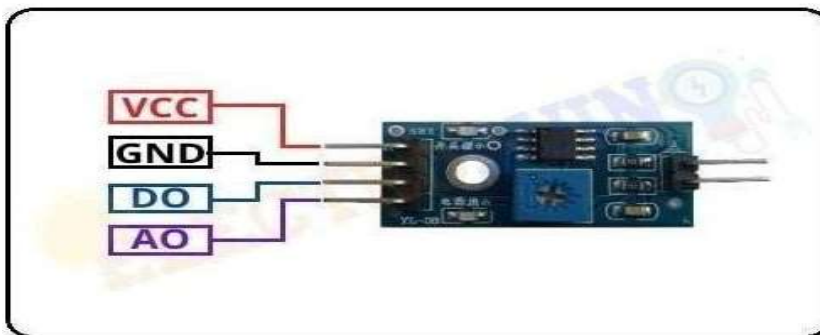
Measurements in millimeter



Rain Sensor module:



A rain sensor is one kind of low-cost electronic sensor which is used to detect the rainfall or water drops. It works as a switch. Normally the switch is open condition. This sensor is

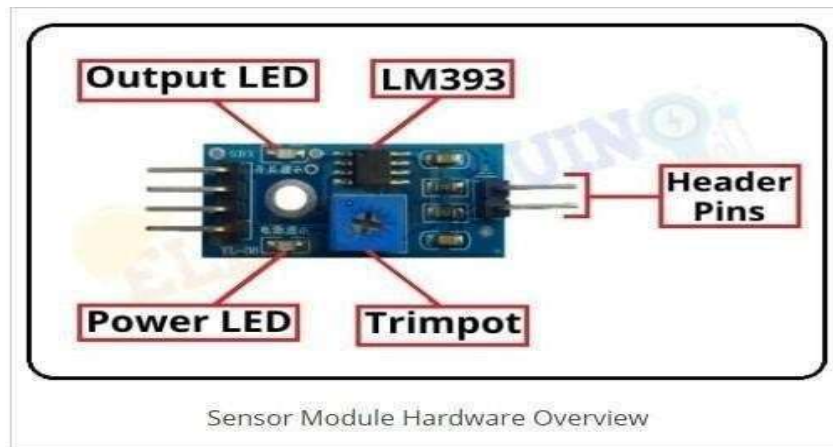


consists of mainly two parts, one is **Sensing Pad** and another one is the **Sensor Module**. When rainfall or water drops fall on the Sensing Pad surface, then the switch will be closed. The Sensor Module reads data from the sensor pad and processes the data and converts it into

a digital/analog output. So, the sensor can provide both types of output **Digital output (DO)** and **Analog output(AO)**

The Rain Sensor Module's Sensing Pad consists of two nickel-coated series copper tracks. Also, it has two Header pins, these are internally connected to the two copper tracks of the Sensing Pad. These pins are used to connect the Sensing Pad to the rain sensor module circuit through two jumper wire. Always, one pin of the rain sensor circuit provides a +5v power supply to the one track of the sensing pad, and another pin is received the return power supply from another track of the sensing pad.

Sensor Module



The Sensor module is consists of some key components. These are LM393 Comparators, Variable Resistor (Trimpot), Power LED, output LED.

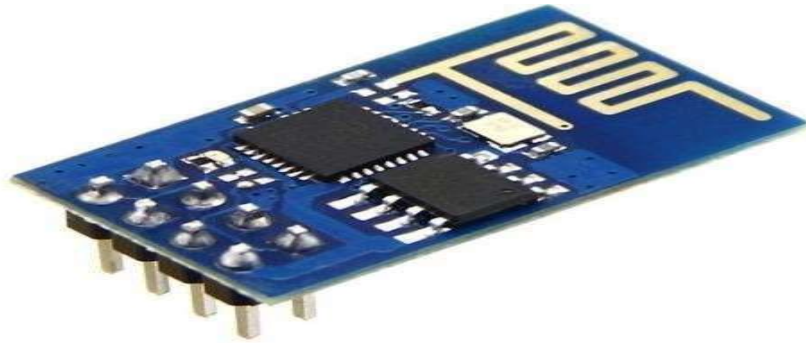
Variable Resistor(Trimmer):

This rain sensor module circuit has an onboard Trimpot or variable resistor(potentiometer), which is a 10k preset. It is used to set the sensitivity of the rain sensor, rotate the preset knob to adjust the sensitivity of the rain detection. If the preset knob rotated **clockwise**, the rain sensor sensitivity will be increased. If it rotated **counterclockwise**, the rain sensor sensitivity will be decreased.



ESP8266 WiFi Module:

ESP8266 is Wi-Fi enabled system on chip (SoC) module developed by Espressif system. It is mostly used for development of IoT (Internet of Things) embedded applications.



ESP8266-01 WiFi Module

Lcd Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a widerange of applications. A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Since LCD panels produce no light of their own, they require external light to produce a visible image.

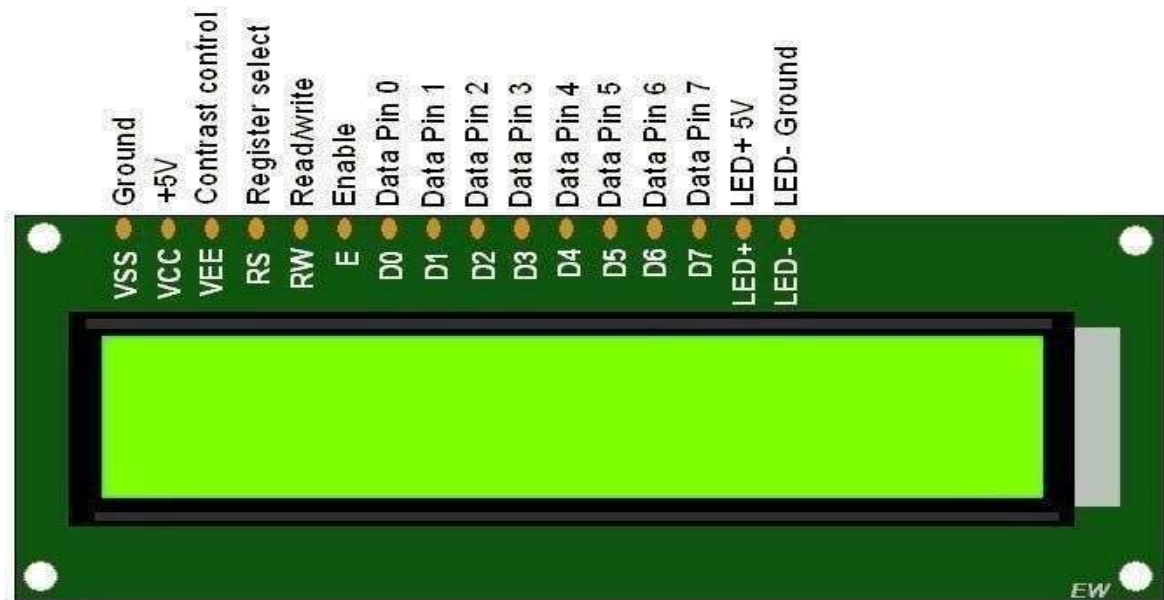
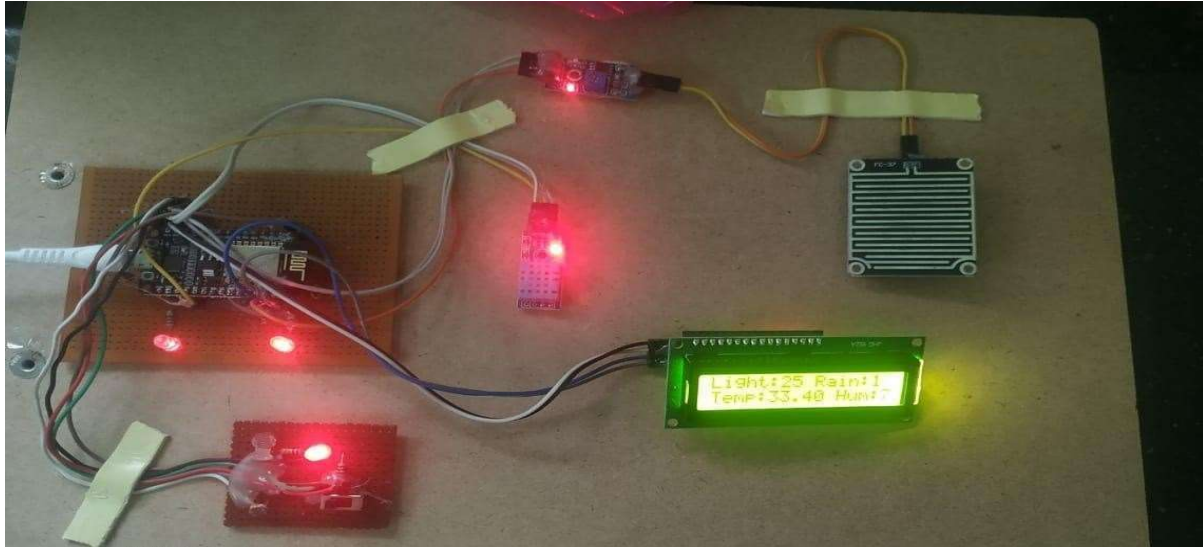


Fig LCD DISPLAY

Result



Here we have an IOT based project, which is a weather monitoring system that help in accessing different weather parameter remotely over Thingspeak website or using an mobile application while connected to internet.

In this modern time, we are highly dependent on growing technology. Our project uses microcontroller (Arduino UNO), WIFI module and different sensors i.e. DHT11, light sensor etc.

The system was at the first time when different sensors were mounted over to the Arduino Uno and breadboard. The code upload time was also comparatively higher at the beginning than in the last phases. DHT humidity sensor is good in passing signals.

Conclusion & Future scope

Here we learnt that how present system is better and also more efficient than the other systems. It is exceptionally compatible. It reduces human efforts. This terminate that present project work is a huge success and will provide a considerable way for saving weather parameters of real time and will help farmers, industries, normal people as well as others whose daily life is related with weather and its parameters. It can be used to get required information about for each or particular area for many years. The collected information will used to determine the best conditions required for plants to grow if we talk about agriculture and the farmer can modify the environment conditions which is more suitable for the plan growth.

This, will have a large effect on agriculture and also on farmers everywhere. This system will help in monitoring the condition of particular area and help individuals to work accordingly. Suppose a farmer want to grow a crop or tree which grows only in particular type of conditions. So, by this system he can see the temperature and humidity or wind direction as well as other parameters from any place. He will install this system only once and further work will be done automatically. Present model can be updated to monitor the cities and industries for pollution related data gathering. To shield the public health from pollution, model will provide an efficient and very cheaper solution for constant monitoring of environment and its conditions. We can do lots of additions in this system such as adding pressure sensor, gas sensor like CO, soil and moisture retrieving sensor which will able to tell us water content present in soil etc., Other sensors like soil moisture sensor, gas sensor, pressure measuring sensor can also be interfaced with existing system to get data about a particular place.

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