IOT WEATHER STATION USING ARDUINO UNO

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Abstract:

Now a days many weather reporting applications are available which gives us information for protection 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 extracts the data from accurate weather system. The main aim of this project is to design a smart way of weather monitoring system using clod storage technology based on wireless Wi-Fi communication. The weather parameters are monitored using sensing devices like rain sensor, temperature and humidity sensors. Then the collected data and analysis results will be available to the user through Wi-Fi to the cloud storage and provides thing speak. This data will be helpful for future references.

Keywords:

Arduino UNO, Rain sensor, DHT11 (temperature & humidity) sensor, ESP8266 WI-FI module, Thingspeak.

1. Introduction:

Here we are building our own weather reporting system which would give us the information about present temperature, humidity, and rain etc. We can even set up this in our home and get alerts for time to time changes in climate which would help us in planning our daily work easily. It would be helpful for a farmer in this agricultural activity by which he can protect his crops according to climatic changes. It would help in transportation giving information of weather conditions.

Internet of things, IoT, as an important part of the new generation of information technology, have developed rapidly both in theory and practice since proposed and derived many applications such as smart home, intelligent environmental monitoring. Things not only liberated a lot of manpower, but also achieved a standardized, automated management.

Wi-Fi (Short for **Wi**reless **Fi**delity) is a wireless technology that uses radio frequency to transmit data through the air. Wi-Fi has initial speeds of 1mbps to 2mbps. Wi-Fi transmits data in the frequency band of 2.4 GHz. It implements the concept of frequency division multiplexing technology. Range of Wi-Fi technology is 40-300 feet.

By keeping the weather station in the environment for monitoring enables self-protection to the environment. Micro controller forms the controlling module and it is the heart of the device. The controller performs the functionality of receiving data from the different sensors connected to it like temperature, rain, humidity sensors. The received data can be monitored and displayed on thingspeak cloud along with date and time through Wi-Fi. The smart way to monitor environment this device is an efficient low cost embedded system.

2. LITERATURE SURVEY:

Weather surveillance development system can be used in gathering real-time information as well as for transmission. They have achieved by introducing a VAISALA WXT520 weather transmitter device to transmit the information from one place to another place. This device senses all the ecological parameters and their ratio. Then the collected real-time information's are transmitted wirelessly over a long distance through GSM. This method provides flexibility because, in this method, one can add or remove the measuring parameters. Santhosh et al.had projected a new model for ecological observation applications.

Additionally, internet interface based systems are developed that utilizes a wireless device network

(WDN) for agricultural area monitoring. WDN consists of a frequency transmitter and a receiver. AVR-ZigBee, Bluetooth-module, temperature, humidity, soil wet sensors, and LCDs are used in this research. Smart PZT sensors were used as an actuator and receiver, coupled with two XBee‟s and two Ardiuno as signal generator and signal receiver in damage identification. This method is reliable and economical for agricultural unit‟s observation system.

3. Implementation:

3.1 block diagram of **IoT weather station using Arduino UNO**

The design can be implemented with Arduino uno. The interfaced devices to the Arduino are dht11sensor, Rain sensor, Esp8266 Wi-Fi module. The Arduino continuously read the data from sensors and update them into the thingspeak cloud along with date and time through Wi-Fi. So user can access this data with his credential from anywhere in the world. The main controlling device of the project is Arduino UNO which loaded with an intelligent program written in embedded ‘C’ language.

4. Related Work:

The brief introduction of different modules used in this project is discussed below:

4.1. ARDUINO UNO.

4.1.1 ARDUINO UNO

- The Arduino Uno is a microcontroller board which has ATmega328 from the AVR family. There are 14 digital input/output pins, 6 Analog pins and 16MHz ceramic resonator.
- USB connection, power jack and also a reset button is used. Its software is supported by a number of libraries that makes the programming easier.

4.2. DHT11(Temperature,humidity) sensor:

Fig: DHT11 sensor

A **humidity sensor** senses, measures and regularly reports the relative humidity in the air. It measures both moisture and air temperature. Relative humidity, expressed as a percent, is the ratio of actual moisture in the air to the highest amount of moisture air at that temperature can hold. The warmer the air is, the more moisture it can hold, so relative humidity changes with fluctuations in temperature.

Relative humidity

Resolution: 16Bit

Repeatability: ±1% RH

Accuracy: At 25℃ ±5% RH

Interchangeability: fully interchangeable

Response time: 1 / e (63%) of 25℃ 6s 1m / s air 6s

Temperature

Resolution: 16Bit

Repeatability: ±0.2℃

Range: At 25℃ ±2℃

Response time: 1 / e (63%) 10S

Electrical Characteristics

Power supply: DC 3.5～5.5V

Supply Current: measurement 0.3mA standby 60μ A

Sampling period: more than 2 seconds

Pin Description

1, the VDD power supply 3.5～5.5V DC

4.3. Rain sensor:

Fig: Rain sensor

Raindrop Sensor is a tool used for sensing rain. It consists of two modules, a rain board that detects the rain and a control module, which compares the analog value, and converts it to a digital value.

The input to the inverting terminal is set to a certain value by varying the potentiometer and the sensitivity is set. When the rain board module's surface is exposed to rainwater, the surface of the rainboard module will be wet, and it offers minimum resistance to the supply voltage. Due to this, the minimum voltage will be appearing at the non-inverting terminal of LM393 Op-Amp. The comparator compares both inverting and non-inverting terminal voltages. If the condition falls under case(1), the output of the Op-Amp will be digital LOW. If the condition falls under case(2), the output of the Op-Amp will be digital HIGH. The below diagram shows the equivalent circuit of both the conditions.

4.4 Wi-Fi module (esp8266):

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as a Wi-Fi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost-effective board with a huge, and ever growing, community.

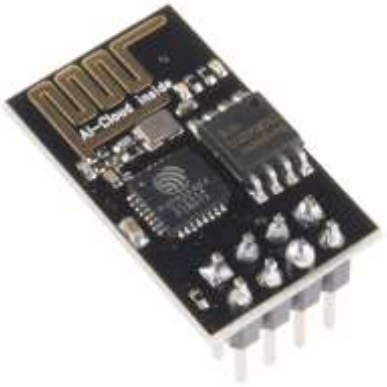

Fig: ESP8266 Wi-Fi module

Electrical Characteristics

Working Voltage: 3.3V

Maximum IO Driving Power IMAX: 12 mA

Maximum IO Voltage Level VMAX: 3.6V

Current Consumption: 100mAmp

5. CONCLUSION:

The Presence of each and every module has been reasoned out and placed very carefully. Hence the contributing to the best working unit for "**IOT WEATHER STATION USING ARDUINO UNO**"

has been designed perfectly. Secondly, using Wi-Fi technology to upload the weather sensor data into the thingspeak web cloud. Thus the project has been successfully designed and tested.

6. ACKNOWLEDGEMENT

We would like to thank all the authors of different research papers referred during writing this paper. It was very knowledge gaining and helpful for the further research to be done in future.

7. RESULTS:

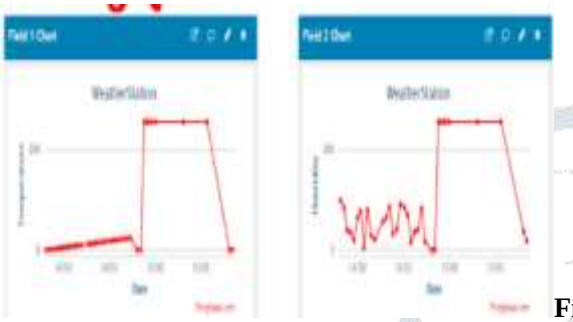

Fig: 7.1
DHT11 sensor data in thingspeak cloud

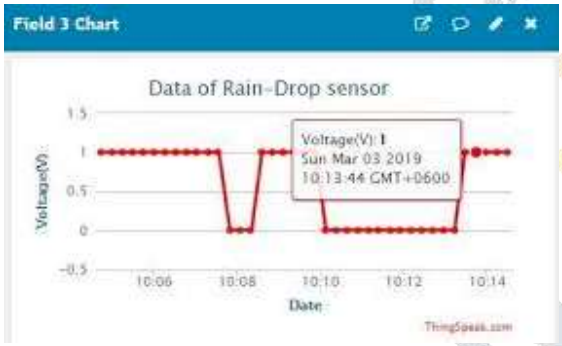

Fig: 7.2 Rain drop sensor data in thingspeak

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