IOT Based Weather Reporting System to Find Dynamic Climatic Parameters

Kavya Ladi(student)
Information technology, GITAM university
Visakhapatnam, India
kavya1756@gmail.com

A V S N Manoj(student)
Information technology, GITAM university
Visakhapatnam, India

G V N Deepak (student)
Information technology, GITAM university
Visakhapatnam, India
deepakgadamsetty01@gmail.com

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 extracts the data from accurate weather system. 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 climatic changes. It would help in transportation giving information of weather conditions etc.

Keywords: IOT, Temperature sensor, Weather forecasting, Reliability

I. INTRODUCTION

IOT is a vast network in which devices like sensors, actuators, smart phones, etc. are connected through internet which allows collecting and exchanging data. These are controllable across existing network and have connection with other devices too by which it gives accurate and efficient results. Algorithms like swarm intelligence can also be implemented for further improving of accuracy [1],[2],[3]. IOT can be used in environmental protection like earthquake, tsunami, soil conditions, and in monitoring or protecting wildlife by using sensors. These sensors can sense a large geographical area and can be mobile. In the present system a weather reporting system is build followed by an android application which displays the data which is being extracted from weather reporting system. In our project we are using sensors which are capable of covering a small area (for example small garden, a house) and the data which is being extracted from sensors is store in cloud for this storage we are using a website called https://thingspeak.com/ which is basically used for IOT platform projects which gives free cloud storage space, so it is beneficial for students project . From the cloud storage space we extract the entire weather data to android application using API key [4],[5].

II. WORKING PRINCIPLE

It is an easy tool for detecting rain drops. Once the plague detects the rain drops on its lead strips the voltage is measured. One can have a doubt that the board may get short circuited because of rain drops but the fact is that water is a bad conductor and in this sensor acts as a Variable resistor only.

Once the voltage measures are done circuit board takes the action for giving the output. The Voltage measures are processed in Sensitivity Adjustment through a potentiometer. The analog output is connected to 5V supply. To convert analog signals to digital signals it uses LM393 comparator.

The power LED turns on when power supply is noticed and sensor plate have no rain drops and digital output is high. And switch LED turns on when sensor board dictates rain drops as the moisture is set upto certain threshold limit by potentiometer and and digital output is actively low.

Digital depends upon VCC and GND values. It shows the value of VCC when rain is not detected and output is high and GND when rain is detected and output is low.
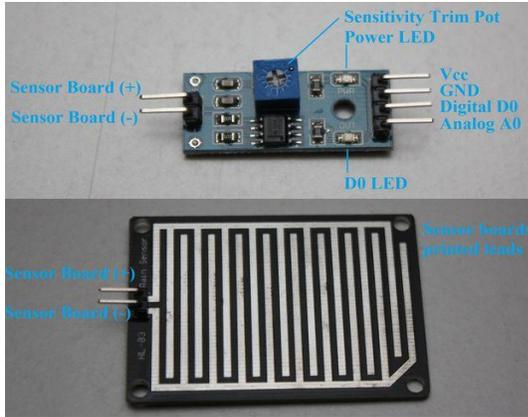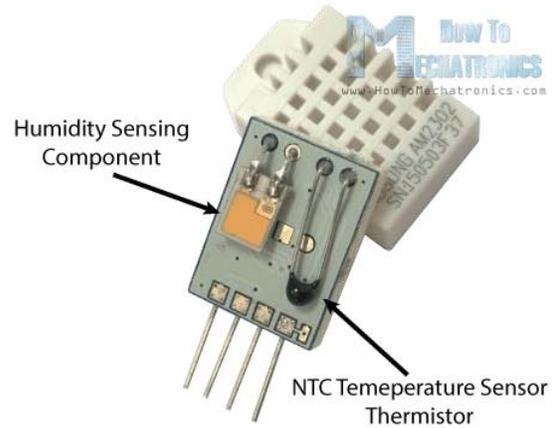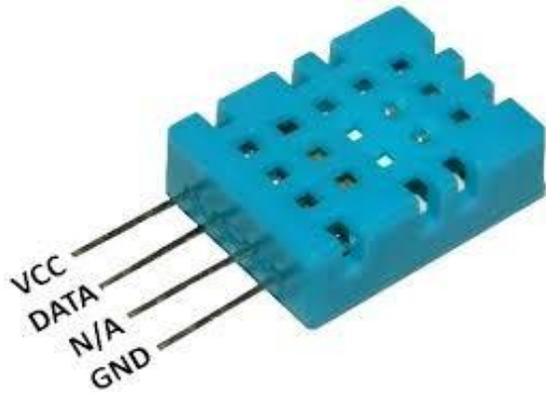
Figure 1: Rain Drop Sensor

TEMPERATURE SENSOR

Figure 2: DHT11 Sensor

Features

Temperature range   0C to 50C with +/-2 degrees accuracy

• **Humidity range 20% to 80% with 5% accuracy**	
• **Sampling rate 1HZ(means reading changes for every one second)**	
• **operational voltage 3-5 volts**	
• **Maximum current 2.5 amp(this is current used during time of measuring)**	

Figure 3: DHT11 Sensor

Let's go through how the sensor works. It consists:

- Humidity sensing component
- Negative temperature Co-efficient(NTC) or Thermistor
- An IC at back of sensor

For measuring humidity they use the humidity sensing component which has two electrodes with moisture holding substrate between them. So as the humidity changes, the conductivity of the substrate changes or the resistance between these electrodes changes. This change in resistance is measured and processed by the IC which makes it ready to be read by a microcontroller.

On the other hand, for measuring temperature these sensors use a NTC temperature sensor or a thermistor. A thermistor is actually a variable resistor that changes its resistance with change of the temperature. These sensors are made by sintering of semi conductive materials such as ceramics or polymers in order to provide larger changes in the resistance with just small changes in temperature. The term "NTC" means "Negative Temperature Coefficient", which means that the resistance decreases with increase of the temperature.

III. NODEMCU Microcontroller (ESP8266)

Nodemcu is a firmware which is mainly used for IOT based projects. This can be programmed using arduino IDE[6]-[8]. The board consists of 5 volt step down converter. It uses LUA scripting language [9],[10].

Figure 4: NodeMcu Microcontroller

It runs on ESP8266 Wi-Fi module which is manufactured by adafruit can host the applications. If it is the only application then it can directly boot up from internal flash[11]-[13]. ESP8266 have a separate cache memory which helps in improving performance of the system and minimizes the memory requirement. DMA inbuilt processor can also be used to enhance the memory accessing and reliability [14][15]. one can establish a wifi adapter and wireless internet access to any other microcontroller by connecting it with UART [16][17].
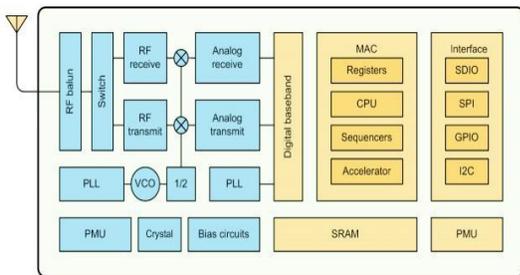

Figure 5: NodeMcu

ESP8266 consists of following features :- It has 802.11 b/g/n protocol , Wi-Fi Direct (P2P), soft-AP ,Integrated TCP/IP protocol stack ,Integrated TR switch, balun, LNA, power amplifier and matching network ,Integrated PLL, regulators, and power management units ,+19.5dBm output power in 802.11b mode, Integrated temperature sensor

,Supports antenna diversity , Power down leakage current of < 10uA ,Integrated low power 32-bit CPU could be used as application processor ,SDIO 2.0, SPI, UART ; STBC, 1×1 MIMO, 2×1 MIMO ; A-MPDU & A-MSDU aggregation & 0.4μs guard interval ; Wake up and transmit packets in < 2ms, contains 16 GPIO input pins, memory of 64 KiB instruction, 96 KiB data and Standby power consumption of < 1.0mW (DTIM3). Mainly ESP8266 is used for security id tags, wifi location aware devices, smart power plugs and home automation [18][19].
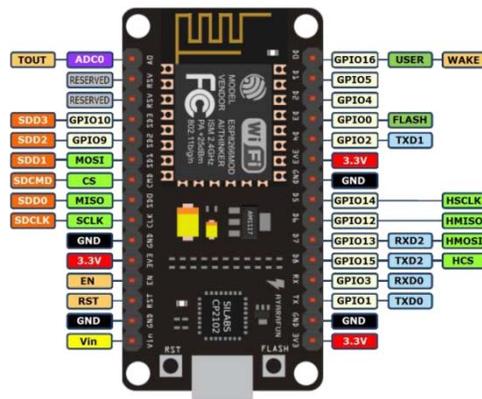

Figure 6: NodeMcu pin layout

The above Figure 6 is a circuit diagram of our proposed system where we used NodeMcu (ESP8266) [20]-[22]a microcontroller which is interfaced with DHT11 (Temperature Sensor) and Rain Drop Sensor. The cable is connected to Vcc pin of DHT11 to Vin pin of microcontroller. The data pin of DHT11 is connected to D7 pin(it can be connected with any digital pin but we used D7 in our code) of micro controller. Ground (GND) of DHT11 and Rain drop sensor is connected to GND of microcontroller pin. Then Ao pin of Rain drop sensor is interfaced with Ao pin of microcontroller. We have to give a separate power supply to Rain drop sensor so we connect it with 3.3volts pin of microcontroller.
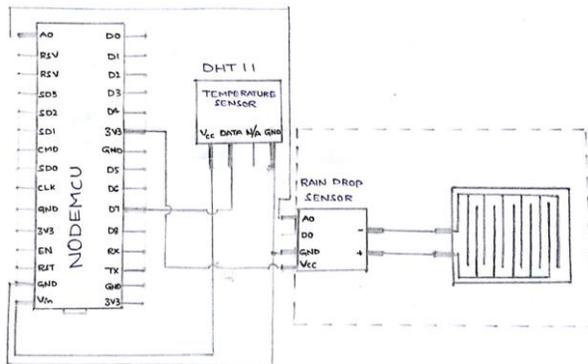
Figure 7(a): Circuit Diagram

Figure 7(b): Circuit Picture

IV. ANDROID STUDIO

ANDROID STUDIO(AS) is developed by Google developers. Its prime aim was to make processing and making easier. Android studio is better than Eclipse and any other android emulator. It has drag and drop feature included in it. It occupies less space and processing is fast. In our project we used Android studio to develop a basic application to display the streaming data from **thingspace.com.** Installing android studio is a two step process:-Go to Google developers website **https://developer. android.com/studio/ install.html** Download android studio, Install .exe file which you downloaded and necessary. SDK Always get updated with recent version of SDK's has it contains new features in it. Now it's time to design our application which should display the values of temperature , humidity, heat index and rain drop, which is stored in cloud that is thingspeak website. We are provided with API key to import our data from thingspeak to our application.

V. CONCLUSION

Now-a-days IOT play a vital role. So, the proposed project which is a IOT based weather reporting system which gives us values to different parameters like temperature, heat index, humidity and rain drop.This can be accessed from anywhere with a laptop , a pc or a smart phone, as we developed an application which displays the streaming information. This project gives a developer a clear idea about both hardware and software knowledge . We need not setup datacenters as we can store the data in cloud itself so the cost of equipment is reduced.

Hence, we conclude that we can use a IOT based weather station which would give us the information remotely from any place.
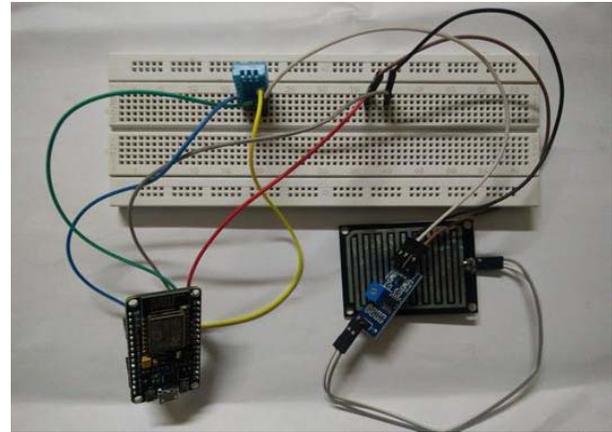
REFERENCES

[1] Mallikharjuna Rao K., K. Anuradha, "An Efficient Method for Enhancing Reliability and Selection of Software Reliability Growth Model through Optimization Techniques," Journal of Software, IAP Publishers, Finland, Vol. 12, No.1, January 2017.

[2] Mallikharjuna Rao K., K. Anuradha, "A Hybrid Method for Parameter Estimation of Software Reliability Growth Model Using Modified Genetic Swarm Optimization with the aid of Logistic Exponential Testing Effort Function," IEEE Proceedings of International Conference on Research Advances in Integrated Navigation Systems (RAINS - 2016), pp. 82-89.

[3] Mallikharjuna Rao K, Anuradha. Kodali, "An Efficient Method for Parameter Estimation of Software Reliability Growth Model using Artificial Bee Colony Optimization," 5th Joint International Conference on Swarm, Evolutionary, and Memetic Computing – SEMCCO 2014, [SPRINGER-Lecture Notes in Computer Science (LNCS) Volume 8947 , pp. 765-776, August 2015.

[4] https://www.instructables.com/id/Esay- IoT-Weather -Station-With-Multiple-Sensors/

[5] N. Suresh Kumar et al. / (IJCSE) International Journal on Computer Science and Engineering "Design of Intelligent Multinode Sensor", IJCSE vol2 (3), 2010, 468-472.(ISSN : 0975-3397).

[6] http://www.cs.unibo.it/~difelice/sm/slides / arduino.pdf

[7]   http://download.arduino.org/products   / UNOWIFI   /0A-ESP8266-Datasheet-EN-v4.3.pdf

[8] Kumar, Abhijeet, and Apoorva Sharma. "Internet of Life (IOL)." (2015). ISBN 978-93-5156-328-0

[9] Zeroday. "A lua based firmware for wifi-soc esp8266". Github. Retrieved 2 April 2015.

[10] Brian Benchoff. "a DEV board for the ESP LUA   interpreter". Hackaday.   Retrieved 2 April 2015

[11]   https://espressif.com/en/products/hardware   / esp8266ex/overview

[12]   "Adafruit HUZZAH ESP8266 Breakout". Adafruit Industries. Retrieved 2015-06-25.

[13] "Espressif Announces ESP8285 Wi-Fi Chip for Wearable Devices". *Espressif. Mar 9, 2016*. Retrieved 2016-07-10.

[14] N. Suresh Kumar et al., "Different clock schemes", IEEE sensor journal, Vol 11, No 10, 2011.

[15] N. Suresh Kumar, et al., "Measurement system for wide range frequency at Nonlinear devices", Proceedings published by Future Communication, Information and Computer Science, Taylor and Francis Group, London, 978-1-138-02653-7, 22-23 May 2014. (Scopus, CRNet)

[16] Vowstar. "NodeMCU Devkit". Github. Node MCU Team. Retrieved 2 April 2015.

.

[17] N. Suresh Kumar et al. / "Two Way Clock Scheme to Minimize the Clock Skew in Digital Frequency   Measurement",   ACST, Ripublications,vol3no(3) Dec, 2010.

[18]   http://rancidbacon.com/files/kiwicon8/   ESP 8266_WiFi_Module_Quick_Start_Guide_v_ 1.0.4.pdf

[19]   https://www.itead.cc/wiki/ESP8266_Serial   _ WIFI _ Module

[20] https://en.wikipedia.org/wiki/NodeMCU

[21] https://en.wikipedia.org/wiki/ESP8266

[22]   https://cdnshop.adafruit.com/datasheets/   ESP 8266_Specifications_English.pdf