International Journal of Scientific Research and Engineering Development-– Volume 2 Issue 5, Sep – Oct 2019

Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

Temperature and Humidity Monitoring and Control System with Thing Speak

Khin Kyawt Kyawt Khaing

Faculty of Computer System and Technologies, University of Information Technology, Myanmar

----------**********----------

Abstract:

Monitoring in IoT infra is some kind of logging a Temperature and Humidity Monitoring in a specific environment and store data in a location database and then displaying the user values on the Thing Speak. The core function of our proposed system is to monitor and pass the real-time values of the temperature and humidity of a particular place from any location via internet. The inspection of the current conditions can be visualized in the channels of the things speak IoT platform privately or publicly. It also focuses on the controlling of the IoT devices depend on the situation of this system.

Keywords **—IoT-Internet of Things, the ThingSpeak.**

----------**********----------

I. INTRODUCTION

The Internet of Things is a current age of creative computing and it's providing opportunities to communicate around the world. The objective ofIoT is something, Anyone, Anytime, Anyplace, Any service and Anynetwork [1].

IoT describes a system where items in the real world, and sensors within or attached to these items, are connected to the Internet via wireless and wired Internet connections.Machine-to-machine communications and intelligence drawn from the devices and therefore the network can enable businesses to alter bound basic tasks while not looking at central or cloud-based applications and services.

Technology has changed our lives day by day. The system that was done manually is developed into an automated system that can save time and energy. Temperature and humidity values are important for many types of users or systems such as farmers, offices, cars, humidors, museums, industrial spaces, including a greenhouse. Temperature and humidity values are also useful or weather prediction. In this paper, IoT based temperature and humidity monitoring and control system is proposed. In this system, temperature and humidity values of the environment will be monitored, stored and displayed on the web via the Internet. The stored old values can also be done for predictions.

The square measure even connected footballs that may track however so much associate degree quick they're tossed and documentations via an application for future coaching functions. Intelligence and instincts to a computer. In reality though, it's a tough task to alter computers to acknowledge pictures of various objects.

Devices and objects with intrinsic sensors unit associated to an online of web platforms that merges information from the various devices and uses analytics to share the foremost worthwhile info with implementation to handle specific desires.

These powerful IoT platforms will pinpoint precisely what info is helpful, and what will safely be neglected. This data may be accustomed to notice patterns, create recommendations, and notice attainable issues before they occur.

II. BACKGROUND THEORY

A variety of temperature sensors are available in market which have different characteristics for different application areas. There are two types of temperature sensors: Contact Temperature Sensor and Non-contact Temperature Sensor. Different environmental parameters have to be considered while designing pollution monitoring systems.

A. Temperature and Humidity Sensor

The DHT11 sensor has three parts: a capacitive humidity sensor, a thermistor, and a chip to perform analog to digital conversion and output temperature and humidity in a digital form. That digital signal can be read using microcontroller of any form. Strictly calibration to DHT11 is needed that is extremely accurate on humidity calibration. Those calibration coefficients.

The features of each DHT11 sensors are extremely correct calibration of humidity calibration cell. 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 the user's needs [2].

Specification of DHT11

- Supply Voltage: +5 V
- Temperature range :0-50 °C error of ± 2 °C
- Humidity :20-90% RH ± 5% RH error
- Interface: Digital

B. WIFI Module

Wi-Fi, a popular wireless networking technology uses radio waves to provide wireless high-speed Internet and network connections. Wi-Fi is short for "Wireless Fidelity".

An open source IoT platform, NodeMCU includes firmware running on the ESP8266 Wi-Fi SoC of Esp Systems. That also includes module-based hardware. The Lua scripting language is used which is based on the eLua plan and built on the Espressif Non-OS SDK for ESP8266. There are new MCU bands which based on a Non-Os SDK. Lua-cjson and SPIFFS are used as open source projects.

C. Pin Diagram of Node MCU

Node MCU in Fig.1 provides access to the GPIO (General Purpose Input/Output) and a pin mapping table is part of the API documentation.

I/O index	ESP8266 pin
0 [*]	GPIO16
1	GPIO5
2	GPIO4
3	GPIO0
4	GPIO2
5	GPIO14
6	GPIO12
7	GPIO13
8	GPIO15
9	GPIO3
10	GPIO1
11	GPIO9
12	GPIO10

Fig 1. Pin Diagram for Node MCU

III. BACKGROUND THEORY

Today people want the world on their hands, It outlets the revolutions of computing and smartenvironment. Some technologies like ambient intelligence satisfy the maximum need of smart world butthese technologies are not tightly coupled with internet, so the people need another technology extension. Internet of Things (IoT) is an ideal emerging technology to influence the internet and communicationtechnologies. Simply "Internet of Things" connects "living and nonliving things" through "internet".

Since the concept of Internet of Things is reliability, sustainability, and efficiency by improved access to information, the fundamental services required for performing smart systems are full filed by the current work by providing visibility of sensor data with the help of android application remotely.

The design and construction of PIC based temperature control system with digital readout up to 600° on 2-line 16-character LCD display will be constructed. The output temperature is described as decimal number form. This device can control the temperature of the specific system when the temperature of the system is beyond the specified limit. The permissible maximum temperature can preset by this unit. Setting can be done by using 3x4 keypad and LCD display. The design will be used in the temperature industrial field (eg: crucible furnace, plastic factory and etc) with extension and other standard features. The MPASM assembly language is used in this system [4].

The Things Node waterproof match box full of sensors has been used to sense light, temperature and movement of a particular place and the data through the Gateways to the Things Network (TTN). Devices use low power networks like LoRa WAN to connect to the Gateway, while the Gateway uses high bandwidth networks like WiFi to connect to The Things Network. The updated data from the implement system can be accessible on the TTN console via internet from anywhere in the world and stored database Firebase via Node-Red. And then users can display at sensor information on the smart phone application which is crucial helpful and importance in smart things [5].

The paper [6] describes Thing Speak API (Application Programming Interface) and web service for IoT. Practical examples of ThingSpeak interfacing is provided for the Arduino microcontroller. To communicate with the graphical interface, python script is used. Authors discuss the strengths and weakness of the platform along with its potential applications. The paper suggests ThingSpeak for small hardware projects where dedicated communication server is not practical. But the system necessitates continuous connectivity over the internet.

As a result of both the hardware and software used in this system are fully open source, there is no need to pay even a little and the modification of the system to be updated is quite freely.

IV. IMPLEMENTATION

The implementation of IoT based temperature and humidity monitoring system using Node MCU includes two sections: hardware implementation and software implementation in Fig 2.Basic IoT monitoring system and many other sensors can be replaced for the applications of user requirements like car parking monitoring system, power consumption monitoring, etc. This system to forecast the parameters based on the historical data and to control the room temperature and humidity.

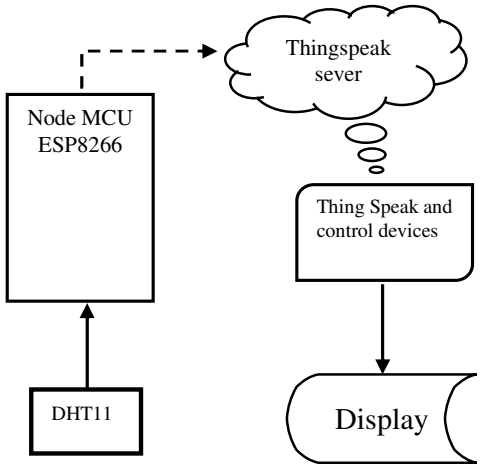

Fig 2. System block diagram.

The main object in temperature system is the reading o temperature value form DHT 11 sensor. The primary use of temperature sensor is that it is the simplest of all the temperature sensors and it has an integrated circuit that gives an output a voltage that is proportional to the temperature in degree Celsius and the sensor itself deals with non-linear effects.

The sensor is directly connected with ESP 8266 controller with WiFi Module and Send data through the gateway via internet to the things speak. The things speak can get the signal from the sensor as variable along the value. After processing, controller will send a cooling or heating signal to the system. A relay is used to control the air conditioning in the room. A transistor is employed

to turn on or off the respective relay. In the mechanism of the control system is utilized to control the heating and cooling devices.

In this system, we will set up the devices connected to a home gateway network. There will also be monitored with a smart phone/tablet and automatically controlled the devices through homegateway network even when the user is outside. The flowchart of the system as shown in Fig 3.

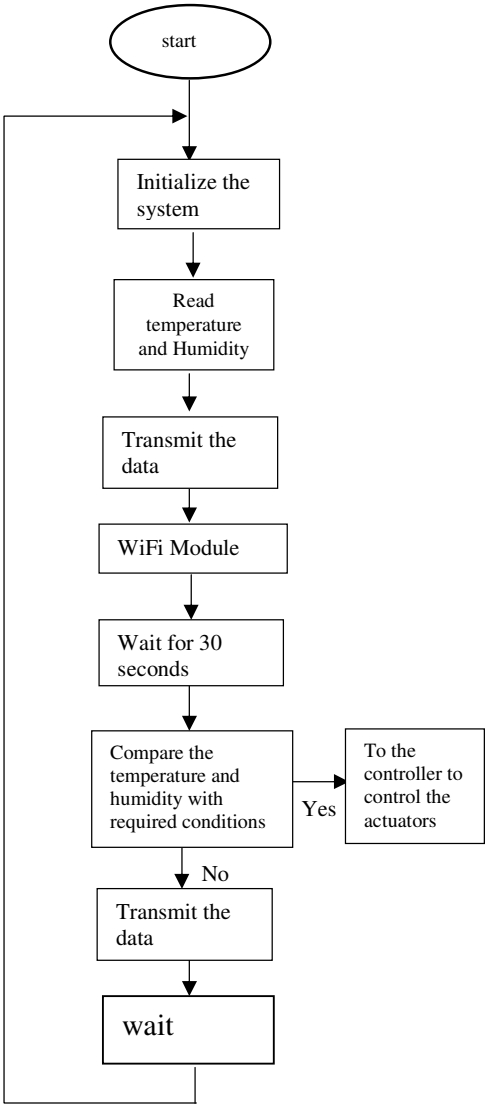

Fig 3. Flow diagram of the proposed model

After observation the condition, the action are going to be set in keeping with the conditions as shown in Table 1. The sensing element information was monitored and supported the information the devices were controlled. The fan, air-condition and alarm were turned on and off in keeping with the environmental conditions and also the alarm was turned on.The data form homes are sent to Thing Speak server using MQTT protocol and was visualized in one channel.

TABLE I. TEMPERATURE AND HUMIDITY CONTROL CONDITIONS

Name	Condition	Action
Fan-On-Low	Temperature>20°C	Set fan status to Low
Fan-On-High	Temperature is between 27°C and 28°C	Set fan status to High
Aircon-On	Temperature≥29°C	Set Aircon On to True
Alarm-On	Humidity ≥ 85	Set alarm On to True

The channel receives sensor data from room at an interval of 30 seconds, and are visualized as line graphs in the channel. If the temperature is greater than the conditions, smart fan and air con will start according to our conditions given from smart phone's web browser. After that, the humidity is also one of the most important thing for health.

Fig 4. The output of the IoT sever and devices of the system.

If a certain kind of humidity is detected, the alarm will start to give us an alarm. The output of the IoT sever and devices are shown in Fig 4.

A. ***Hardware Implementation:***

Hardware requirements: DHT11 – Temperature and humidity sensor, Node MCU – Microcontroller including WIFI module, Router, relay and actuators (Fan, Air-condition and alarm).

B. *Software Implementation*

In software implementation, Thingspeak cloud server is used to store and display the temperature and humidity values. Create new channel in Thingspeak and the API keys will be obtained to add in source code of Node MCU. This will make Node MCU to connect with ThingSpeak.

In this system, the ThingSpeak can get the signal from the sensor as variable along the value temperature and humidity values are displayed in both graphs and numerical values. Temperature and humidity graph of the system on the ThingSpeak as shown in Fig 4(a), (b).

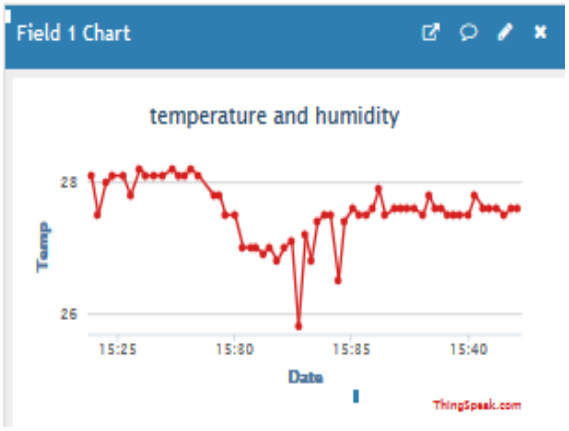

Fig 4(a). Temperature visualized in ThingSpeak.

As this system is IoT based, there will be 30 sec delayed refreshing the live value in Thingspeak.The community was ready to receive information from sensible homes to ThingSpeak platform via MQTT protocol, save the information within the database and visually show within the ThingSpeak webpage.

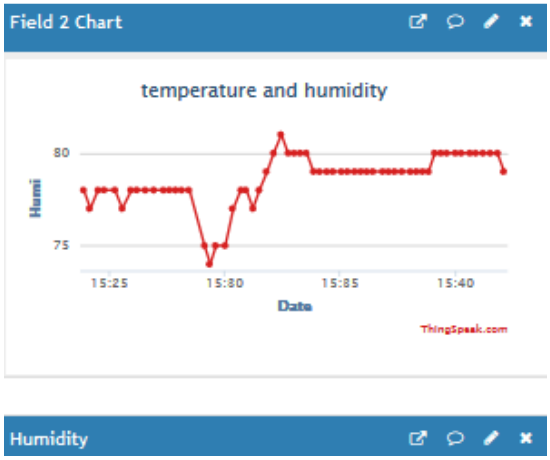

Fig 4 (b). Humidity visualized in ThingSpeak.

V. CONCLUSIONS

This system provides the monitoring access the temperature and humidity values from anywhere with Internet access. This system is useful for many applications like predicting temperature of environment, agriculture, temperature control of data centre and many others. This is the basic of IoTmonitoring system and many other sensors can be replaced for the applications of user requirements like car parking monitoring system, power consumption monitoring, etc. This system to forecast the parameters based on the historical data.

This system can be further expanded to monitor the developing cities and industrial zones for monitoring, collecting the data and analysis.

In this system, temperature and humidity values are displayed in ThingSpeak web browser in this system. This is not easy for users to access this system. So, mobile application should be created for this system by connecting to ThingSpeak cloud server. In this way, users can monitor the temperature and humidity values easily via mobile applications.

ACKNOWLEDGMENT

We express our deep appreciation and sincere thanks to Dr. Saw Sanda Aye, Rector of the University of Information Technology for her extensive personal and professional guidance and life in general. Dr. MyatThida Mon, Dean of Faculty of Computer Systems and Technologies who have been supportive us to pursue those goals.

We are grateful to all of those with whom we have had the pleasure to work during this and other related projects.

REFERENCES

[1] P. Magrassi, T. Berg, "A World of Smart Objects", Gartner research report R-17-2243, 12 August 2002.
[2] www.igcn.gigaku.org.
[3] D.-R. UK, "DHT11 Humidity & Temperature Sensor," 30 July 2010. [Online]. Available: www.droboticsonline.com.
[4] Khin KyawtKyawt Khaing, "PIC-Based Temperature Controller", The Third International Conference on Science and Engineering(ICSE 2011), 2011, Vol-1, page 234-238.
[5] Khin KyawtKyawt Khaing & May Thin Khine, "IoT based Temperature, Movement and Light Monitoring System for Smart Building", MURC 2019, 24th - 25th June 2019, Yangon.
[6] Maureira, M. A. G., Oldenhof, D., &Teernstra, L., 2011, "ThingSpeak–an API and Web Service for the Internet of Things," Available online:http://mediatechnology.leiden .edu/images /uploads/docs/wt2014_thingspeak.pdf, Accessed on 25 March 2018.
[7] https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/
[8] Augusto Casaca, "Internet of Things", IFIP TC6 LATIN AMERICA TUTORIALS IN NETWORKING.
[9] https://www.robot-r-us.com/vmchk/sensor-temp/humid/dht11-temperature-and-humidity-sensor.html.
[10] L. Aosong(Guangzhou) Electronics Co., "Temperature and humidity module DHT11 Product Manual," [Online]. Available: www.aosong.com.
[11] NodeMCu ESP8266 ESP-12E, https:// einstronic.com/wp-content/ …/NodeMCU-ESP-12E-Catalogue.pdf.
[12] Lopez Research LLC, "An Introduction to the Internet of Things (IoT)".

