



# Automated Temperature and Humidity Monitoring and Control System using IoT

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## Abstract:

Internet of Things is an emerging field where the usage of internet extends beyond the World Wide Web. It involves the inter-connection of various things with the help of internet. A method to use IoT for sensing temperature and humidity with the help of scripting using Raspberry Pi is done in this project. The results are obtained and represented. At the end of the section, paper concludes with a Conclusion note. This work is in the form of Review of the existing technology of IoT for sensing and plotting Temperature and humidity. The advantages of Raspberry Pi have been enlisted along with the working methodology. Hence, keeping in mind the versatilities of the IoT, we have implemented the Temperature and Humidity Sensing Model while keeping the basic implementation using software interfacing of Raspberry Pi.

**Keywords:** DHT 11, LED Display, Python, Raspberry Pi, Raspbian,

## I. INTRODUCTION

Automated Temperature and Humidity Monitoring and control is a system that simultaneously and continuously records physical parameters such as temperature, relative humidity at one or more predefined places. Continuous monitoring of any sensitive environment helps to meet security and regulatory compliance needs. Monitoring temperature and humidity conditions is an essential ingredient of a wide range of quality assurance applications. Monitoring deterioration would provide an early warning of incipient problems enabling the planning and scheduling of maintenance programs, hence minimizing relevant costs. Furthermore, the use of data from monitoring systems can be used as an application in various places especially in rural areas.

Temperature and humidity are key issues to be taken care of in manufacturing plants and particularly that of electronic assemblies. Lack of control over any of them will not only affect the component and equipment but also the process and the operators' comfort, all ultimately leading to loss in production. Hence it is extremely important to keep track of the temperature and humidity changes of the surrounding environment.

The aim of this paper is to design and develop a system which fulfils all above requirements. In this paper digital humidity temperature composite (DHT11) sensor is used to sense the environmental temperature and relative Humidity. Raspberry Pi is used to make complex computation of the parameters.

The organization of this document is as follows. In Section 2 (Methods and Material), various materials that are required for this project have been discussed.

Also the methodology used in mentioned. In Section 3 (Result and Discussion), the results of our project are presented. Discussed in Section 4 (Conclusion) is the conclusion of our project.

## II. METHODS AND MATERIALS

We propose to make use of Raspberry Pi technology which will help in monitoring the temperature and humidity it digitally. The humidity and temperature if the current environment will be monitored by a sensor and the information will be passed on to Raspberry Pi, a mini computer which will digitally display the conditions. This system will be space-effective and more accurate compared to the older systems.

### A. DHT11 Sensor

DHT11 is a Humidity and Temperature Sensor, which generates calibrated digital output. DHT11 can be interface with any microcontroller like Arduino, Raspberry Pi, etc. and get instantaneous results. DHT11 is a low cost humidity and temperature sensor which provides high reliability and long term stability.

The DHT11 Humidity and Temperature Sensor consists of 3 main components. A resistive type humidity sensor, an NTC (negative temperature coefficient) thermistor (to measure the temperature) and an 8-bit microcontroller, which converts the analog signals from both the sensors and sends out single digital signal.

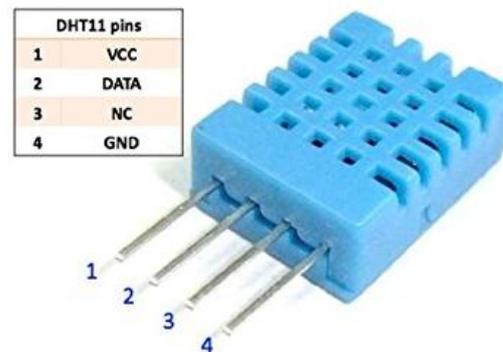


FIG 1 DHT 11 SENSOR

### B. Raspberry Pi

The Raspberry Pi is a low cost, credit-card sized computer which plugs into a computer monitor or TV, and requires a standard keyboard and mouse. It has capability of a little device that allows people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. Its capable of doing everything except a desktop computer to do processing. To use a raspberry pi for various application an SD Card, display and connectivity cables ,keyboard and mouse ,power supply and internet connection are required.



FIG 2 RASPBERRY PI

### C. Raspbian OS

The raspbian operating system is an open source and free operating system which is a Debian based Operating system and it is a primary operating system of Raspberry pi. Raspbian provides the basic set of programs and software utilities for operating Raspberry Pi. It comes with more than 35,000 Raspbian packages which are pre-compiled software, which provides a smooth and error free installation on Raspberry pi. It has a very good community of developers which runs the discussion forms and provides solutions to many relevant problems. However, Raspbian is still under active development with an emphasis on improving the stability and performance of as many Debian packages as possible.

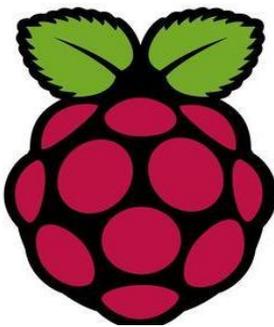


FIG 3 RASPBIAN OS

### D. Python

Recommended language mainly for Raspberry Pi is Python, while Raspberry works on Linux Operating system. Python interpreters allowing Python code to run on a wide variety of systems. Py2exe or PY installer, Python code packaged into stand-alone executable programs for some of the most popular operating systems, so without installing python interpreter these codes can be used easily. Thegithub.com consist of variety of user libraries for working on raspberry using python efficiently. Python is designed to be highly readable Python is a simplest, dynamic, interpreted, object oriented language.

### E. LED Display

LED Display (light-emitting diode display) is a screen display technology that uses a panel of LEDs as the light source. Currently, a large number of electronic devices, both small and large, use LED display as a screen and as an interaction medium between the user and the system. Modern electronic devices such as mobile phones, TVs, tablets, computer monitors, laptops screens, etc., use a LED display to display their output. The biggest advantage of the LED display is its efficient and low-energy consumption. An LED display consists of a number of LED panels that, in turn, consist of several LEDs. The resultant temperature and humidity will be displayed in the LED display.

## III. RESULTS AND DISCUSIONS

Following are the results of automated temperature and humidity monitoring and control system:

### A. Prototype

Given below is the prototype of the automatic temperature and humidity monitoring system.



FIG 4 PROTOTYPE OF AUTOMATIC MONITORING SYSTEM

### B. Graph

The graph of humidity/temperature vs time is as follows:

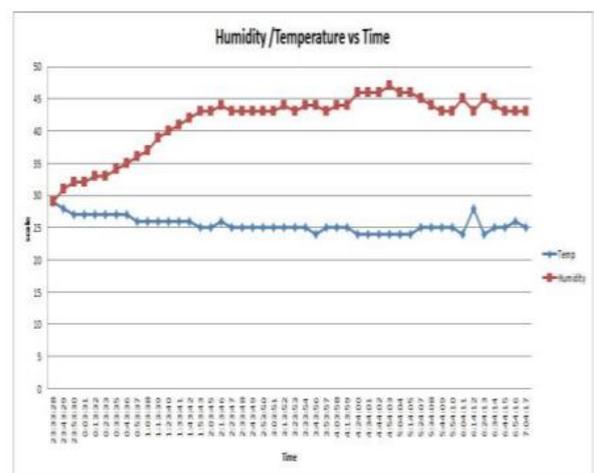


FIG 5. PLOT OF HUMIDITY/TEMPERATURE VS TIME

### C. System Architecture

The system architecture diagram consists of the following components:

1. Temperature Sensor
2. Humidity Sensor
3. Raspberry Pi
4. Display
5. Transmitter
6. Receiver

All the components together constitute the automatic temperature and humidity monitoring system.

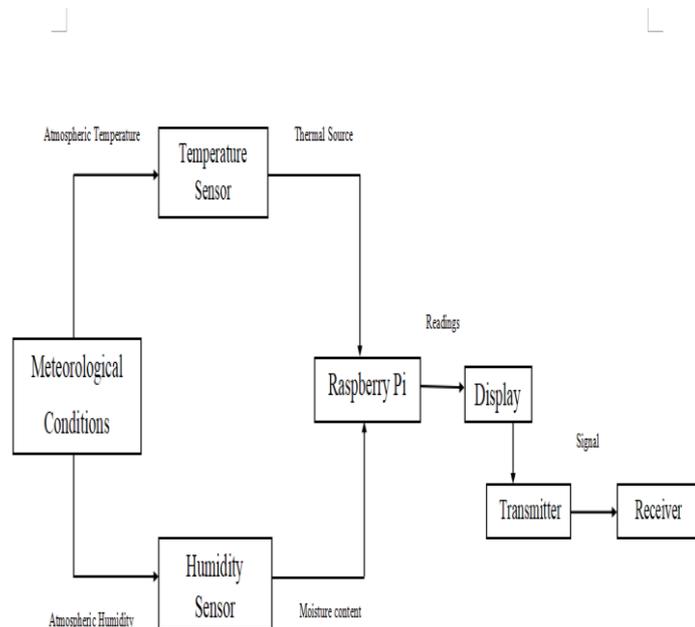


FIG 6 SYSTEM ARCHITECTURE DIAGRAM

### IV. CONCLUSION

Thus hereby we conclude that the proposed system removes all the drawbacks of the existing system. The temperature and humidity displayed is of greater accuracy and the system is more cost effective. The existing technology has been implemented more effectively to ensure that the user receives accurate information, regarding the current temperature and humidity.

### V. REFERENCES

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