

Using Raspberry Pi to Sense Temperature and Relative Humidity

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ABSTRACT: Weather monitoring plays a very important role in human life hence studies of weather system is necessary. In industrial areas, maintaining temperatures plays an important role. If we have high temperature in industrial areas, It may lead to disaster. In order to avoid such conditions, we can smart weather monitoring and prediction system. By using this project we can monitor and predict the temperature regularly. Whenever it detects high temperatures, automatically it will ring the buzzer, and also we will get notifications to our mobile phone .we also have an feature that predict the temperature. For every 5-10 second, this system will predict the temperature. In this project we are using Raspberry pi, DTH 11 sensor, buzzer, pushover app for notifications and also 16*2 LCD.

KEYWORDS: Python, Raspberry pi, DTH11 temperature sensor, 16*2 LCD

I. INTRODUCTION

In this 21st century, weather monitoring holds great importance and have uses in several areas ranging from keeping track of agricultural fields weather conditions to industrial conditions monitoring. Weather monitoring would help in keeping track of different climate behaviors including temperature, humidity and light intensity. Weather monitoring system can be either wired or wireless one. In case of wireless communication, the connectivity will be more convenient and user friendly and weather monitoring would not required physical presence of the person at the location. Wireless communication is the transfer of information over a distance without the use of wires. The distance involved may be short or long. In this project we are using pushover app to get notifications whenever the temperature is high. The wireless weather monitoring system basically requires few basic modules such as GSM module, display module, and microprocessor module.

RASPBERRY PI 3

Raspberry pi is a credit card size world smallest CPU. Raspbian is the operating system of raspberry pi. Raspberry having 40 pins 40 pins are classified into four types they are voltage pins, ground pins, reserved pins, GPIO PINS.

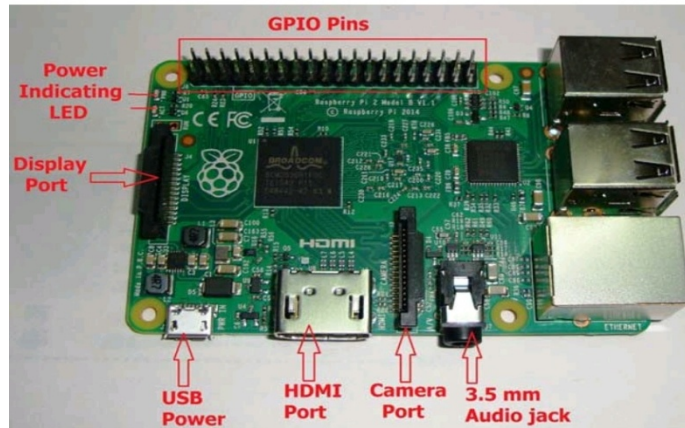


Figure: Raspberry pi

Just add a keyboard, mouse, display, power supply, micro SD card with installed linux distribution and you will have a fully fledged computer that can run applications from word processors and spreadsheets to games. As the Raspberry pi 3 supports HD video, you can even create a media centre with it. The raspberry pi 3 models B is the first Raspberry pi to be open-source from the get-go, expect it to be the defacto embedded linux board in all the forms. Raspberry pi a dynamic micro controller and runs with the python programming language. It has capability of a little device that allows people of all ages to explore computing. The raspberry pi has the ability to interact with the outside world, and has been used in a wide array projects like smart home monitoring system wireless motion sensor activated light and many more.

II. BLOCK DIAGRAM

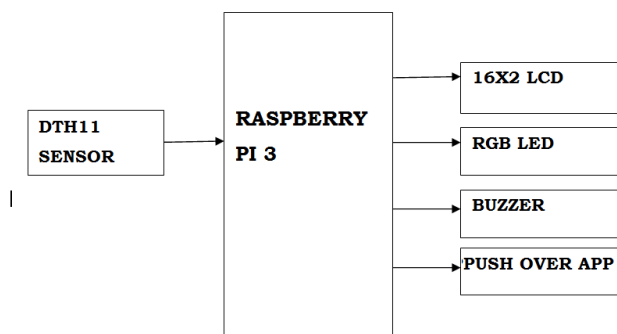


Figure: Block diagram of smart weather monitoring and prediction system

The proposed method aims at continuously monitoring the real time temperature and relative humidity in a cost effective way by polling sensor at fixed interval of time. Here the monitoring node is raspberry pi. The sensor utilized here is DTH11 temperature /Humidity Sensor. The sensor is connected to the raspberry pi kit using jumper wire. The raspberry pi kit can be used to store and display the real time temperature and relative humidity.

The block diagram of the proposed method is shown in figure. The temperature is displayed in degree Celsius or Fahrenheit as required. To know the current temperature and relative humidity at remote location, the user can log in on web applications after entering the password by the user. Web applications opens after entering password and with the output graphical representation can also be obtained. Raspberry pi processed data will be updated continuously on cloud server and user will get to know the stored data on hourly and daily basis. Wireless wifi is attached so that it

fetches data with the help of internet and user can access or control temperature and humidity from any part of the world.

III. METHODOLOGY

First of all raspberry pi has to be prepared and for that we require pushover. Pushover, short for new out of the box software. It is an operating system manager that makes it easy to download, install, and setup your raspberry-pi. When you first boot up pushover, you will get a selection of OSES to choose from. Pushover makes getting started with pi easy, and includes a bunch of different operating systems to choose from. The raspberry pi itself doesnot come with an operating system, we need to select it while booting of pushover. Raspbian has been the standard raspberry pi operating system. Raspbian is a version of linux built specifically for the Raspberry pi. Here Raspberry pi 3 model b has been used.

Jumpers: Jumper wires are used on breadboards to 'jump' from one connection to another. The ones you will be using in this circuit have different connectors on each end. The end with the 'pin' will go into the Breadboard. The end with the piece of plastic with a hole in it will go onto the Raspberry Pi's GPIO pins

PUSH OVER INSTALLATION

1. On your mobile device, open Pushover app and log into your account. You will be asked to register your device by providing a name for it.
2. Visit <https://pushover.net> on your computer and log into your account. You should see your devices listed in a section called Your Devices, a little way down the page. Verify that the devices you have registered are on this list and are enabled.
3. Note down your user (like,uyaa3u82r6rw853a2zhwj7afyxq4ba). You will need it for your Python code.
4. To get API key, click on Your Applications (doorbell) and note down your API token (like, au3kybdp4bmv3xs3qp1prku7pcrp9r).
5. Under Settings in Pushover, you can set an audio alert for quiet hours, etc for your mobile as per your requirement

4.2 Download the python program that will poll the sensor DTH11.

Dth11 is used for monitoring temperature and humidity using the dth11 sensor, once your raspberry pi is up and running we setup python to talk to the GPIO pins. The GPIO pins are our interface to the dth11 temperature/humidity sensor. Not all the libraries we need to make this project are pre-loaded on the raspberry pi. We require the adafruit GPIO python library and the adafruit dth11 library.

About GPIO pins

We are keeping the circuit simple and building directly to the raspberry pi using our components and jumper wires. Before connecting anything to your raspberry pi, disconnect the power.

Warning – you can destroy your Raspberry pi with a short circuit from a wrong connection. Just be careful and double check everything before powering back on.

All the connections were carefully checked and connected. Since, a little careless mistake may short-circuit the RaspberryPi circuit. The DHT 22 has 4 pins. Pin 1 is vcc , Pins 2 is Data, pin 3 is NOT used, pin 4 is Ground.

Raspberry Pi 3 GPIO Header

Pin#	NAME		NAME	Pin#
01	3.3v DC Power		DC Power 5v	02
03	GPIO02 (SDA1 , I ² C)		DC Power 5v	04
05	GPIO03 (SCL1 , I ² C)		Ground	06
07	GPIO04 (GPIO_GCLK)		(TXD0) GPIO14	08
09	Ground		(RXD0) GPIO15	10
11	GPIO17 (GPIO_GEN0)		(GPIO_GEN1) GPIO18	12
13	GPIO27 (GPIO_GEN2)		Ground	14
15	GPIO22 (GPIO_GEN3)		(GPIO_GEN4) GPIO23	16
17	3.3v DC Power		(GPIO_GEN5) GPIO24	18
19	GPIO10 (SPI MOSI)		Ground	20
21	GPIO09 (SPI MISO)		(GPIO GEN6) GPIO25	22
23	GPIO11 (SPI CLK)		(SPI_CE0_N) GPIO08	24
25	Ground		(SPI_CE1_N) GPIO07	26
27	ID_SD (I ² C ID EEPROM)		(I ² C ID EEPROM) ID_SC	28
29	GPIO05		Ground	30
31	GPIO06		GPIO12	32
33	GPIO13		Ground	34
35	GPIO19		GPIO16	36
37	GPIO26		GPIO20	38
39	Ground		GPIO21	40

Rev. 2
29/02/2016

www.element14.com/RaspberryPi

Python: Also other languages like c language, c++,JAVA can be used but python is used for current applications it has following advantages:

Python programs are typically 3-5 times shorter than equivalent java programs. This difference can be attributed to Python's built-in high-level data types and its dynamic typing. Python is designed to be highly readable. Python is a simplest, dynamic, interpreted, object oriented language. Python interpreters allowing Python code to run on a wide variety of systems.

Applications

Temperature sensors are used in food and pharmaceutical industries

It is used in large boilers

It is also used in coal mines

International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

Volume 8, Special Issue 1, March 2019

7th National Conference on Frontiers in Communication and Signal Processing Systems (NCFCSPPS '19)

19th-20th March 2019

Organized by

Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India

It is also used in air conditioners to measure temperature.

IV. CONCLUSION

This paper is very useful for industrial Applications where constant monitoring of temperature is required. We use DHT11 sensor to sense temperature and humidity values from the surroundings. Whenever the temperature value exceeds the maximum limit (which is set by us) then the alarm will ring. And also the notification will be sent to the person incharge by using pushover app. One more feature of this project is, the RASPBERRYPI can predict the temperature based on existing values.

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