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1. Abstract:

This report presents the detection of real time temperature and relative humidity employing raspberry pi. This is a raspberry pi based temperature and humidity logger that uses DHT11 sensor for measurement and it is unique as it not only reads temperature from sensor but also stores data in excel data sheet(LibreOffice Calc) and provide means to read that temperature data with any web enabled device (Computer, Phone)web browser. Python and C language are used.

2. Introduction:

Temperature has an impact on almost all the activities surrounding us. A precise determination of temperature and more importantly relative humidity is a vital factor in countless industries and different fields of science. Analog and digital Temperature sensors are available for sensing temperature for commercial purpose. Temperature sensors possessing temperature-dependent properties that can be measured electrically contain resistors, semiconductor mechanisms such as diodes, thermocouples, thermistors.

This project aims at monitoring the real time temperature and relative humidity in a cost effective way. Here the monitoring node is raspberry pi. Programming language used for raspberry pi is Python & C. The Sensor utilized here is DHT11 temperature sensor. The sensor is interfaced with the raspberry pi using jumper wires. The temperature is sensed using the sensor DHT11 and is read, stored and displayed by the raspberry pi kit.

2.1 Raspberry Pi 3 B+:

The latest Raspberry Pi 3 Model B+ has a faster 64-bit 1.4GHz quad core processor, 1GB of RAM, faster dual-band 802.11 b/g/n/ac wireless LAN, Bluetooth 4.2, and significantly faster 300Mbit/s Ethernet.

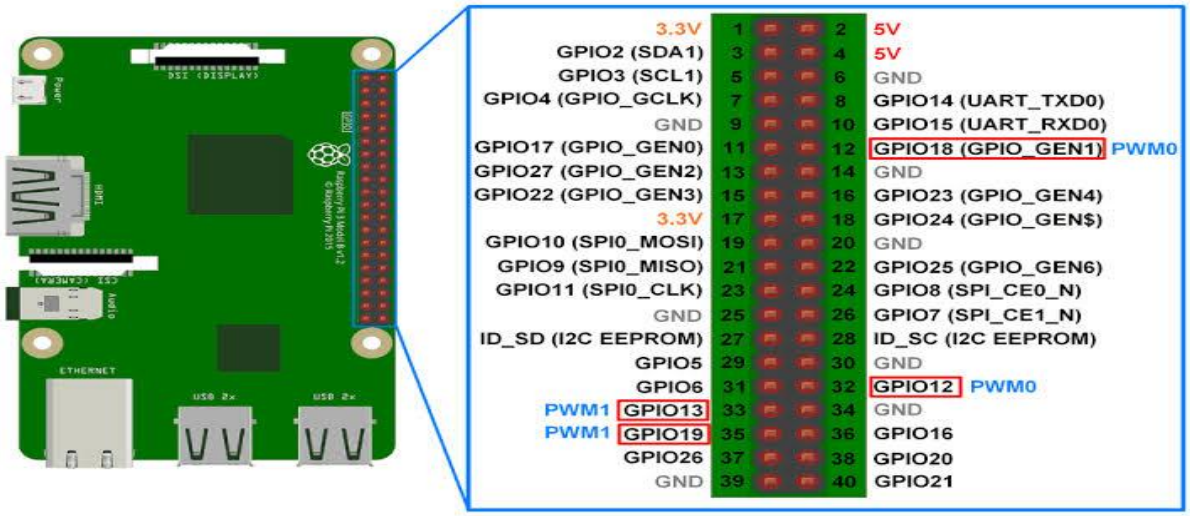


Fig.01. GPIO Pin Diagram of Raspberry Pi 3 B+ Model

2.2 Why Raspberry PI is better:

This project can be done by using Arduino. But here we have used Raspberry Pi instead of Arduino because The Raspberry Pi is 40 times faster than an Arduino when it comes to clock speed. Even more seemingly damning for Arduino, Pi has 128,000 times more RAM. The Raspberry Pi is an independent computer that can run an actual operating system in Linux. It can multitask, support two USB ports, and connect wirelessly to the Internet whereas Arduino has one USB port for only one input. In short, it's powerful enough to function as a personal computer (though not powerful enough to compete with your Mac or PC). These advantages cannot be get from an Arduino. That is why, we have used Raspberry PI in our project.

2.3 DHT11 Temperature and Humidity Sensor:

The DHT11 temperature and humidity sensor is a nice little module that provides digital temperature and humidity readings. It's really easy to set up, and only requires one wire for the data signal. These sensors are popular for use in remote weather stations, soil monitors, and home automation systems.

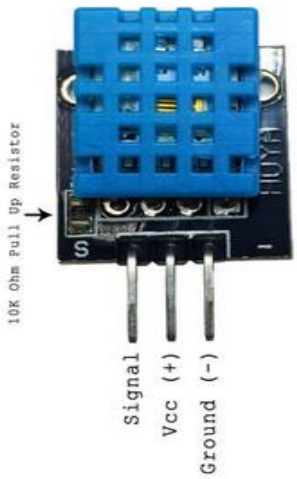


Fig.02. 3 Pin DHT11

3. Component List:

1. Raspberry Pi-

   I. SD Card
   II. USB Cable
   III. USB Power Supply
   IV. Monitor

2. Breadboard

3. DHT11

4. Male to Male and Male to Female Jumper Wire

4. Cost Estimation:

Component Name	Quantity	Total Price(Tk)
Breadboard	1	90
DHT11	1	90
Male to Male and Male to Female Jumper Wire	2 sets	100

We have used Raspberry PI 3 B+ with necessary components (monitor, SD card, USB Cable, USB Power Supply) from the department.

5. Working Methodology:

We have started our project in a raspberry Pi which has been already set up. We have taken the following steps to complete the project:

- **Step 1**:
  Installation of Wiring Pi
  Installing Wiring PI by the following code:
  sudo apt-get install git-core
- **Step 2:**
  Ensuring the installation of Wiring Pi
  Checking whether the Wiring Pi has been installed or not by writing this code on the Terminal:
  gpio –v
  gpio readall
  Writing this code, we have obtained the following output:

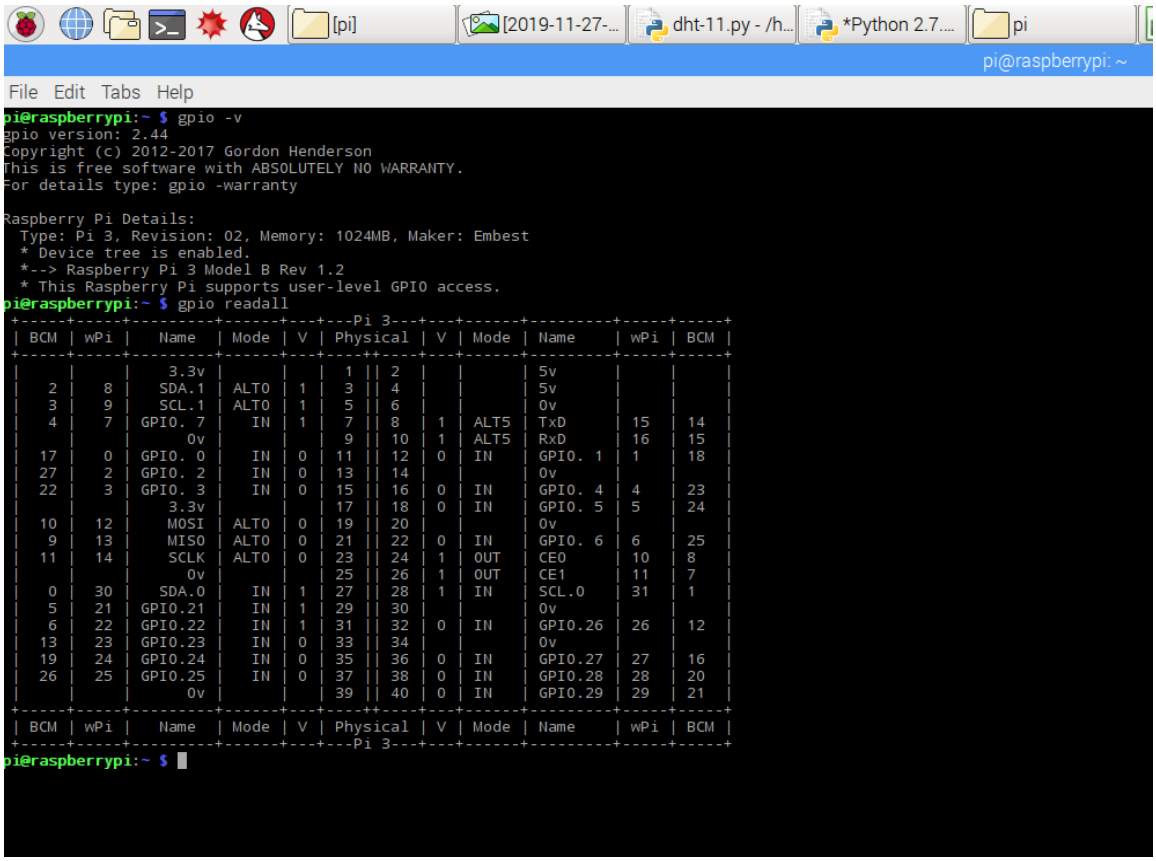


Fig.03.Checking installion of Wiring PI

- **Step 3**:
  Code of DHT-11
  We have saved the code of DHT11 in C language in “home-py” as “project.c” which has been saved in Wiring Pi as Project. We can check the file in the terminal by the command “ls” and get the following output:

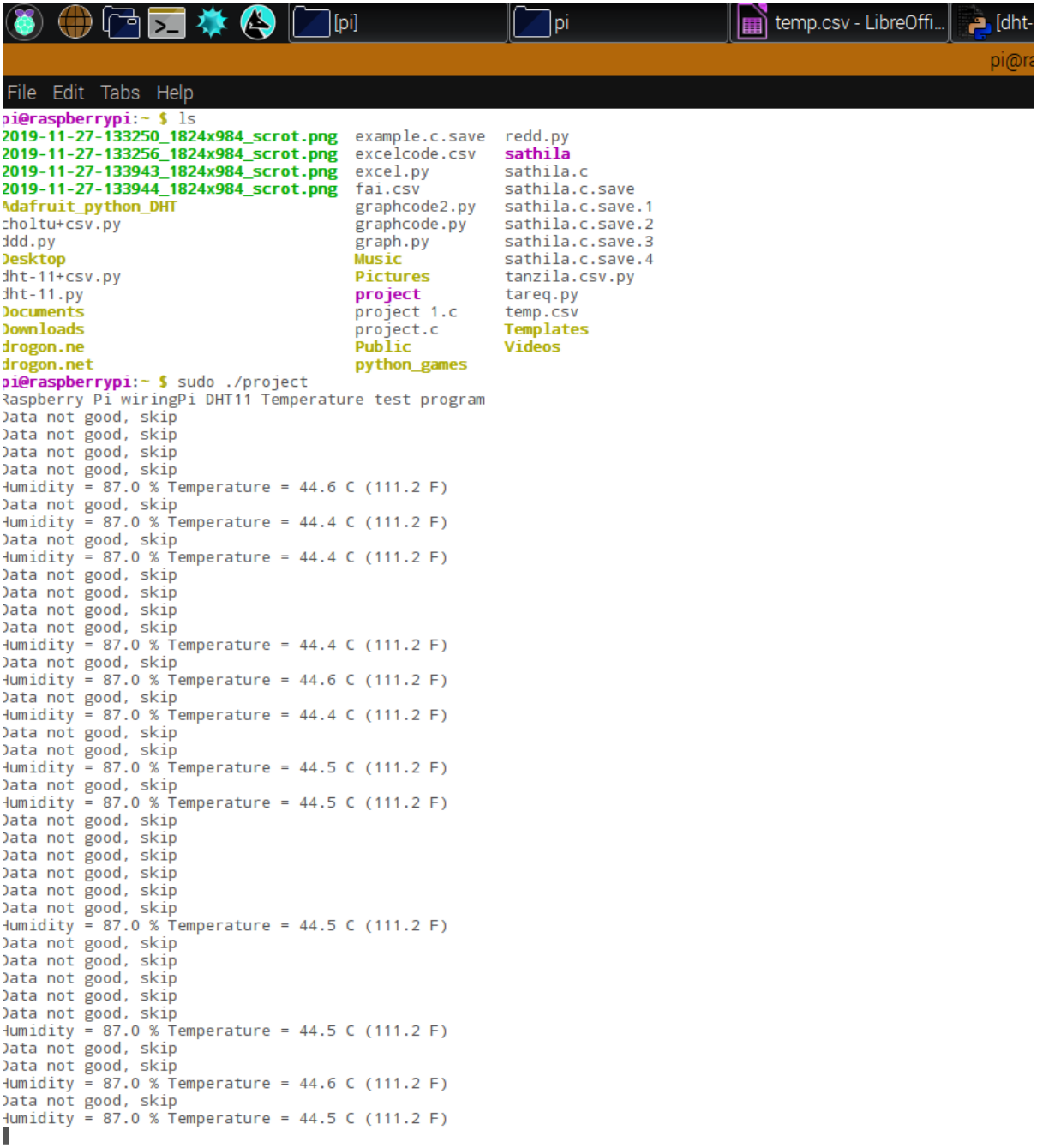


Fig.4: Data of Temperature and Humidity

- **Step 5:**

  Installing Adafruit DHT11

  We have installed Adafruit DHT11 to code python 2.7.9. And confirmed installation by typing import Adafruit_DHT and get the following output.

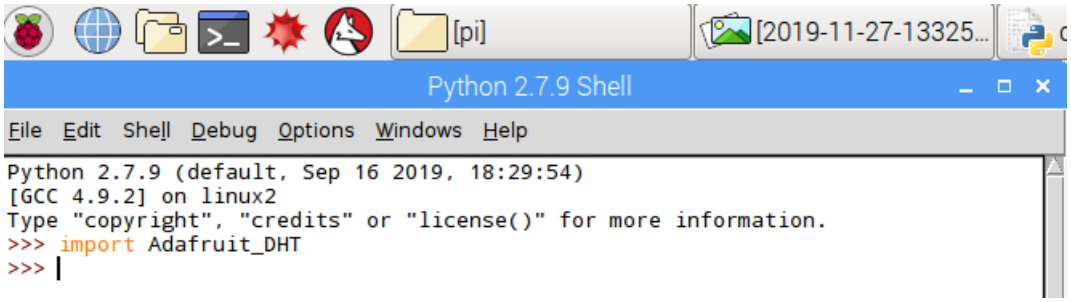


Fig.05. Confirming the installation of Adafruit_DHT

As there is no error, we are confirmed that the installation has been completed successfully.

- **Step 6:**

  Creating csv file

  To complete this step we have coded in python and created a csv file named "temp.csv".

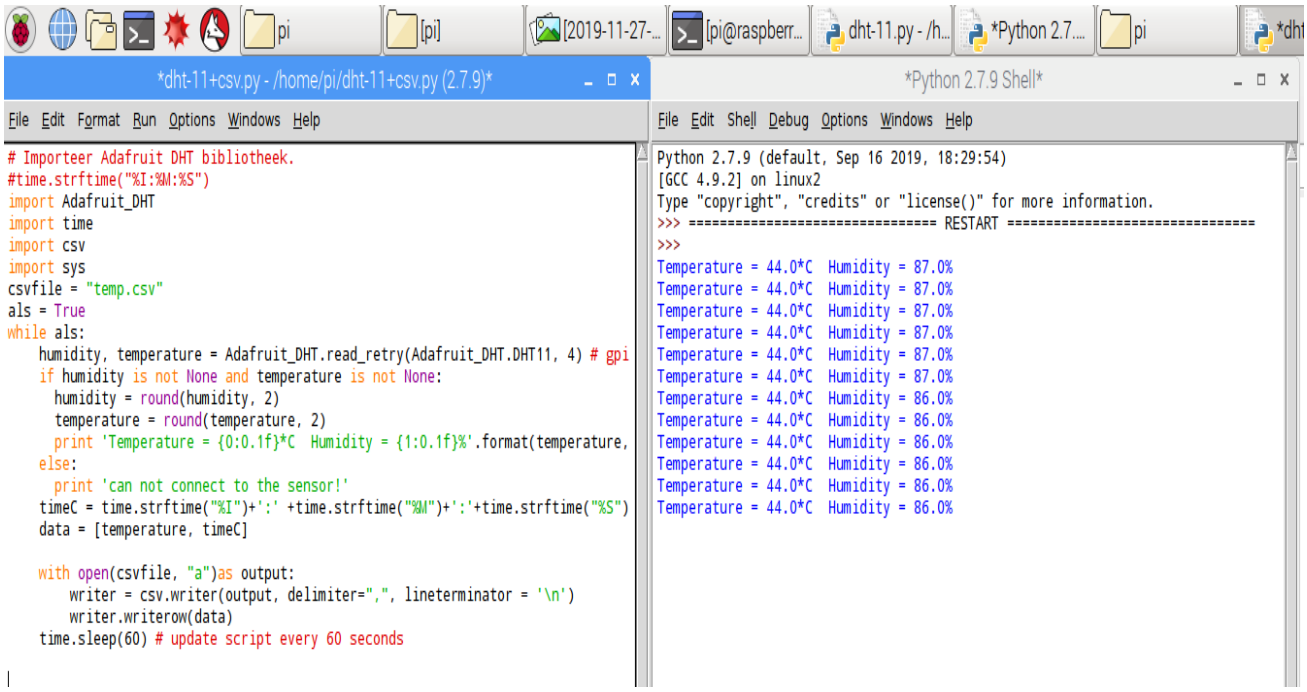


Fig.06. Creating csv file

- **Step 7:**
  Opening temp.csv in Excel sheet

For this we have to open the temp.csv in “LibreOffice Calc” and got the temperature data with respect to time. And our output is shown below:

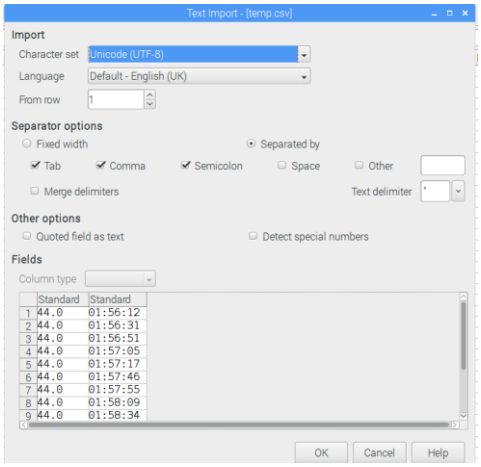


Fig.07. Opening temp.csv in Libreoffice calc

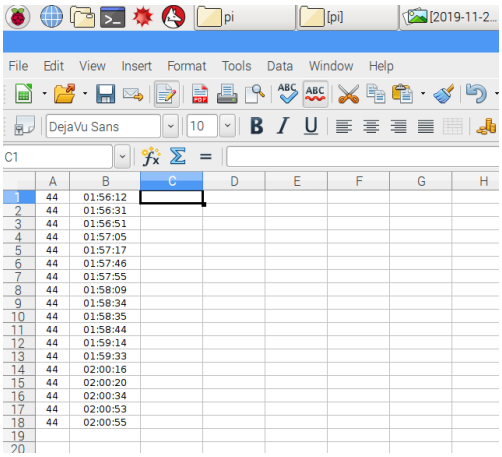


Fig.08.Temparature in the Excel sheet w.r.t. Time

6. Application:

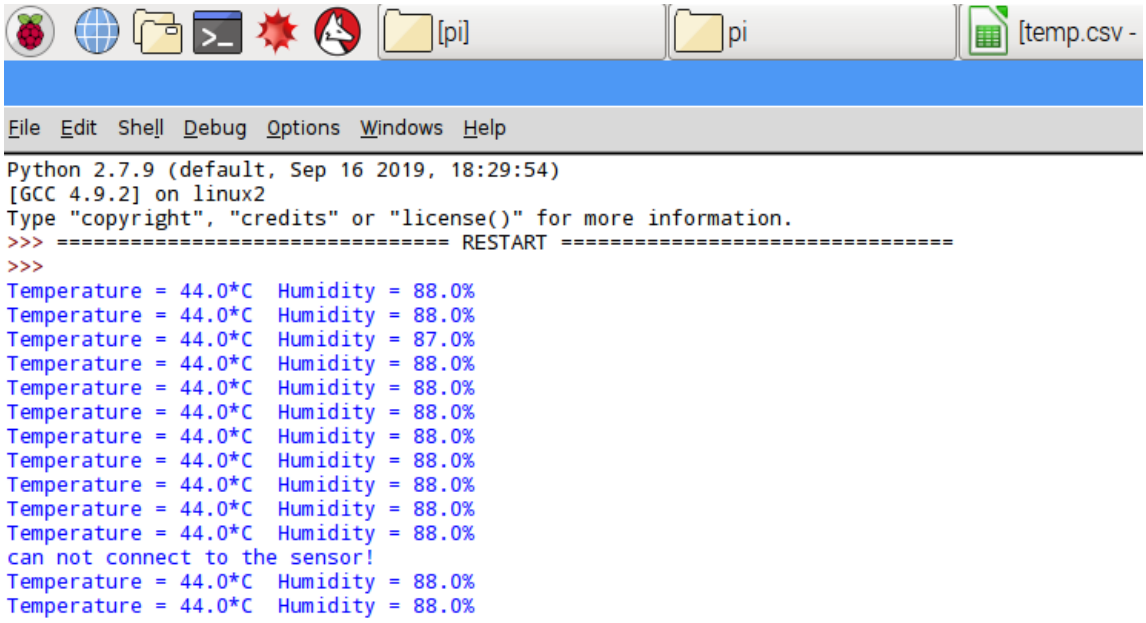
The temperature monitoring is crucial in lot of industries, like food industry, the workshop and pharmaceutical industry. This project aims at monitoring the real time temperature and relative humidity in a cost effective way.

7. Future Development:

Our next plan with this project is to upload our data in a website. The website will automatically update and anybody can access this website for monitoring temperature and humidity of any random time. Besides, the record of the temperature will also be available in the website with respective date and time. Furthermore we can build up our project in a wide range by which we can monitor temperature and humidity over a large area in such a manner that weather stations can use our website.

8. Conclusion:

Our purpose of this project is to sense the temperature and humidity using Raspberry Pi. We have used temperature and humidity sensor DHT11 for monitoring temperature and humidity for our room and collected data for every one minute and showed in an excel sheet. Though the sensor can able to monitor almost actual humidity of the room, it cannot detect the temperature properly.



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By observing error of the temperature we are assuming that there is a slight defect in our temperature sensor DHT11. We can overcome this error by using DHT22 which can give us more accuracy but this sensor is more expensive.

9. References:

1. **http://wiringpi.com/**
2. **https://www.youtube.com/watch?v=PNbsyHocM2U&feature=youtu.be**
3. **https://www.youtube.com/watch?v=DPvxsHoD7kc&feature=youtu.be**