

Regularity (2)	Content (4)	Viva-voce (2)	Timely Submission (2)	Total (10)	Dated Sign of Subject Teacher

Assignment No. 03

Date of Performance:

Title: Open source prototype platform- Raspberry-Pi/Beagle board/Arduino - Simple program digital read/write using LED and Switch - Analog read/write using sensor and actuators.

Objective: To get knowledge for communicating with objects using sensors and actuators.

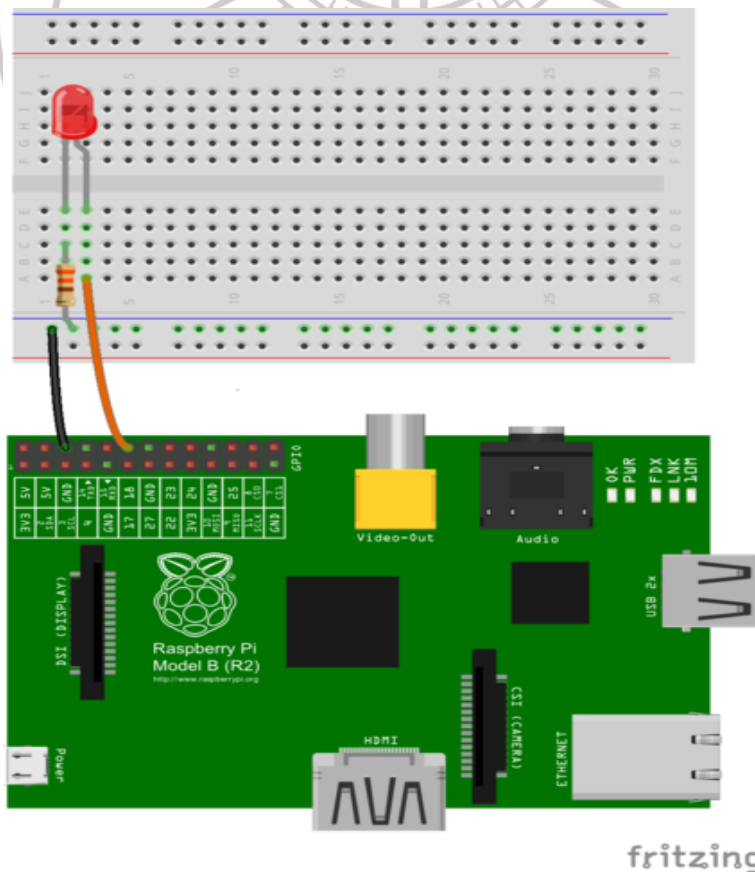
Theory:

An application of blinking LEDs using Raspberry Pi

In this assignment, we will learn how to interface an LED with Raspberry Pi. To implement this, we will gather the requirements and follow the instructions given below.

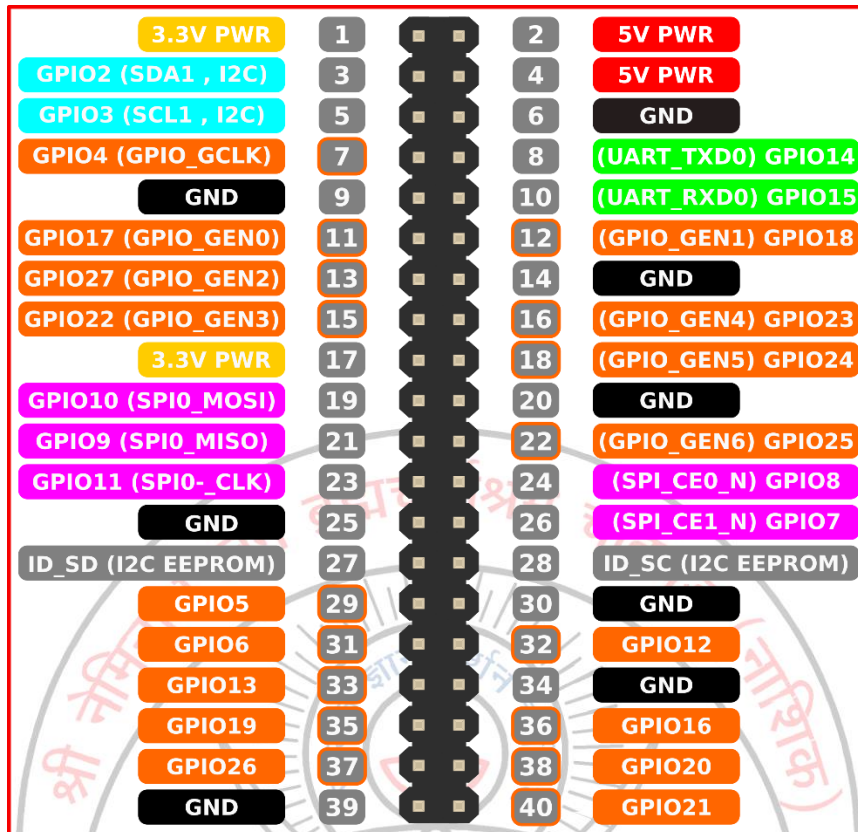
Requirements:

1. Raspberry Pi3 Kit
2. Breadboards
3. LEDs
4. Jumper wires



Instructions to Glow LED:

Use GPIO diagram of Raspberry Pi, which will give you understanding of GPIO structure.

**Algorithm:**

1. Connect GPIO 18 (Pin No. 12) of Raspberry Pi to the Anode of the LED through connecting jumper wires and Breadboard.
2. Connect Ground of Raspberry Pi to Cathode of the LED through connecting wires and breadboard.
3. Now power up your Raspberry Pi and boot.
4. Open terminal and type `nano blinkled.py`
5. It will open the nano editor. Use following pseudo code in the python to blink LED and save

```
import RPi.GPIO as GPIO
import time
GPIO.setmode(GPIO.BCM)
GPIO.setup(18, GPIO.OUT)
while True:
    GPIO.output(18, GPIO.HIGH)
    time.sleep(1)
    GPIO.output(18, GPIO.LOW)
    time.sleep(1)
```

6. Now run the code. Type `python blinkled.py`
7. Now LED will be blinking at an interval of 1s. You can also change the interval by modifying `time.sleep` in the file.
8. Press Ctrl+C to stop LED from blinking.

An application to read the environment temperature and humidity & display it.

In this assignment, we will learn how to find environment temperature and humidity using DHT11 sensor and Raspberry Pi.

Temperature and Humidity Sensor- DHT11

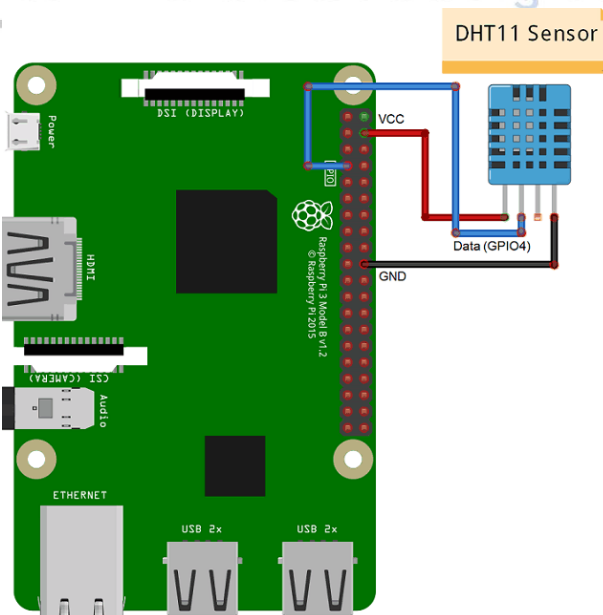
- It's a very basic and slow sensor, easy to use for small scale.
- The DHT sensors are made of two parts, a capacitive humidity sensor and thermistor.
- There is also a very basic chip inside that does some analog to digital conversion and spits out a digital signal with the temperature and humidity.
- The digital signal is fairly easy to read using any microcontroller.
- These sensors are frequently used in remote weather stations, soil monitors, and home environment control systems.

Features of DHT11 Sensor: -

- Ultra-low cost
- 3 to 5V power and I/O
- 2.5mA max current use during conversion (while requesting data)
- Good for 20–80% humidity readings with 5% accuracy
- Good for 0–50°C temperature readings $\pm 2^\circ\text{C}$ accuracy
- No more than 1 Hz sampling rate (once every second)
- Body size 15.5mm x 12mm x 5.5mm
- 4 pins with 0.1" spacing

Requirements:

1. Raspberry Pi3 Kit
2. Breadboards
3. DHT11 Sensor
4. Jumper wires



Algorithm:

1. Connect GPIO 18 (Pin No. 12) of Raspberry Pi to the Data pin of DHT11 sensor through connecting jumper wires and Breadboard.
2. Connect Power (5V) and Ground of Raspberry Pi to DHT11 sensor through connecting wires and breadboard.
3. Now power up your Raspberry Pi and boot.
4. Download Adafruit_Python_DHT.tar.gz package
5. Open terminal and type *tar -xvzf Adafruit_Python_DHT.tar.gz* command to extract Adafruit package.
6. In the same terminal, type *nano temp.py*
7. It will open the nano editor. Use following pseudo code in the python to blink LED and save

```
import Adafruit_DHT as dht
import time

while True:
    hum, temp = dht.read_retry(11,18)
    print "Temp: ", temp
    print "Hum: ", hum
    time.sleep(1)
```

8. Now run the code. Type *python temp.py*
9. Now temperature and humidity will be displayed at an interval of 1s. You can also change the interval by modifying *time.sleep* in the file.
10. Press Ctrl+C to stop displaying temperature and humidity.

Conclusion: - Thus, we have studied how to monitor LEDs and measure temperature and humidity in the environment using DHT11 sensor and Raspberry Pi 3.

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