

Aim:- Understanding the connectivity of Raspberry-pi with temperature sensor.

Problem Statement:- Understanding the connectivity of Raspberry-pi circuit with temperature sensor. write an application to read the environment temperature. If the temperature crosses a threshold value generate alerts using LED.

Theory:-

Temperature sensor - DHT11

- The DHT11 temperature and humidity sensor is a nice little module that provides digital temperature and humidity readings. It only requires one wire for the data signal.
  - These sensors are frequently used in remote weather stations, soil monitors and home environment control systems. The programming is simple too, and many libraries.
- The DHT11 contain a surface mounted NTC thermistor and a resistive humidity sensor. An IC on the back of the module converts the resistance measurements from the thermistor and the humidity sensor into digital outputs of degrees Celsius and Relative Humidity.
- It has ultra low cost, require 3 to 5V power and I/O. It require 2.5mA max current use during conversion. It has 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. Body size 15.5mm x 12mm x 5.5mm. 4 pins with 0.1" spacing Temperature Sensor - DHT11.

Circuit Diagram - DHT11.

VCC of DHT11 → 5V Pin of Raspberry Pi 3

- GND of DHT11 → GND Pin of Raspberry Pi 3
- Signal pin of DHT11 → GP10 4 pin of Raspberry Pi 3.

- Programming the DHT11 in python.

- We will be using the Adafruit DHT11 python library. We can download the library using git, so if you don't have Git installed on your Pi already, enter this at the command prompt: `sudo apt-get install git-core`.

Note: If you get an error installing Git, run `sudo apt-get update` and try it again.

Install the Adafruit DHT11 library.

1. Enter this command prompt to download the library:  
`>>> git clone https://github.com/adafruit/Adafruit_Python_DHT.git`
2. Change the directions with: `cd Adafruit_Python_DHT`
3. ENTER this: `Sudo apt-get install build-essential python-dev`
4. Install the library with: `Sudo python setup.py install`

Conclusion:- Successfully implemented read temperature and humidity.



**Aim:-** To understand connectivity of Raspberry-pi circuit with IR sensor.

**Problem statement:-** Understanding the connectivity of Raspberry-pi circuit with IR sensor. Write an application to detect obstacle and notify user using LED.

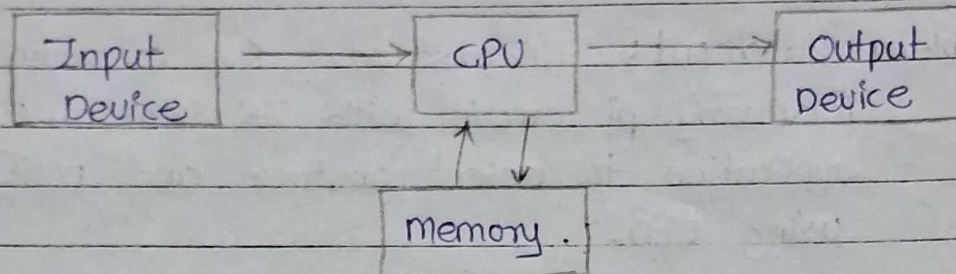
**Objectives:-**

1. To acquire knowledge for Internet of thing.
2. To be able to interface different sensor with Raspberry-pi circuit.

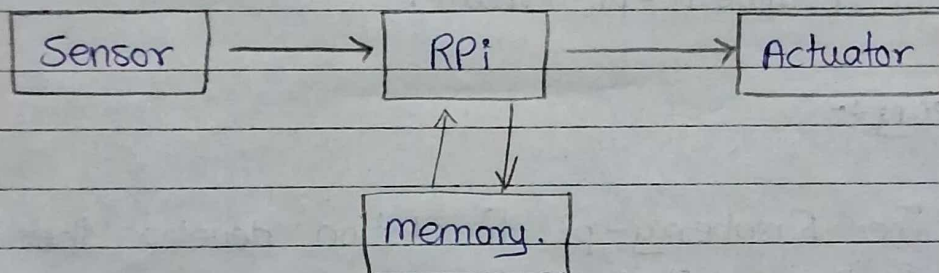
**Theory:-**

- The Raspberry-pi Foundation develops the Raspberry-pi in the United Kingdom.
- These boards are approximately credit card sized.
- Raspberry pi world is most expensive and powerful single board computer.
- Raspberry pi runs Debian based GNU/Linux operating system called Raspbian and ports of many other OS exist for Raspberry Pi.
- Python language is popular for programming Raspberry-pi.
- The first generation (Raspberry pi 1 model B) was released in February 2012.
- Then the Raspberry pi hardware was evolved through several versions that feature variations in memory capacity and peripheral-device support.

- Basic Interfacing.  
General Computer Architecture.



- RPi Embedded System architecture.



- Sensors.

- A sensor or a detector is a device that is used to convert a physical parameter into a signal that can be measured or monitored.
- For example, GAS sensor monitors gas concentration and converts into electrical signal that can be measured.
- The input parameter can be different like light, temperature, humidity pressure etc. but the output is generally a human readable or electrically monitorable.



- According to Oxford dictionary, definition of sensor is "A device which detects or measures a physical property and records, indicates, or otherwise responds to it".
- Meaning of sensor is "A sensor is an object whose purpose is to detect events or changes in the environment, and then provide a corresponding output."

### Types of sensors.

- A sensor is classified based on various aspects such as -
  - Application based industrial sensor, automotive sensor etc.
  - Output based: Resistive output, Differential output, voltage output, etc.
  - Parameter sensing based light, Temperature Sound, Gas, etc.

### • Commonly used sensors

Light Sensor	Temperature sensor	Proximity sensor	Pressure Sensor	GAS sensor.
Current Sensor	Sound sensor	Tilt sensor	Hall effect sensor	Level sensor.
Accelerometer sensor	Color sensor	Flow sensor	Humidity sensor	motion sensor.
Speed sensor	RPM sensor	Force sensor	Flame sensor	-



## Actuator.

- An actuator is a component of a machine that is responsible for moving or controlling a mechanism or system.
- An actuator requires a control signal and a source of energy. The control signal is relatively low energy and may be electric voltage or current, pneumatic or hydraulic pressure or even human power.
- When the control signal is received, the actuator responds by converting the energy into mechanical motion.
- Following basic actuators are used for signaling and output purpose:
  - LED - RGB Red Buzzer,
  - Servo motor,
  - DC motor, Relay.
- GPIO modes.
  - The GPIO\_BOARD option specifies that pins referring by the number of the pin the plug - ie the numbers printed on the board (eg. Pi) and in the middle of diagrams.
  - The GPIO\_Bcm option means that pins referring by the 'Broadcom SOC channel' number, these are the numbers after 'GPIO' in the green rectangles around the outside of the diagram.
  - Unfortunately, the Bcm numbered changed between versions of the pi1 model B.
    - The model B+ uses the same numbering as the model B v2.0 and adds new pins



- The Raspberry Pi zero, Pi 2B and Pi 3B use the same numbering as the B+.

- Registers.

- Always use the resistor to connect LEDs up to the GPIO pins of the Raspberry Pi
- The Raspberry Pi can only supply a small current (about 50mA).
- The LEDs will want to draw more, and if allowed to they will burn out the Raspberry Pi
- Therefore putting the resistors in the circuit will ensure that only this small current will flow and the Pi will not be damaged.
- Resistors are a way of limiting the amount of electricity along going through a circuit; specifically they limit the amount of 'current' that is allowed to flow.  
The measure of resistance is called the Ohm ( $\Omega$ ), and the larger the resistance, the more it limits the current. The value of a resistor is marked with colored bands along the length of resistor body.

- Jumper wires.

- 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.

Conclusion:- Successfully implemented connectivity of Raspberry-pi detected obstacle and notify the result from LED.