Introduction

Raspberry Pi kit includes RGB Led module, different sensors like Touch sensor, Ultrasonic sensor, Flame sensor, Temperature and humidity sensor and many more. It also includes LCD, Bread Board and connecting wires, potentiometer, resistors, Buttons and also other components which can useful for learning raspberry pi projects.

WiringPi

WiringPi is a PIN based GPIO access library written in C for the BCM2835 used in the Raspberry Pi. It's released under the GNU LGPLv3 license and is usable from C, C++ and RTB (BASIC) as well as many other languages with suitable wrappers. It's designed to be familiar to people who have used the Arduino "wiring" system.

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Operation Demo

Step 1: Download and install WiringPi?

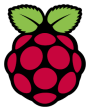
Most of the Rapbian versions are already preloaded with WiringPi. And the test methods are as follows.

Open terminal and run: gpio –v

If you get something then it is already preloaded else you have to install it.
Refer following link if not installed,

http://wiringpi.com/download-and-install/

Step 2: Hardware required

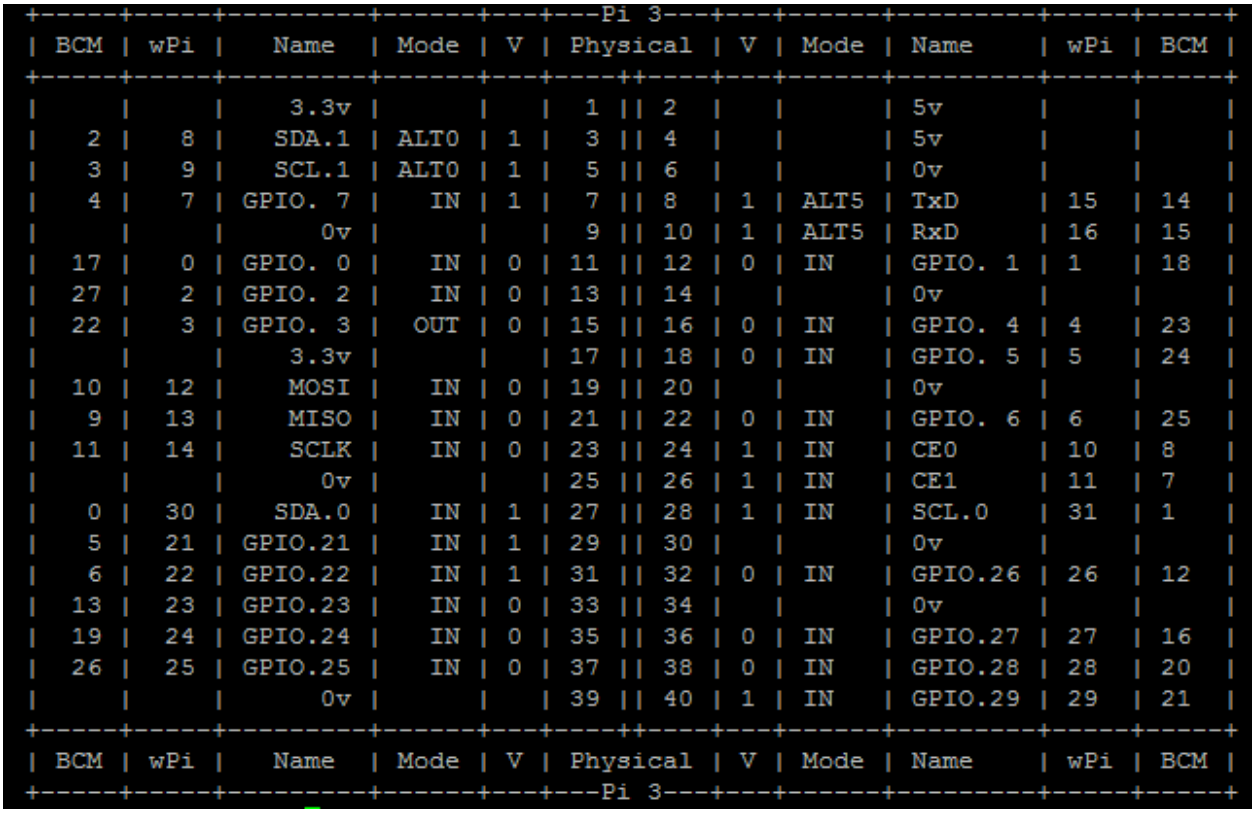
Hardware	Image	Quantity
Raspberry pi		1
LED		1
Resistor (220Ω)		1
Jumper Wires		As Required
Bread Board		1

Step 3: Circuit connection

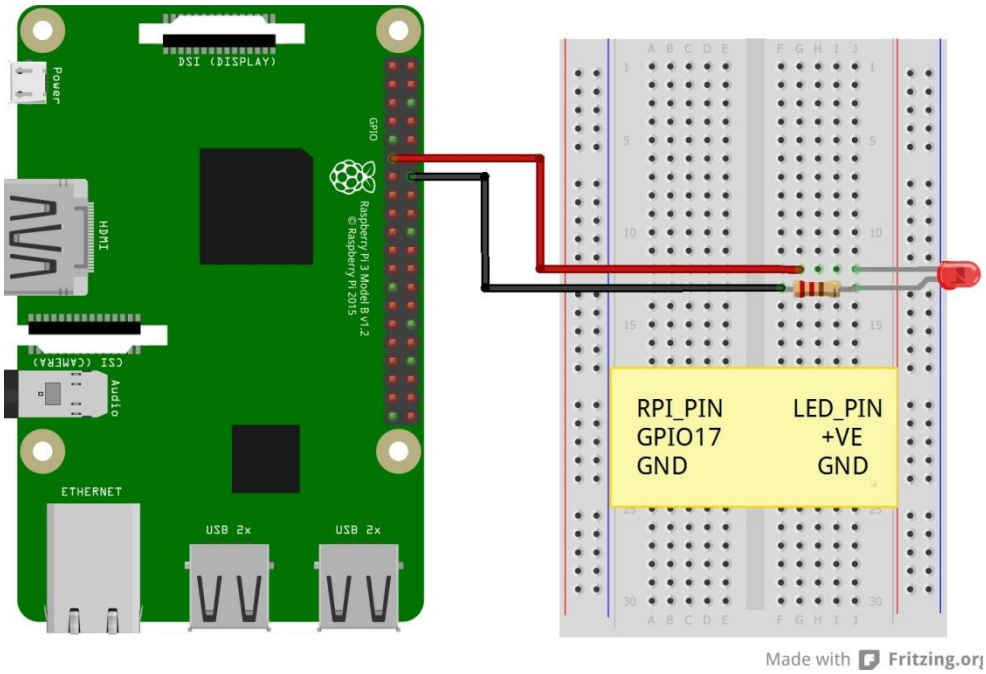
To get WiringPi pin re-layout enters following command in terminal.

Run: gpio readall

After apply this command you will get following window. Here you can easily figure out the connections.



BCM	wPi	Name	Mode	V	Physical	V	Mode	Name	wPi	BCM
		3.3v			1 || 2			5v		
2	8	SDA.1	ALT0	1	3 || 4			5v		
3	9	SCL.1	ALT0	1	5 || 6			0v		
4	7	GPIO. 7	IN	1	7 || 8	1	ALT5	TxD	15	14
		0v			9 || 10	1	ALT5	RxD	16	15
17	0	GPIO. 0	IN	0	11 || 12	0	IN	GPIO. 1	1	18
27	2	GPIO. 2	IN	0	13 || 14			0v		
22	3	GPIO. 3	OUT	0	15 || 16	0	IN	GPIO. 4	4	23
		3.3v			17 || 18	0	IN	GPIO. 5	5	24
10	12	MOSI	IN	0	19 || 20			0v		
9	13	MISO	IN	0	21 || 22	0	IN	GPIO. 6	6	25
11	14	SCLK	IN	0	23 || 24	1	IN	CE0	10	8
		0v			25 || 26	1	IN	CE1	11	7
0	30	SDA.0	IN	1	27 || 28	1	IN	SCL.0	31	1
5	21	GPIO.21	IN	1	29 || 30			0v		
6	22	GPIO.22	IN	1	31 || 32	0	IN	GPIO.26	26	12
13	23	GPIO.23	IN	0	33 || 34			0v		
19	24	GPIO.24	IN	0	35 || 36	0	IN	GPIO.27	27	16
26	25	GPIO.25	IN	0	37 || 38	0	IN	GPIO.28	28	20
		0v			39 || 40	1	IN	GPIO.29	29	21
BCM	wPi	Name	Mode	V	Physical	V	Mode	Name	wPi	BCM



Step 4: Open terminal and download the demo code

For download demo codes 1st install code zip file provided by us. By writing and run following string to the terminal you will able to download it.

Run: wget http://robokits.co.in/downloads/Rpi-Basic-Starter-Kit.zip

After executing this command you will get following window.

```
pi@raspberrypi:~ $ wget http://robokits.co.in/downloads/Rpi-Basic-Starter-Kit.zip
--2017-06-21 14:49:14--  http://robokits.co.in/downloads/Rpi-Basic-Starter-Kit.zip
Resolving robokits.co.in (robokits.co.in)... 27.109.16.98
Connecting to robokits.co.in (robokits.co.in)|27.109.16.98|:80... connected.
HTTP request sent, awaiting response... 301 Moved Permanently
Location: http://robokits.download/downloads/Rpi-Basic-Starter-Kit.zip [following]
--2017-06-21 14:49:14--  http://robokits.download/downloads/Rpi-Basic-Starter-Kit.zip
Resolving robokits.download (robokits.download)... 138.197.44.96
Connecting to robokits.download (robokits.download)|138.197.44.96|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 20574 (20K) [application/zip]
Saving to: 'Rpi-Basic-Starter-Kit.zip.1'

Rpi-Basic-Starter-Kit.zip.1                 100%[=======================================================================>]

2017-06-21 14:49:16 (84.6 KB/s) - 'Rpi-Basic-Starter-Kit.zip.1' saved [20574/20574]

pi@raspberrypi:~ $
```

Step 5: To Unzip file

After going through step 4 you will get zip file of code for unzip that files you have run following command to the terminal.

Run: unzip Rpi-Basic-Starter-Kit.zip

After executing this command you will get following window.

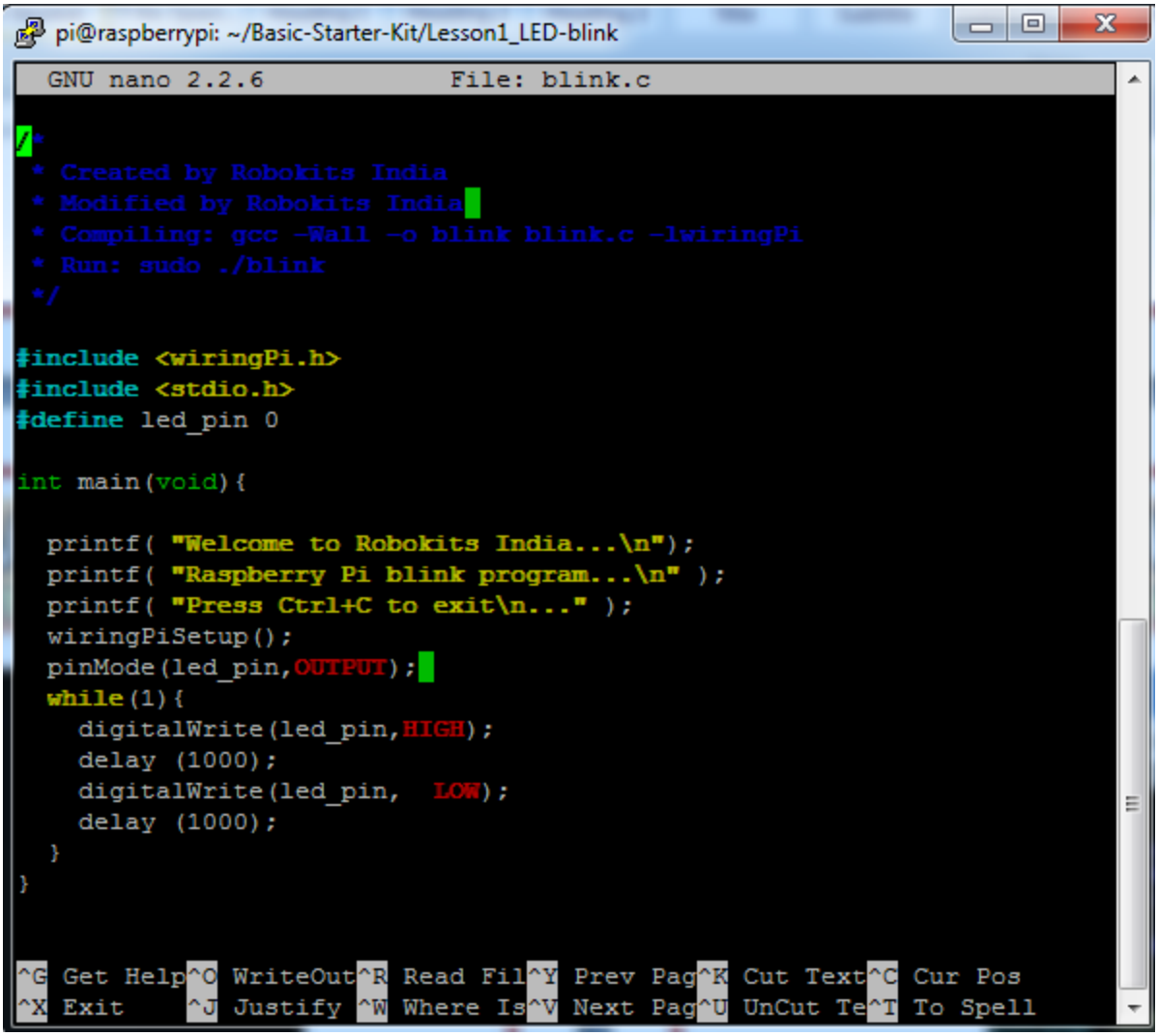
```
pi@raspberrypi:~ $ unzip Rpi-Basic-Starter-Kit.zip
Archive:  Rpi-Basic-Starter-Kit.zip
   creating: Basic-Starter-Kit/Lesson1_LED-blink/
  inflating: Basic-Starter-Kit/Lesson1_LED-blink/blink.c
   creating: Basic-Starter-Kit/Lesson10_9G-servo/
  inflating: Basic-Starter-Kit/Lesson10_9G-servo/servo.c
   creating: Basic-Starter-Kit/Lesson11_Stepper-Motor/
  inflating: Basic-Starter-Kit/Lesson11_Stepper-Motor/stepper_motor.c
   creating: Basic-Starter-Kit/Lesson12_Ultrasonic-ranging/
  inflating: Basic-Starter-Kit/Lesson12_Ultrasonic-ranging/ultrasonic.c
   creating: Basic-Starter-Kit/Lesson13_Touch-Lamp/
  inflating: Basic-Starter-Kit/Lesson13_Touch-Lamp/touch_lamp.c
   creating: Basic-Starter-Kit/Lesson14_PCF8591-Module/
  inflating: Basic-Starter-Kit/Lesson14_PCF8591-Module/pcf8591.c
   creating: Basic-Starter-Kit/Lesson15_Flame-Sensor/
  inflating: Basic-Starter-Kit/Lesson15_Flame-Sensor/flame.c
   creating: Basic-Starter-Kit/Lesson16_Photoresistance-Sensor/
  inflating: Basic-Starter-Kit/Lesson16_Photoresistance-Sensor/photoresistance.c
   creating: Basic-Starter-Kit/Lesson17_Thermistor-Sensor/
  inflating: Basic-Starter-Kit/Lesson17_Thermistor-Sensor/thermistor.c
   creating: Basic-Starter-Kit/Lesson18_Potentiometer/
  inflating: Basic-Starter-Kit/Lesson18_Potentiometer/potentiometer.c
   creating: Basic-Starter-Kit/Lesson19_Water-level-monitoring-experiment/
  inflating: Basic-Starter-Kit/Lesson19_Water-level-monitoring-experiment/watersensor.c
   creating: Basic-Starter-Kit/Lesson2_Button/
  inflating: Basic-Starter-Kit/Lesson2_Button/button.c
   creating: Basic-Starter-Kit/Lesson20_Joystick-experiment/
  inflating: Basic-Starter-Kit/Lesson20_Joystick-experiment/joystick.c
   creating: Basic-Starter-Kit/Lesson21_IR-remote-control-experiment/
  inflating: Basic-Starter-Kit/Lesson21_IR-remote-control-experiment/remote.c
   creating: Basic-Starter-Kit/Lesson22_IR-remote-control-LED/
  inflating: Basic-Starter-Kit/Lesson22_IR-remote-control-LED/IR-LED.c
   creating: Basic-Starter-Kit/Lesson23_DHT11-Experiment/
  inflating: Basic-Starter-Kit/Lesson23_DHT11-Experiment/DHT11.c
   creating: Basic-Starter-Kit/Lesson24_Serial-1602-LCD/
  inflating: Basic-Starter-Kit/Lesson24_Serial-1602-LCD/1602LCD.c
   creating: Basic-Starter-Kit/Lesson3_Ball-switch/
  inflating: Basic-Starter-Kit/Lesson3_Ball-switch/ball.c
   creating: Basic-Starter-Kit/Lesson4_Active-buzzer/
  inflating: Basic-Starter-Kit/Lesson4_Active-buzzer/active_buz.c
   creating: Basic-Starter-Kit/Lesson5_Relay-module/
  inflating: Basic-Starter-Kit/Lesson5_Relay-module/relay.c
   creating: Basic-Starter-Kit/Lesson6_RGB-LED/
  inflating: Basic-Starter-Kit/Lesson6_RGB-LED/RGBled.c
   creating: Basic-Starter-Kit/Lesson7_1-digit-7-Segment-Displays/
  inflating: Basic-Starter-Kit/Lesson7_1-digit-7-Segment-Displays/1seg.c
   creating: Basic-Starter-Kit/Lesson8_4-digit-7-Segment-Displays/
  inflating: Basic-Starter-Kit/Lesson8_4-digit-7-Segment-Displays/4seg.c
   creating: Basic-Starter-Kit/Lesson9_Heart-shaped-display-experiment/
  inflating: Basic-Starter-Kit/Lesson9_Heart-shaped-display-experiment/led_matrix.c
```

Step 6 : Enter the demo code

Run: cd Basic-Starter-Kit
cd Lesson1_LED-blink

```
pi@raspberrypi:~/Basic-Starter-Kit $ ls
Lesson10_Heart-shaped-display-experiment
Lesson11_9G-servo
Lesson12_Stepper-Motor
Lesson13_Ultrasonic-ranging
Lesson14_Touch-Lamp
Lesson15_PCF8591-Module
Lesson16_Flame-Sensor
Lesson17_Photoresistance-Sensor
Lesson18_Thermistor-Sensor
Lesson19_Potentiometer
Lesson1_LED-blink
Lesson20_Water-level-monitoring-experiment
Lesson21_Joystick-experiment
Lesson22_IR-remote-control-experiment
Lesson23_IR-remote-control-LED
Lesson24_DHT11-Experiment
Lesson25_LCD1602-with-IIC
Lesson26_Temperature-and-humidity-monitoring-experiment
Lesson2_Button
Lesson3_Ball-switch
Lesson4_Active-buzzer
Lesson5_Passive-buzzer
Lesson6_Relay-module
Lesson7_RGB-LED
Lesson8_1-digit-7-Segment-Displays
Lesson9_4-digit-7-Segment-Displays
pi@raspberrypi:~/Basic-Starter-Kit $
```

Run: sudo nano blink.c



Note: You can edit the Demo code.

The compiling is: gcc -Wall -o blink blink.c -lwiringPi
And run the program using: sudo. /blink

Step 7: Exit and save

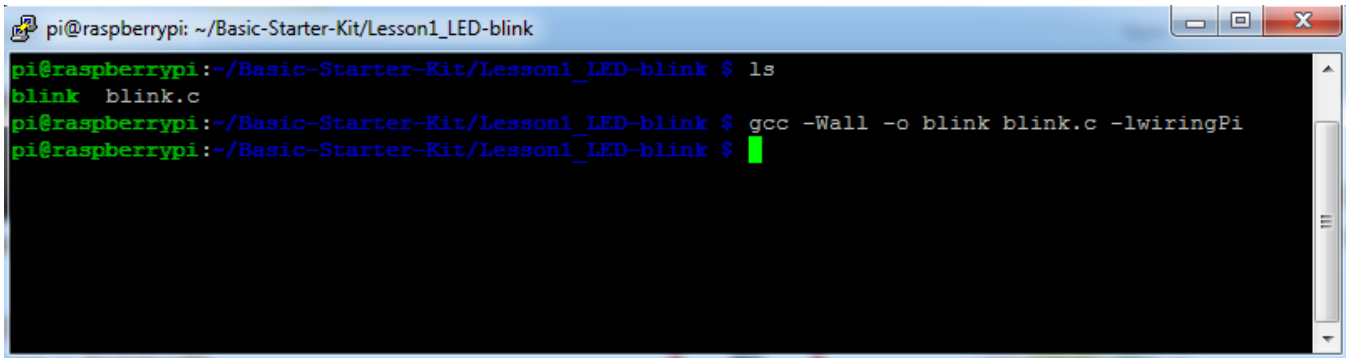
For exit and save you need to press CTRL+O and CTRL+X

Step 8: Compiling

Run: gcc -Wall -o blink blink.c –lwiringPi

Note: if you want to compile "xxx.c" and you need run it by following this way.

Run: gcc -Wall -o xxx xxx.c -lwiringPi
Or: g++ -Wall -o xxx xxx.c -lwiringPi



Step 9: Run the program

Run: sudo ./blink

```
pi@raspberrypi:~/Basic-Starter-Kit/Lesson1_LED-blink $ ls
blink  blink.c
pi@raspberrypi:~/Basic-Starter-Kit/Lesson1_LED-blink $ sudo ./blink
Welcome to Robokits India...
Raspberry Pi blink program...
Press Ctrl+C to exit
```

Note: Exit the Program -> "Ctrl+c".

Step 9: Application effect:

Blinks LED every 1 Second.

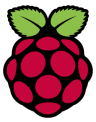
Lesson 1 LED Blink

LED is the best way to start up with Raspberry Pi to understand I/O pins of Raspberry Pi.

Pin description:

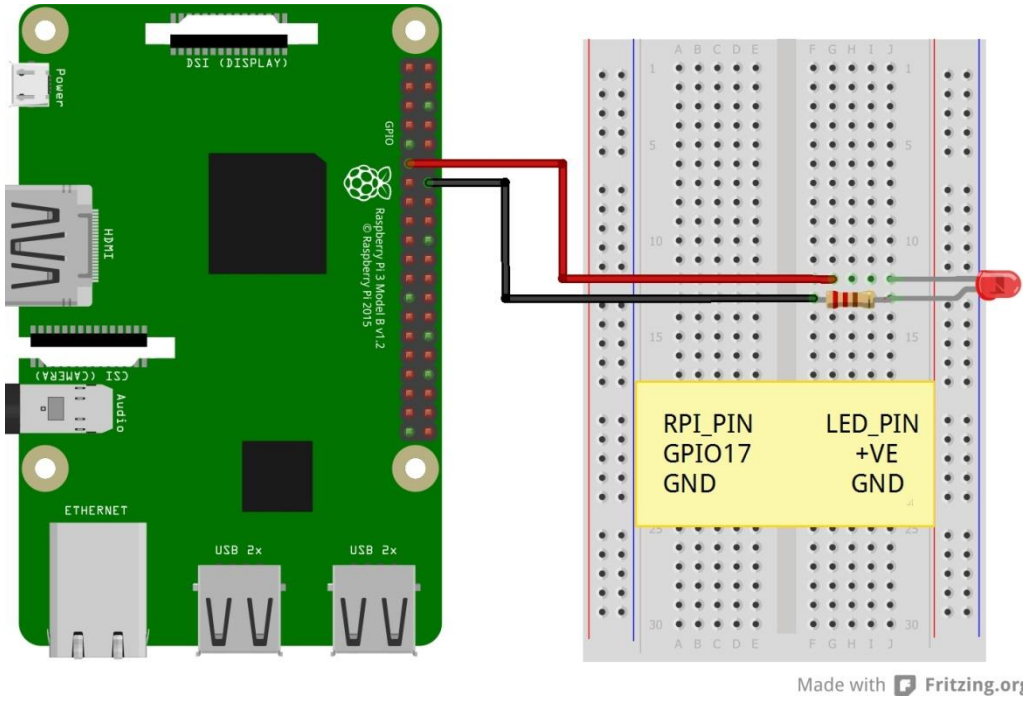
LED_PIN	RPI_PIN
Long pin(+ve)	GPIO17
Short pin(GND)	GND

Hardware requirement:

Hardware	Picture	Quantity
Raspberry pi		1
LED		1
Resistor(220Ω)		1

Jumper Wires		As required
Bread Board		1

Connection Diagram:



Compile and Run:

To compile and run refer step 5 to 9 from the operation demo.

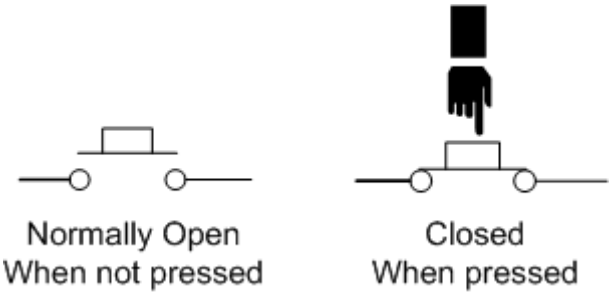
Application effect:

After executing this code, LED will glow for one second and off for one second repeatedly.

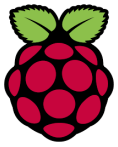
Lesson 2 Push Button

This lesson will teach you about push buttons. This is device for making and breaking the connection in an electric circuit.

Button definition:

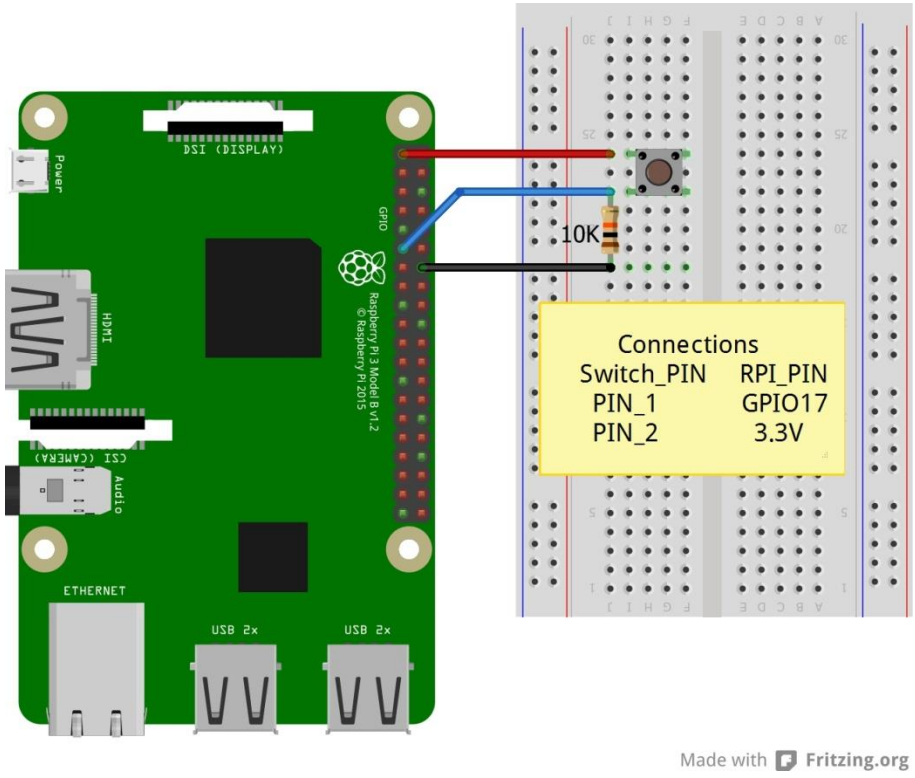


Hardware details:

Hardware	Picture	Quantity
Raspberry pi		1
Pushbutton		1
Resistor(220Ω)		1
Jumper Wires		As require

Bread Board		1

Connection Diagram:



Pin configuration:

Button_PIN	RPI_PIN
Pin 1	GPIO17
Pin 2	3.3V

Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

By executing this program and pressing push button you will find button state on the screen.

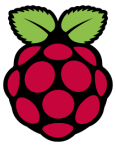
Lesson 3 Ball Switch

This lesson will teach you about ball switch module which is simple and easy to use. Tilt sensors allow you to detect orientation or inclination.

Pin definition:

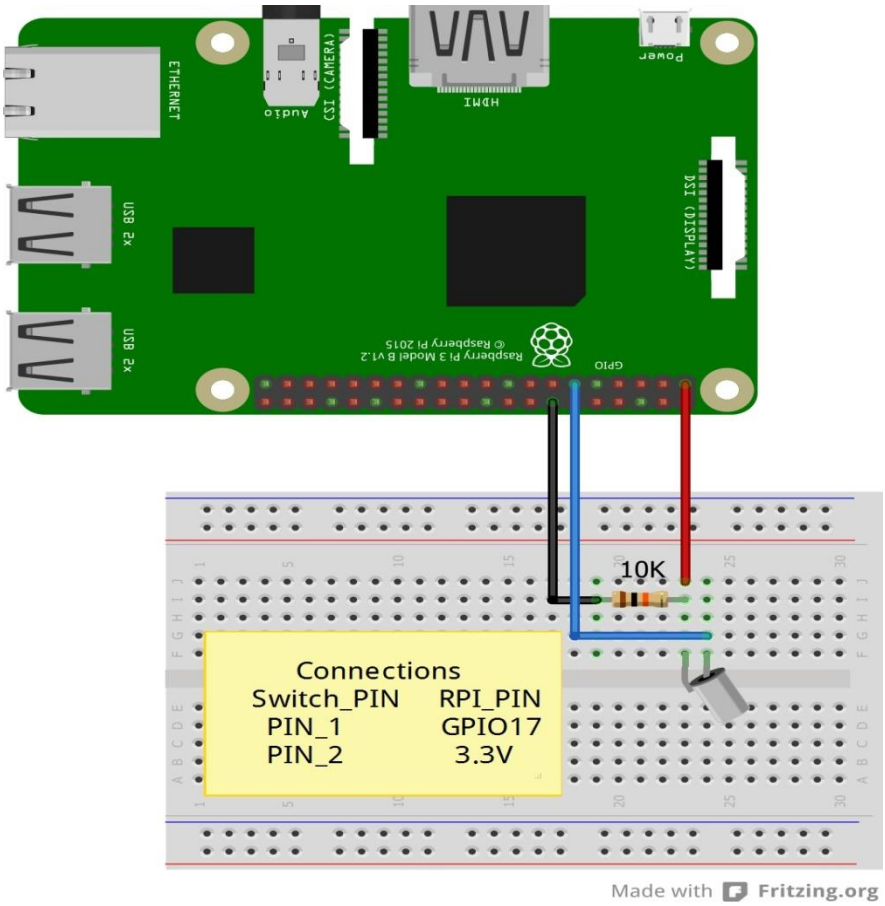
Ball switch has two pins without polarity.

Hardware Details:

Hardware	Picture	Quantity
Raspberry pi		1
Ball Switch		1
Resistor(10K)		1
Jumper Wires		As require

Bread Board		1

Connection Diagram:



Pin configuration:

Ball switch_PIN	RPI_PIN
Pin 1	GPIO17
Pin 2	3.3V

Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

By executing program and shocking the ball switch screen will display state of ball switch.

Lesson 4 Buzzer

This lesson will helpful you to simple and easy use of Buzzer module with raspberry pi.

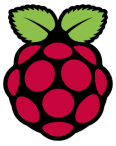
Technical Specifications:

- Supply voltage: 5V DC
- Mini sound output: 85db
- Dimensions: 0.98 in x 0.59 in x 0.39 in (2.5 cm x 1.5 cm x 1.0 cm)

Pin definition:

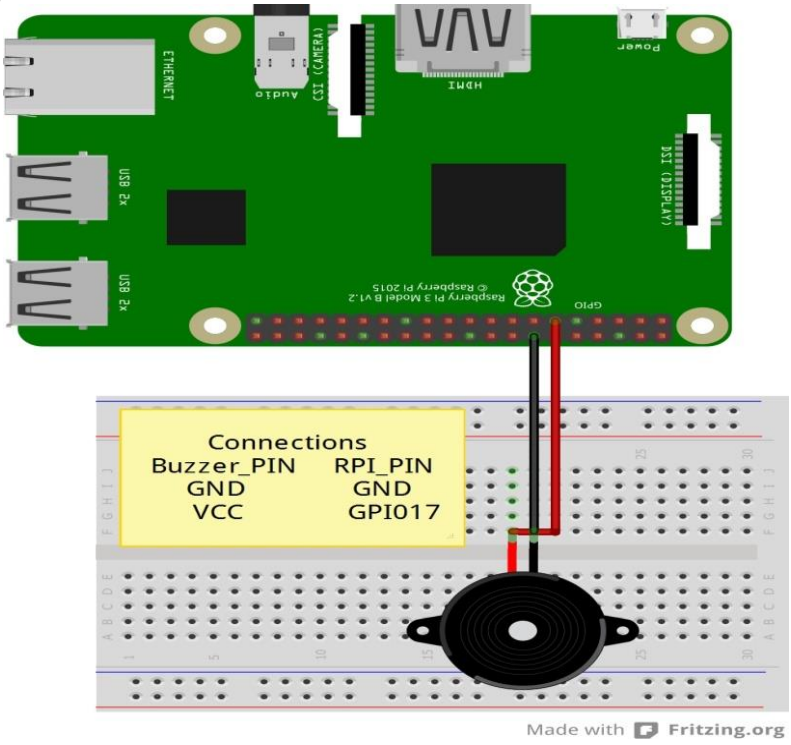
Buzzer_PIN	Description
VCC	5V
GND	GND
Signal	Output

Hardware description:

Hardware	Picture	Quantity
Raspberry pi		1
Buzzer		1

Jumper Wires		As require
Bread Board		1

Connection Diagram:



Pin Configuration with Raspberry pi:

Buzzer_PIN	RPI_PIN
VCC	GPIO17
GND	GND

Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code you will find that buzzer is ringing

Lesson 5 Relay Module

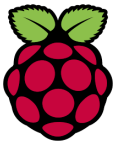
This lesson will help to understand about relay module and how it is simple and easy to use. Relay is electrically operated device.

Technical specifications:

It has three pins

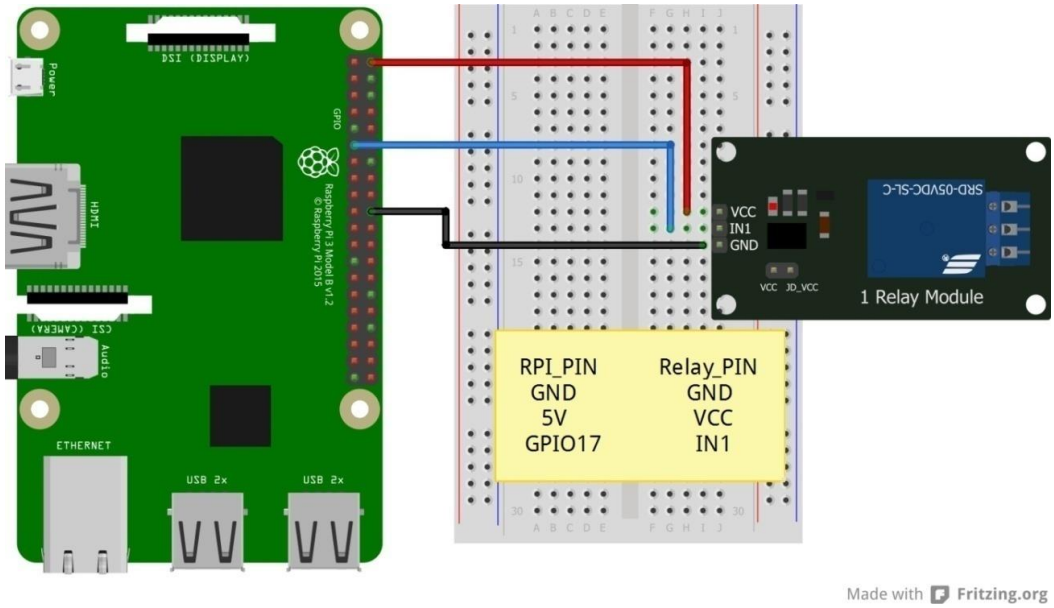
Relay_PIN	Description
VCC	5V
GND	GND
Signal	Input

Hardware details:

Hardware	Picture	Quantity
Raspberry pi		1
Relay Board		1
Jumper Wires		As require

Bread Board		1

Connection diagram:



Pin Configuration with Raspberry pi:

Relay_PIN	RPI_PIN
VCC	5V
GND	GND
S	GPIO17

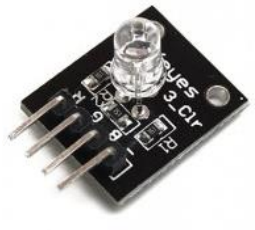
Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code, according to the screen tips control relay.

Lesson 6 RGB LED



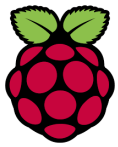
This lesson is helpful for easy and simple use of RGB LED with raspberry pi. It is tri-colored LED (Red, Green, and Blue).

Technical specifications:

RGB LED module has four pins.

- Red
- Green
- Blue
- GND

Hardware details:

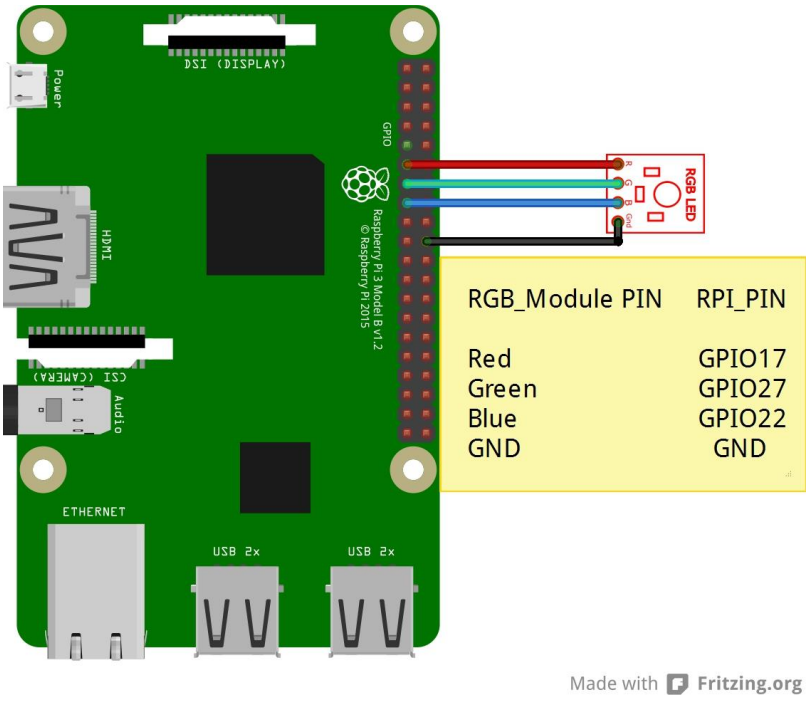
Hardware	Picture	Quantity
Raspberry pi		1
RGB Module		1
Jumper Wires		As Require

Bread Board		1

Pin Configuration with Raspberry pi:

Module_PIN	RPI_PIN
Red	GPIO17
GND	GND
Blue	GPIO22
Green	GPIO27

Connection diagram:



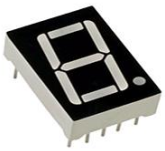
Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code you will find that led emits six different colors.

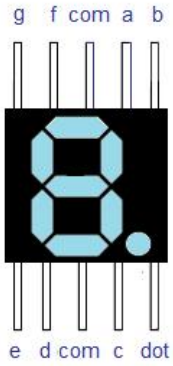
Lesson 7 1 digit 7 Segment Displays

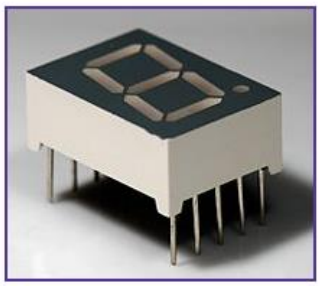


This lesson will helpful to use of 7 Segment with raspberry pi to display one digit. This experiment can achieve time counting function. You can use increasing or decreasing timing counter. Here we use increasing timing counter.

Technical specifications:

Following picture shows pins of 7 segment.

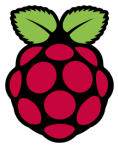




Here for displaying different digit refer following truth table.

Segment Inputs							7 segment Display output
A	B	C	D	E	F	G	
0	0	0	0	0	0	1	0
1	0	0	1	1	1	1	1
0	0	1	0	1	1	0	2
0	0	0	0	1	1	0	3
1	0	0	1	1	0	0	4
0	1	0	0	1	0	0	5
0	1	0	0	0	0	0	6
0	0	0	1	1	1	1	7
0	0	0	0	0	0	0	8
0	0	0	0	1	1	0	9

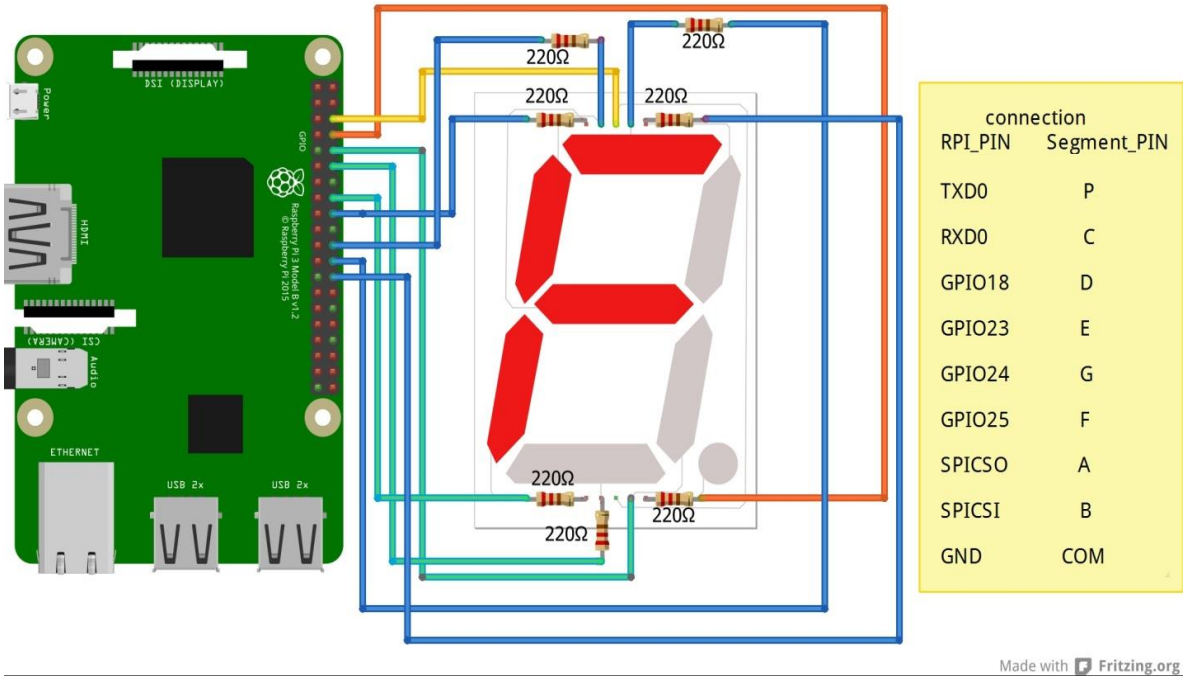
Hardware requirement:

Hardware	Picture	Quantity
Raspberry pi		1
7 Segment		1
Jumper Wires		As Require
Resistor(220Ω)		8

Pin Configuration with Raspberry pi:

7 segment_Pin	RPI_PIN
P	TXD0
C	RXD0
D	GPIO18
E	GPIO23
G	GPIO24
F	GPIO25
A	SPICSO
B	SPICSI
COM	GND

Connection diagram:



Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code you will find numbers increasing from 0to9

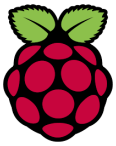
Lesson 8 4 Digit 7 segment display

This experiment is same as 1 digit 7 segment experiment but here we use 4 digit display. Timing counter achieved by this experiment. You can use increasing or decreasing timing counter. Here we use increasing timing counter.

Pin specifications:

4 digit 7 segment has 12 pins as shown in above picture.

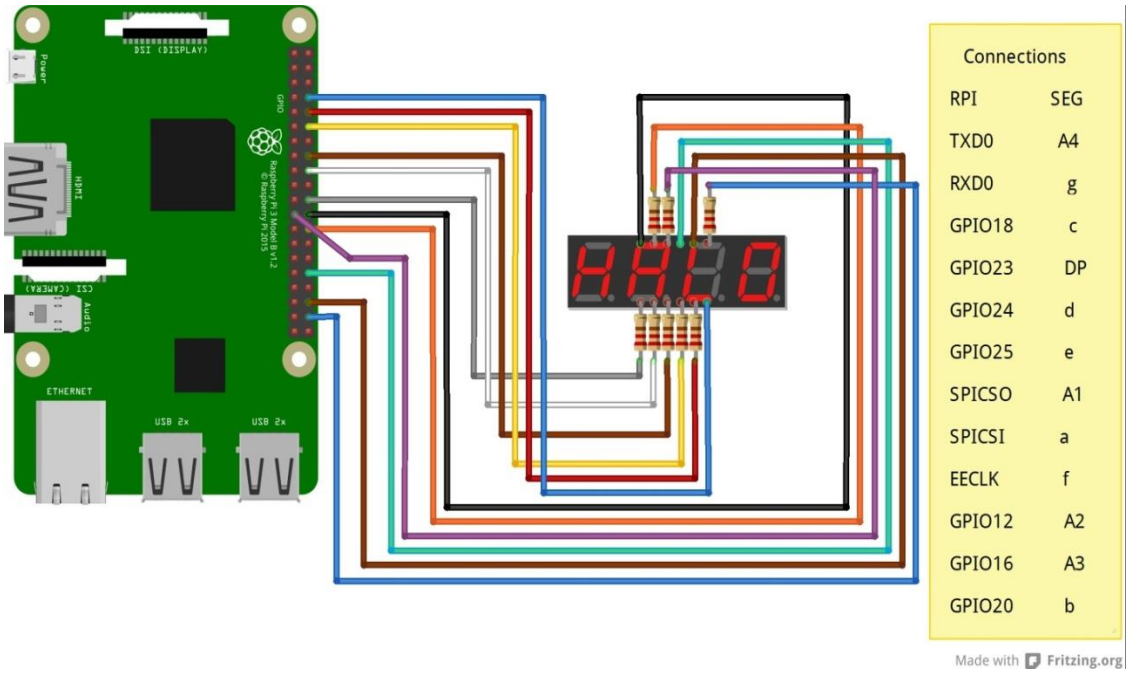
Hardware requirement:

Hardware	Picture	Quantity
Raspberry pi		1
4 digit 7 segment		1
Jumper Wires		As require
Resistor(220Ω)		8

Pin Configuration with raspberry pi:

7 segment_Pin	RPI_PIN
A4	TXD0
G	RXD0
C	GPIO18
DP	GPIO23
D	GPIO24
E	GPIO25
A1	SPICSO
A	SPICSI
F	EECLK
A2	GPIO12
A3	GPIO16
B	GPIO20

Connection diagram:



Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code you will find numbers on display increases.

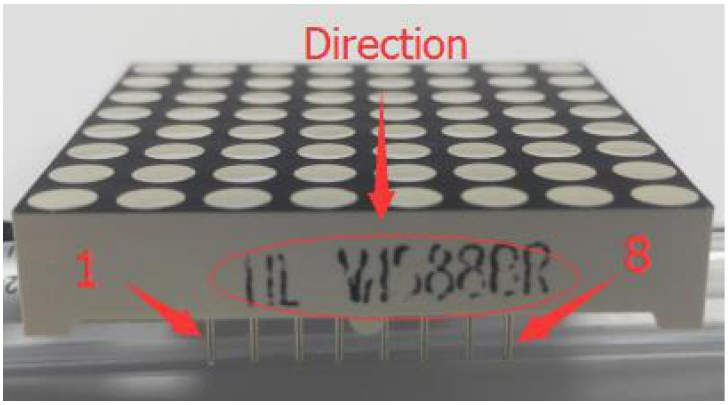
Lesson 9 Heart shaped display experiment

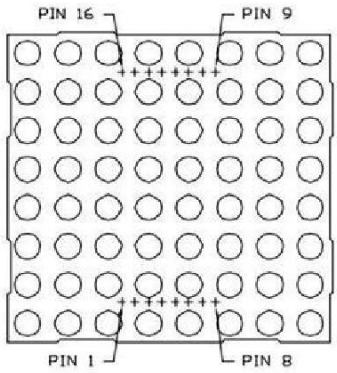
Here we use 8*8 LED display. This experiment is also application of LED. Here by making different codes you can make different animations on the display.

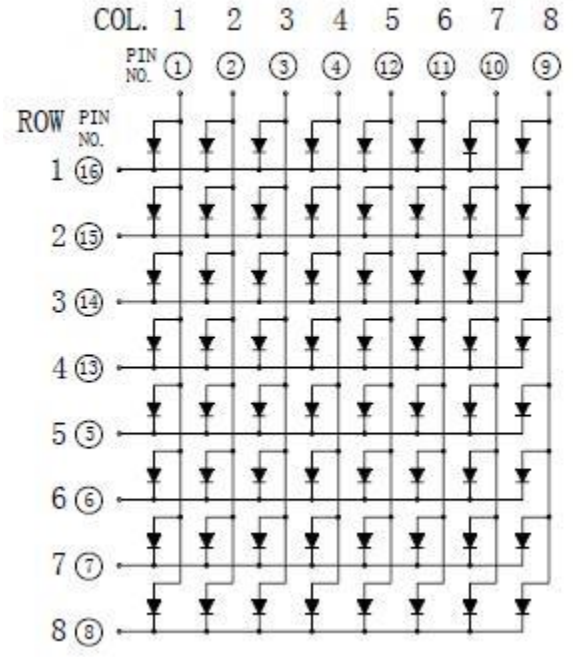
Specifications:

- It is 8*8 Dot matrix.
- It contains 16 pins.

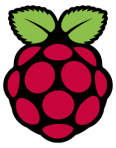
Pin definition:







Hardware requirement:

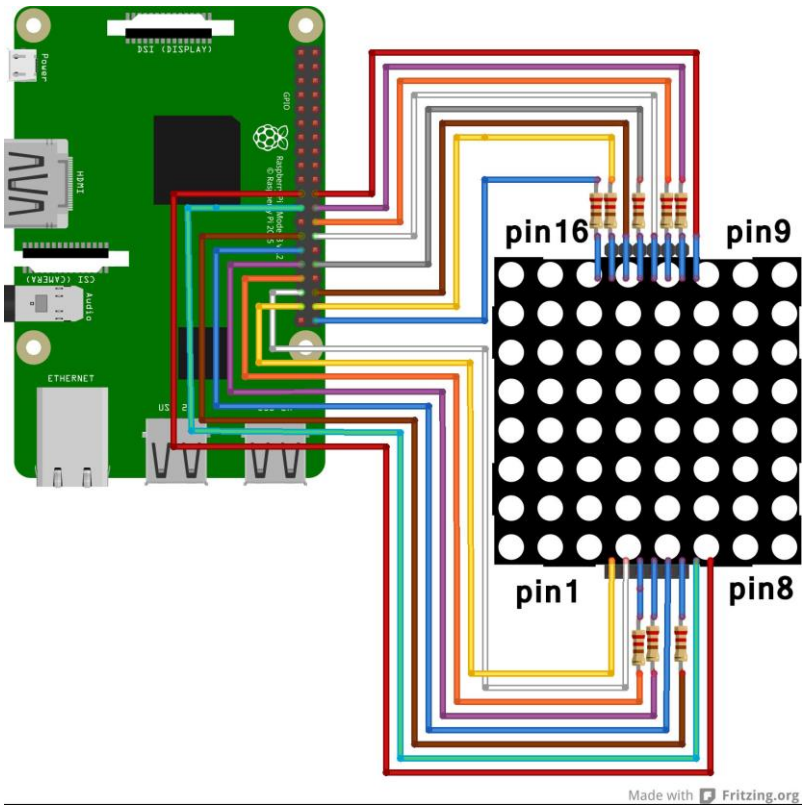
Hardware	Picture	Quantity
Raspberry pi		1
LED Matrix		1
Jumper Wires		As require

Resistor(220Ω)		8

Pin Configurations:

LED Matrix_PIN	RPI_PIN
PIN 1	GPIO26
PIN 2	GPIO13
PIN 3	GPIO19
PIN 4	GPIO6
PIN 5	GPIO5
PIN 6	EEDATA
PIN 7	SPISCLK
PIN 8	SPIMISO
PIN 9	GPIO25
PIN 10	SPICSO
PIN 11	SPICSI
PIN 12	EECLK
PIN 13	GPIO12
PIN 14	GPIO16
PIN 15	GPIO20
PIN 16	GPIO21

Connection diagram:



Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code you will see heart animation.

Further implementation:

By developing new codes you can make different animations with LED matrix. You can also use LED matrix of different size.

Lesson 10 9G Servo

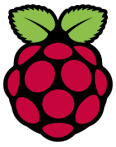
This experiment is helpful to know simple and easy use of servo motor with raspberry pi. In this experiment motor will run back and forth 180 degrees.

Specifications:

- Operating Voltage: 4.8-6.0 Volts
- Dimensions: 22mmx11.5mmx27mm

Wire Color	Specifications
Orange	PWM
Brown	GND
Red	VCC

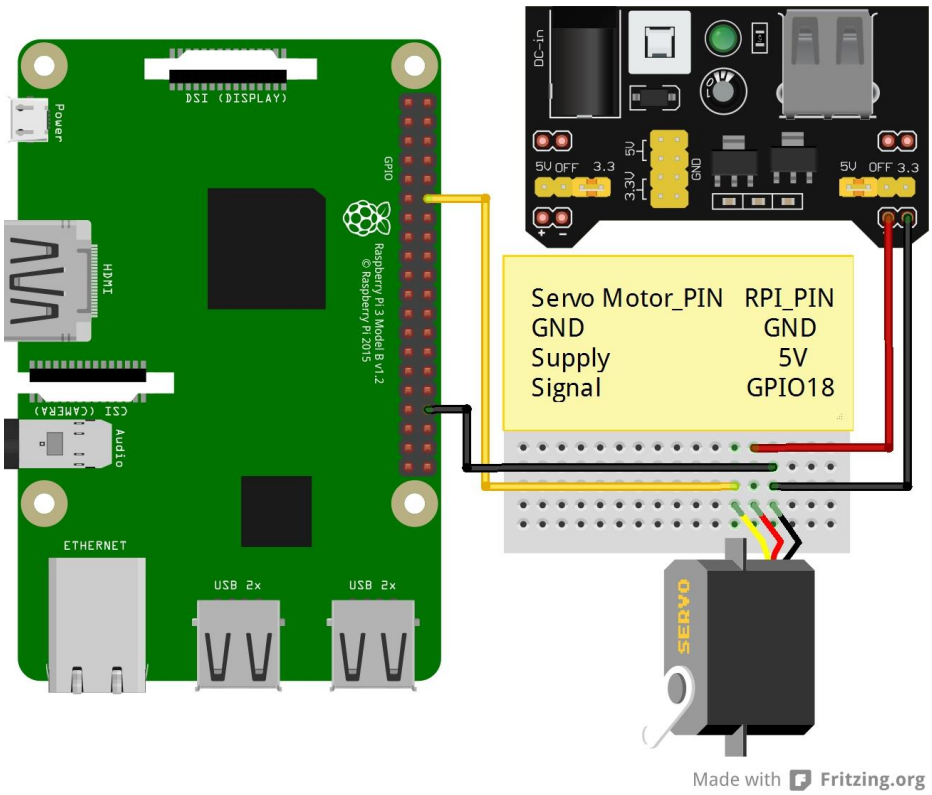
Hardware details:

Hardware	Picture	Quantity
Raspberry pi		1
9g servo motor		1
Jumper Wires		As require

Pin configurations:

Motor_PIN	RPI_PIN
VCC	5V
GND	GND
Signal	GPIO18

Connection diagram:



Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code, you can control motor by screen tips.

Lesson 11 Stepper Motor

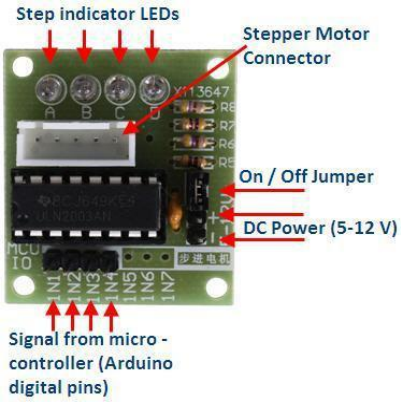
This lesson will helpful to use stepper motor with raspberry pi.

Specifications:

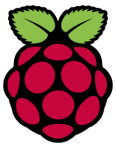
Here you need stepper motor driver for motor.

Motor Driver: (ULN2003 driver board)

Driver Specifications:



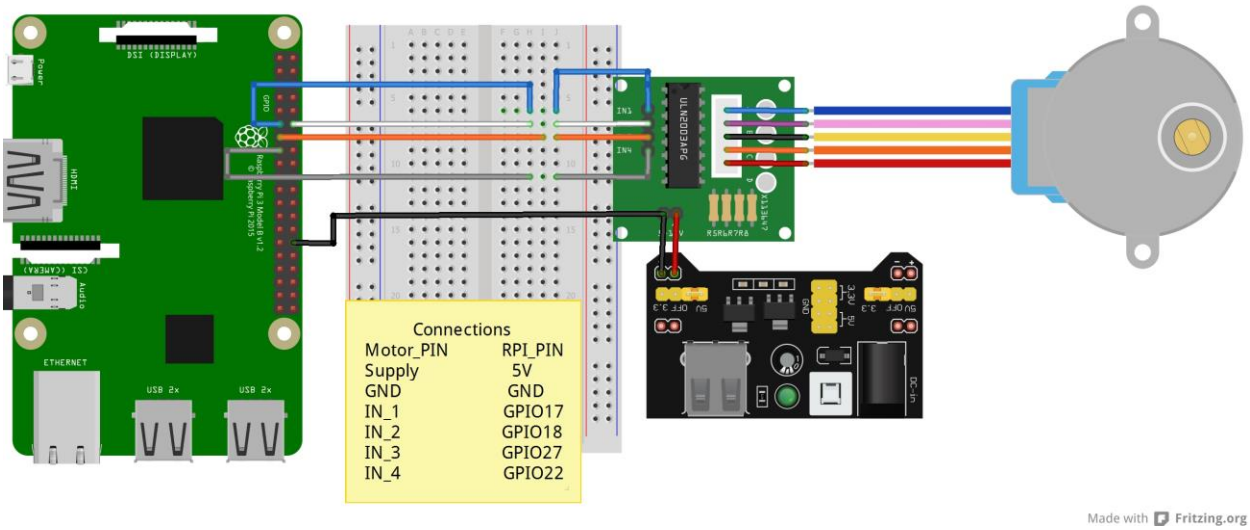
Hardware requirement:

Hardware	Picture	Quantity
Raspberry pi		1
Stepper motor		1
Motor driver(ULN2003)		1
Jumper Wires		As require

Pin Configurations:

Motor_PIN	RPI_PIN
IN1	GPIO17
IN2	GPIO18
IN3	GPIO27
IN4	GPIO22
VCC	5V(From Power supply)
GND	GND

Connection Diagram:



Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code you will able to control motor with screens tips.

Lesson 12 Ultrasonic sensor

This lesson is helpful to use ultrasonic sensor for distance measurement with raspberry pi.

Specifications:

For specifications please visit,

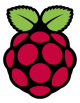
http://robokits.co.in/sensors/ultrasonic-sensor/hc-sr04-ultrasonic-sensor-distance-measuring-module

Pin specifications:

Ultrasonic sensor has 4 pins.

- VCC
- GND
- Echo
- Trig

Hardware requirement:

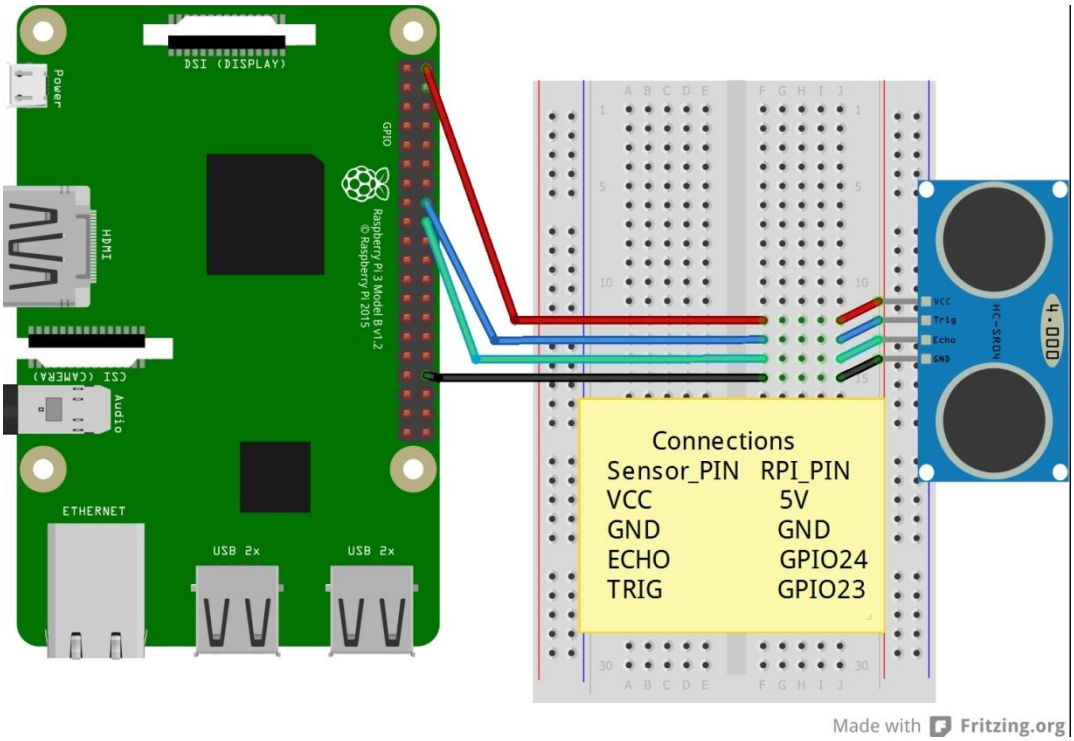
Hardware	Picture	Quantity
Raspberry pi		1
Ultrasonic sensor(HC-SR05)		1

Bread Board		1
Jumper Wires		As Require

Pin Configuration:

Sensor_PIN	RPI_PIN
VCC	5V
GND	GND
Echo	GPIO24
Trig	GPIO23

Connection diagram:



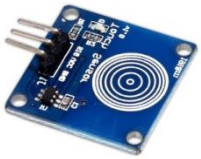
Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code you will see parameters returned by ultrasonic sensor.

Lesson 13 Touch sensor



This lesson will helpful to use touch sensor module with raspberry pi.

Specifications:

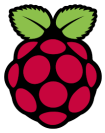
For specifications please visit,

http://robokits.co.in/sensors/touch-sensor/capacitive-touch-module-based-on-ttp223

Pin definition:

Touch sensor_PIN	Description
VCC	5V
GND	GND
Signal	Output

Hardware requirement:

Hardware	Picture	Quantity
Raspberry pi		1
Touch sensor		1
Bread Board		1

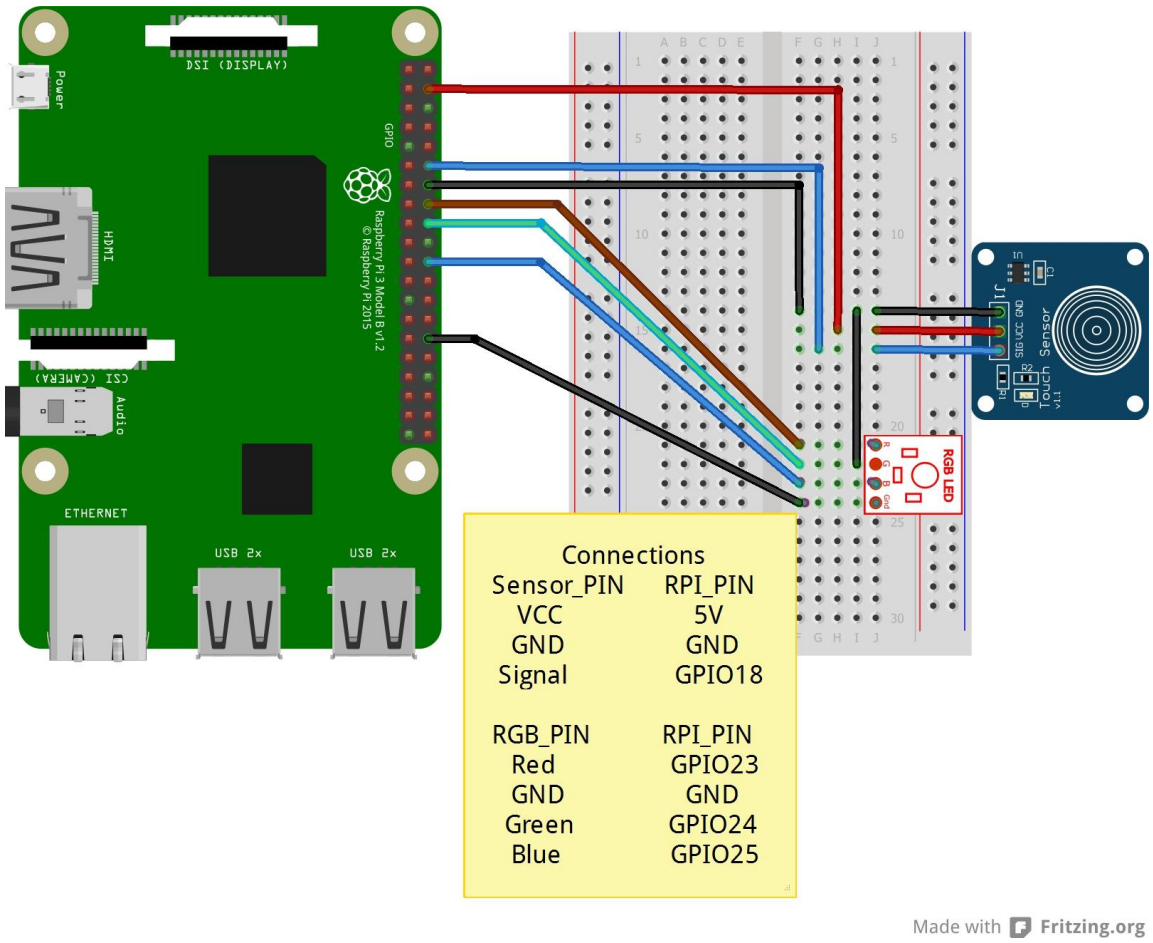
Jumper Wires		As require
RGB Module		1

Pin configurations:

Sensor_PIN	**RPI_PIN**
VCC	5V
GND	GND
Signal	GPIO18

RGB_PIN	**RPI_PIN**
Red	GPIO23
GND	GND
Green	GPIO24
Blue	GPIO25

Connection diagram:



Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code through touch sensor you can control the LED.

Lesson 14 PCF8591 Module

From this lesson you will able to understand about ADC module and how to use it with raspberry pi.

Overview:

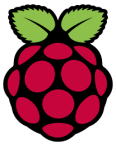
The PCF8591 is a monolithically integrated, and a separate power supply, low-power, 8-bit CMOS data acquisition devices. The PCF8591 has the four analog inputs, one analog output and a serial I2C bus interface.
PCF8591 three address pins A0, A1 and A2 can be used in hardware address programmed 8 PCF8591 device allows access to the same I2C bus, without the need for additional hardware. On the PCF8591 device input and output of the address, control and data signals are transmitted in serial fashion via the two-wire bidirectional I2C bus.

Specifications:

For specifications and features please visit,

http://robokits.co.in/arduino/arduino-accessories/pcf8591-adc-dac-ad-da-analog-digital-converter-module

Hardware requirement:

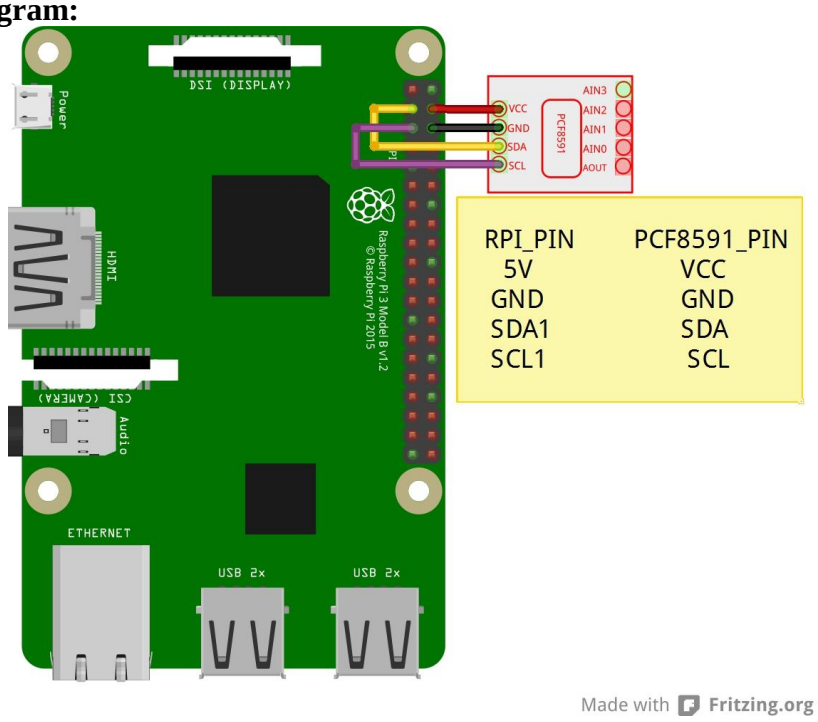
Hardware	Picture	Quantity
Raspberry pi		1

PCF8591 Module		1
Bread Board		1
Jumper Wires		As require

Pin configurations:

PCD8591_PIN	RPI_PIN
VCC	5V
GND	GND
SDA	SDA1
SCL	SCL1

Connection diagram:



Compile and run:

Tips: Refer to the operation demo (Step4 to Step7).

If print: Unable to open I2C device
You need to open IIC.
Enter Desktop: Preferences → Raspberry Pi
Configuration →Interfaces → Enabled I2C → reboot.

Application effect:

After executing code you will find data from analog photo-resistance sensor.

Lesson 15 Flame sensor

This lesson will helpful to use flame sensor with raspberry pi

Overview:

Flame Detection Sensor Module is sensitive to the flame, but also can detect ordinary light. Usually used as a flame alarm.

It detects a flame or a light source of a wavelength in the range of 760nm-1100 nm. Detection point of about 60 degrees is particularly sensitive to the flame spectrum. Sensitivity is adjustable, stable performance.

Specifications:

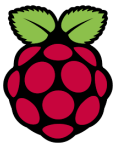
For specifications please visit:

http://robokits.co.in/sensors/temperature/flame-sensor-module

Pin definition:

Flame sensor_PIN	Description
VCC	5V
GND	GND
AO	For analog output interface
DO	For digital output interface

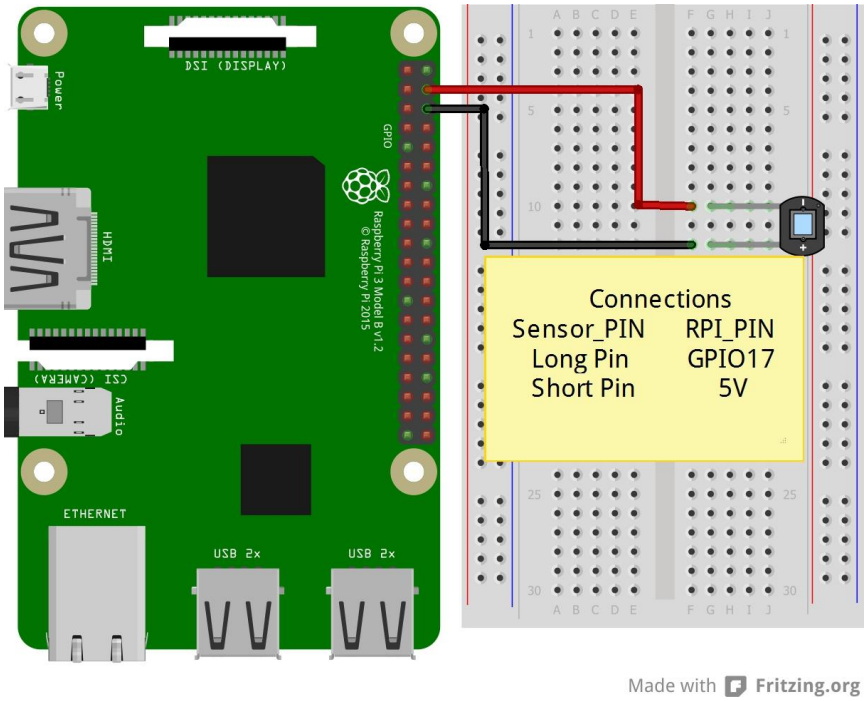
Hardware requirement:

Hardware	Picture	Quantity
Raspberry pi		1
Flame sensor		1
Bread Board		1
Jumper Wires		As require

Pin configurations:

Diode_PIN	RPI_PIN
Long pin(+ve)	GND
Short pin(GND)	GPIO17

Connection diagram:



Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code see analog data from the sensor.

Lesson 16 Photoresistance Sensor

This lesson will help to easy and simple use of Photoresistor sensor with raspberry pi.

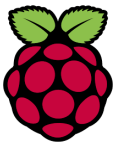
Overview:

A Photoresistor is a light-controlled variable resistor. The resistance of a Photoresistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity.

Pin definition:

- It has two non-polarity pins.

Hardware requirement:

Hardware	Picture	Quantity
Raspberry pi		1
PCF8591 Module		1
Sensor		1
Bread Board		1

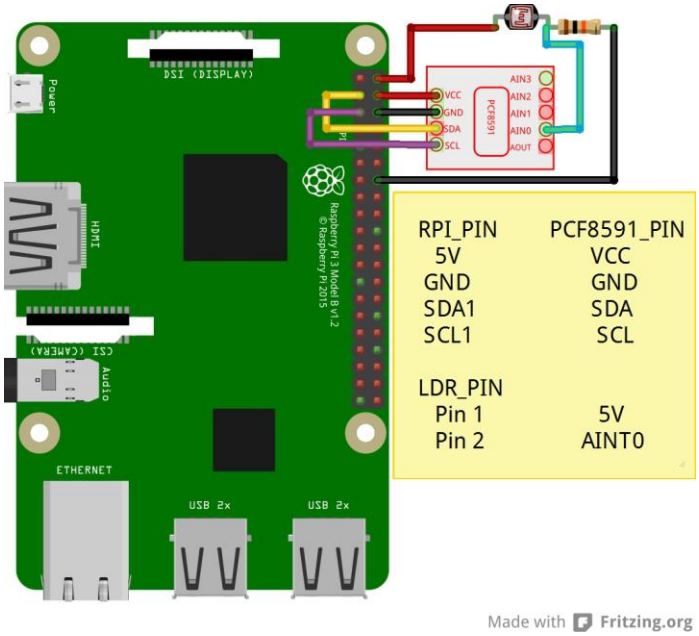
Jumper Wires		As require
Resistor(10K)		1

Pin Configurations:

Sensor_PIN	Description
Pin 1	5v0
Pin 2	AINT0

PCD8591_PIN	RPI_PIN
VCC	5V
GND	GND
SDA	SDA1
SCL	SCL1

Connection diagram:



Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code you will find data from analog photo-resistance sensor.

Lesson 17 Thermistor sensor

By this lesson you will able to use Thermistor sensor with raspberry pi.

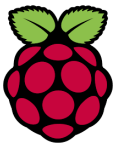
Overview:

The ZX_Thermometer is a temperature sensing module that uses a NTC (Negative Temperature Coefficient) Thermistor device. The output from the NTC Thermistor is converted to a voltage that is directly proportional to the temperature. The Thermistor can be placed some distance away.

Pin definition:

Sensor_PIN	Description
VCC	5V
GND	GND
AO	For analog output interface
DO	For digital output interface

Hardware details:

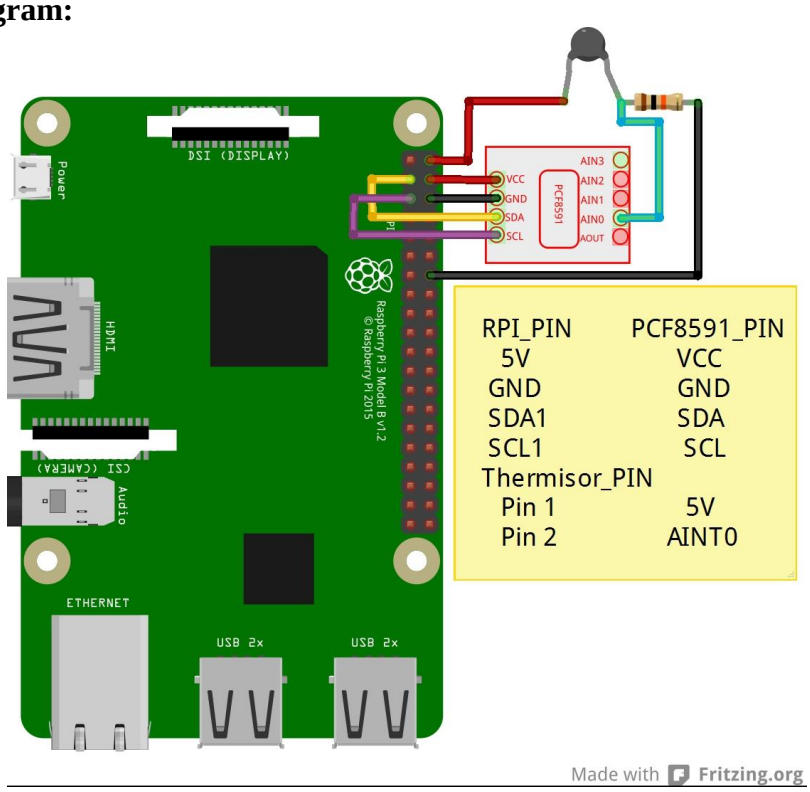
Hardware	Picture	Quantity
Raspberry pi		1
Thermistor		1

Bread Board		1
Jumper Wires		As require

Pin configurations:

Sensor_PIN	RPI_PIN
VCC	5V
GND	GND
Signal/Data	GPIO4

Connection diagram:



Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code, you will see value of Thermistor sensor.

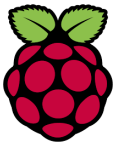
Lesson 18 Potentiometer

This lesson will teach use of potentiometer. This lesson is the example of change intensity of LED with the help of potentiometer.

Specifications:

- Resistance value: 10KΩ

Hardware requirement:

Hardware	Picture	Quantity
Raspberry pi		1
PCF8591 Module		1
Potentiometer		1
Bread Board		1

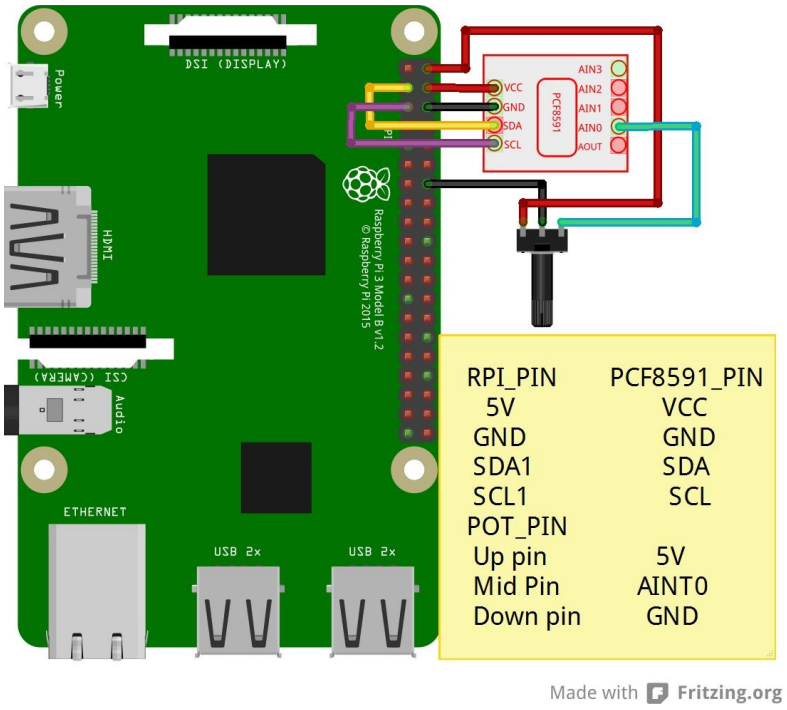
Jumper Wires		As require

Pin configurations:

Potentiometer_PIN	Description
UP	5v0
Middle	AINT0
Down	GND

PCD8591_PIN	RPI_PIN
VCC	5V
GND	GND
SDA	SDA1
SCL	SCL1

Connection diagram:



Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code and rotating potentiometer you can see the analog value of potentiometer.

Lesson 19 Water level sensor

This lesson will help to understand simple and easy use of water level sensor with raspberry pi.

Overview:

Water Sensor water level sensor is an easy-to-use, high level/drop recognition sensor, which is obtained by having a series of parallel wires exposed traces measured droplets/water volume in order to determine the water level. Easy to complete water to analog signal conversion and output analog values can be directly read Arduino development board to achieve the level alarm effect.

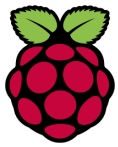
Specifications:

- Operating voltage: DC3-5V
- Operating current: less than 20mA
- Sensor Type: Analog
- Detection Area: 40mmx16mm
- Humidity: 10% -90% non-condensing
- Product Dimensions: 62mmx20mmx8mm

Pin definition:

Sensor_PIN	Description
VCC	5V
GND	GND
Output	Analog data

Hardware requirement:

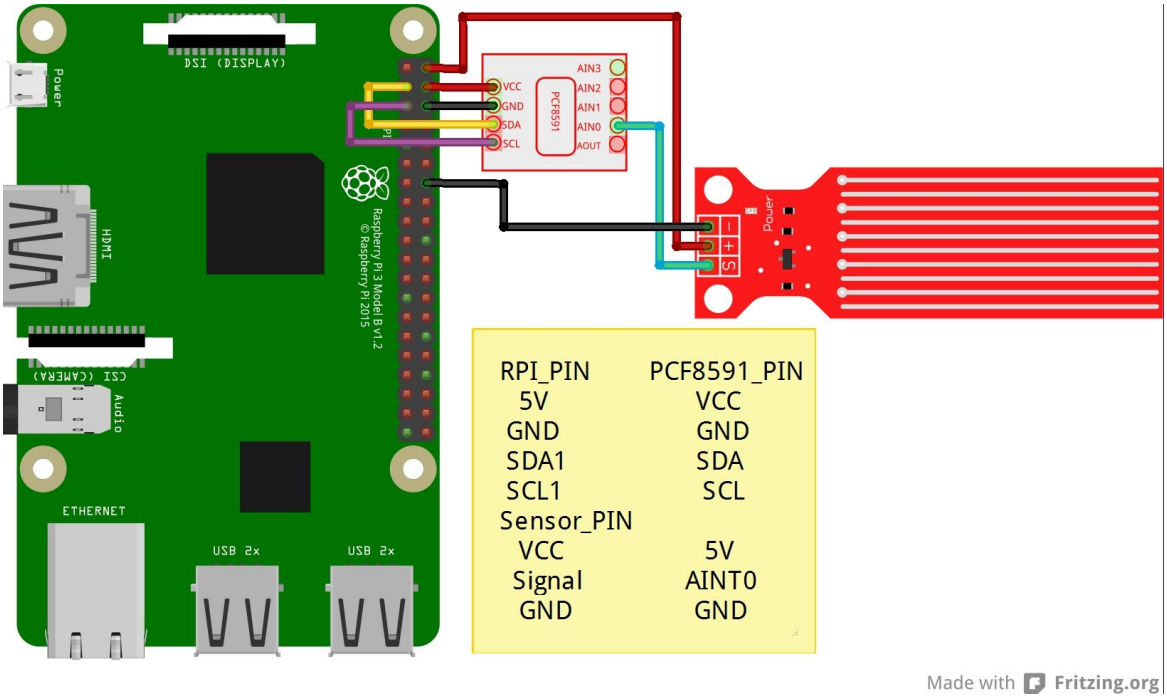
Hardware	Picture	Quantity
Raspberry pi		1
PCF8591 Module		1
Water level sensor		1
Bread Board		1
Jumper Wires		As require

Pin configuration:

Sensor_PIN	RPI_PIN
VCC	5V
GND	GND
Signal	AINT0

PCD8591_PIN	RPI_PIN
VCC	5V
GND	GND
SDA	SDA1
SCL	SCL1

Connection diagram:



Compile and Run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code, put the water level sensor enter water and you will see the analog value of water sensor

Lesson 20 Joystick experiment

This lesson will helps you to understand use the joystick of analog and digital output.

Overview:

A small Dual-axis XY Joystick Module is a PCB for convenient access with microcontroller.

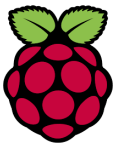
Specifications:

- 2 potentiometers for 2 axes
- Dimensions:4 X 2.6 X 3.2CM

Pin definition:

PIN	Description
GND	GND
VCC	5V
VRx	I/O
VRy	I/O
SW	I/O

Hardware requirement:

Hardware	Picture	Quantity
Raspberry pi		1

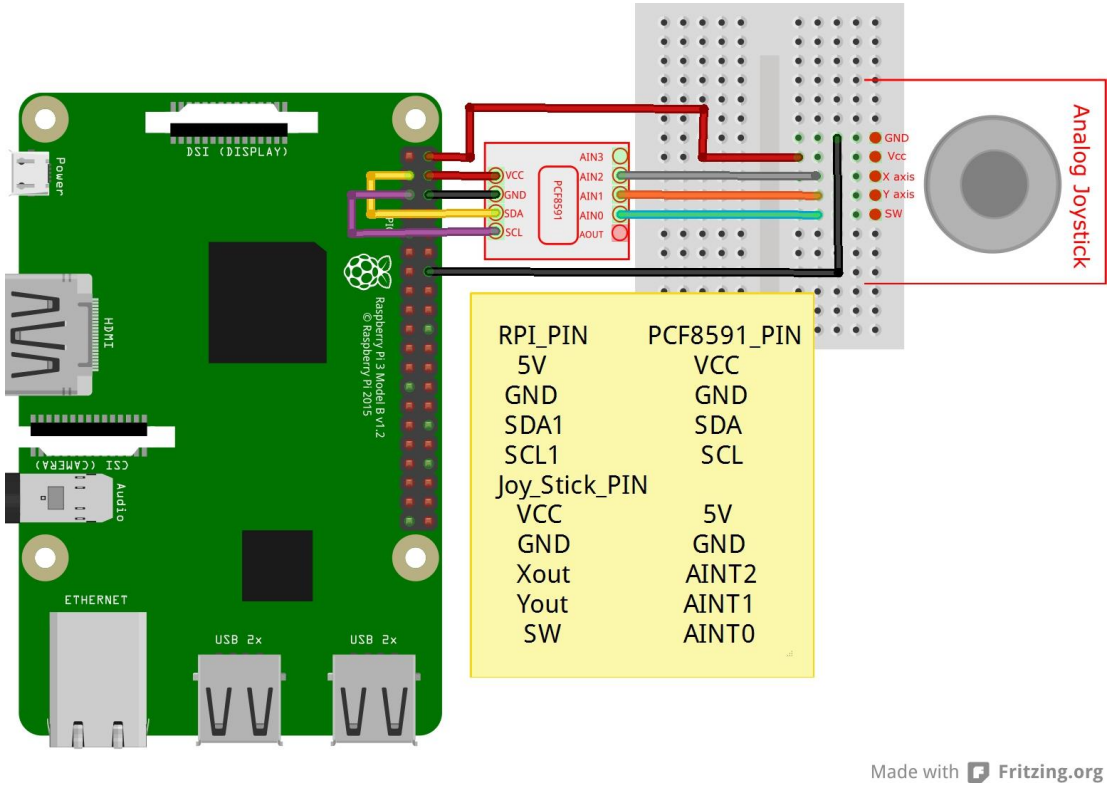
PCF8591 Module		1
Joystick		1
Bread Board		1
Jumper Wires		As require

Pin configuration:

Joystick_PIN	**RPI_PIN**
VCC	5V
GND	GND
VRx	AINT2
VRy	AINT1
SW	AINT0

PCD8591_PIN	**RPI_PIN**
VCC	5V
GND	GND
SDA	SDA1
SCL	SCL1

Connection Diagram:



Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code, by rotating and pressing joystick you will find change in value.

Lesson 21 IR remote control experiment

By this lesson you will learn how to use IR receiver and transmitter with raspberry pi.

Overview:

Here we use TSOP IR remote as transmitter and IR led module as receiver. By pressing button from IR transmitter it will send encoded signal to the IR receiver and receiver will decode corresponding signal.

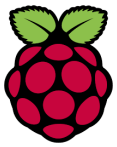
Specifications:

- Working voltage: 2.7~5.5V
- Frequency: 37.9KHz
- Receiving range: 18 meters
- Dimensions: 1.10 in x 0.59 in x 0.08 in (2.8 cm x 1.5 cm x 0.2 cm)

Pin definition:

Sensor_PIN	Description
VCC	5V
GND	GND
Signal	Output

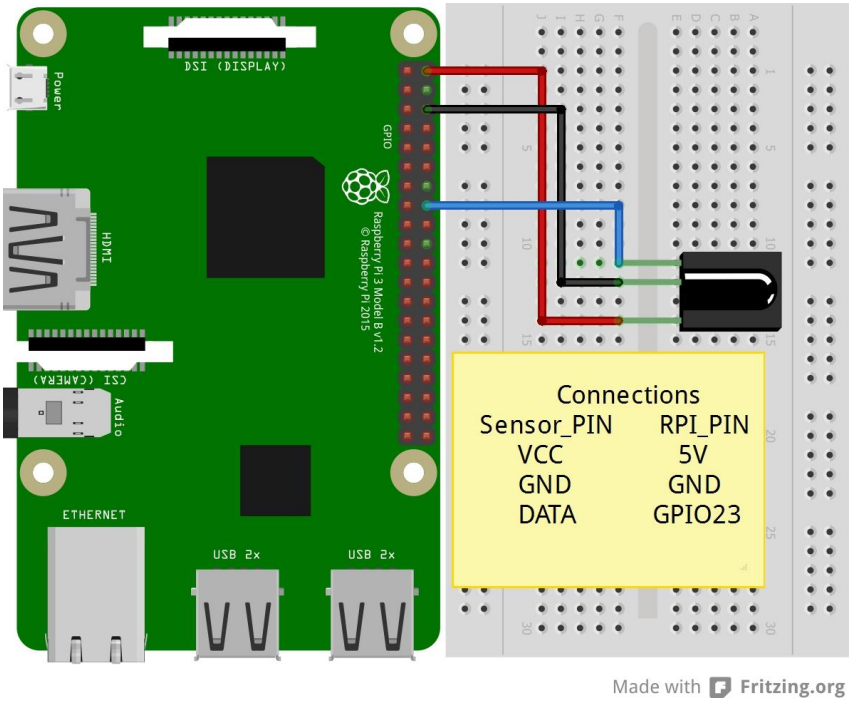
Hardware requirement:

Hardware	Picture	Quantity
Raspberry pi		1
IR Receiver (TSOP1838)		1
IR Transmitter		1
Bread Board		1
Jumper Wires		As require

Pin Configuration:

Sensor_PIN	RPI_PIN
VCC	5V
GND	GND
Signal	GPIO23

Connections diagram:



Compile and run:

For ir sensor you have to follow steps given below:

Step 1: open terminal.

Step 2: Run bash file

Run : sudo ./setup

It will install and configure the LIRC library.

Note: Raspberry pi should be connected to internet.

Step 3: Reboot the system.

Step 4: Run these two commands to display raw data for IR

Run: sudo /etc/init.d/lirc stop

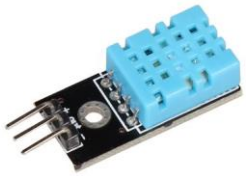
Run: mode2 -d /dev/lirc0

Application effect:

After executing code, by pressing button you will find that each button has corresponding coding and get following window,

```
space 16300
pulse 95
space 28794
pulse 80
space 19395
pulse 83
space 402351
pulse 135
space 7085
pulse 85
space 2903
```

Lesson 22 DHT11 Sensor experiment



By this lesson you can able to use digital sensorDHT11 with raspberry pi.

Overview:

This module integrates DHT11 sensor and other required components on a small PCB. The DHT11 sensor includes a resistive-type humidity measurement component, an NTC temperature measurement component and a high-performance 8-bit microcontroller inside, and provides calibrated digital signal output.
It has high reliability and excellent long-term stability, thanks to the exclusive digital signal acquisition technique and temperature & humidity sensing technology.

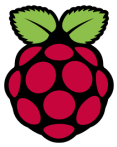
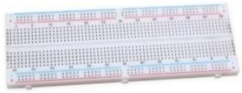
Specifications:

- Power Supply： 3.3~5.5V DC
- Output： 4 pin single row
- Measurement Range： Humidity 20-90%RH
- Temperature 0~50℃

Pin definition:

Sensor_PIN	Description
VCC	5V
GND	GND
Output	Digital Data

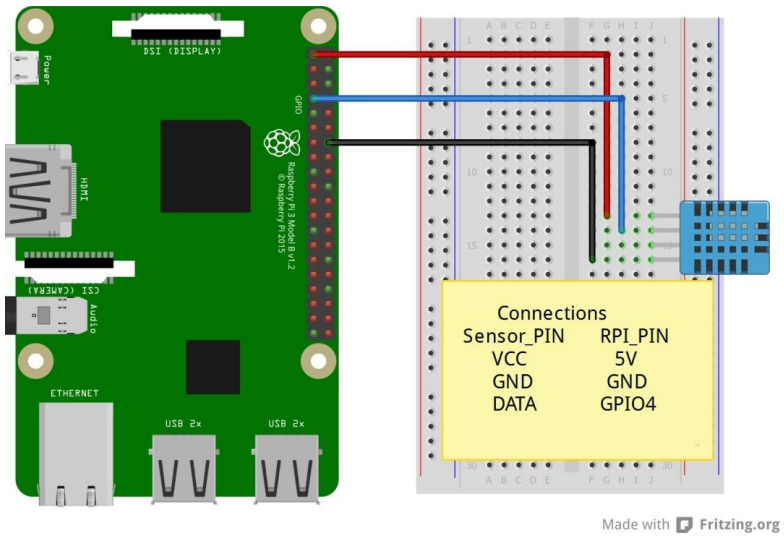
Hardware requirement:

Hardware	Picture	Quantity
Raspberry pi		1
DHT11 Sensor		1
Bread Board		1
Jumper Wires		As require

Pin configuration:

Sensor_PIN	RPI_PIN
VCC	5V
GND	GND
Signal/Data	GPIO4

Connection diagram:



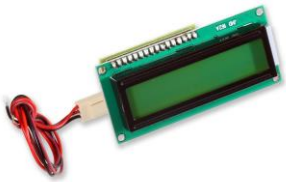
Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code, screen will shows digital sensor data for temperature and humidity.

Lesson 23 Serial LCD



In this lesson you will learn how to use LCD with raspberry pi board.

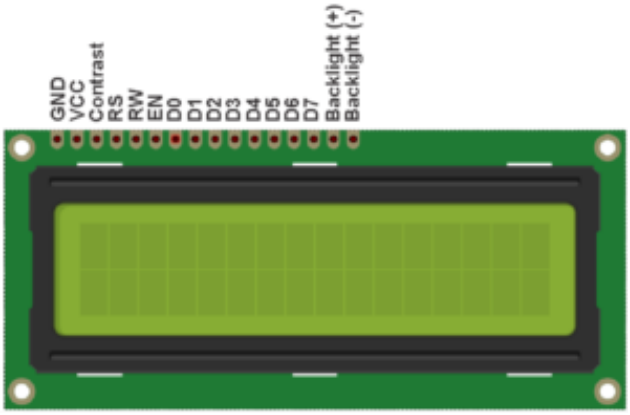
Overview:

This LCD can easily wire up with any device or any controller. This LCD works on the UART protocol of communication. You can also use LCD to display sensors reading and status. By adjust value of potentiometer you can manage brightness of LCD.

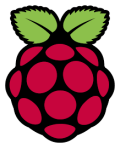
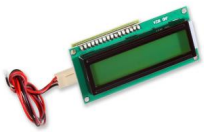
Specifications:

- Number of Characters: 16 characters x 2 line
- Character Format 5 x 7 dots with cursor

Pin configuration:



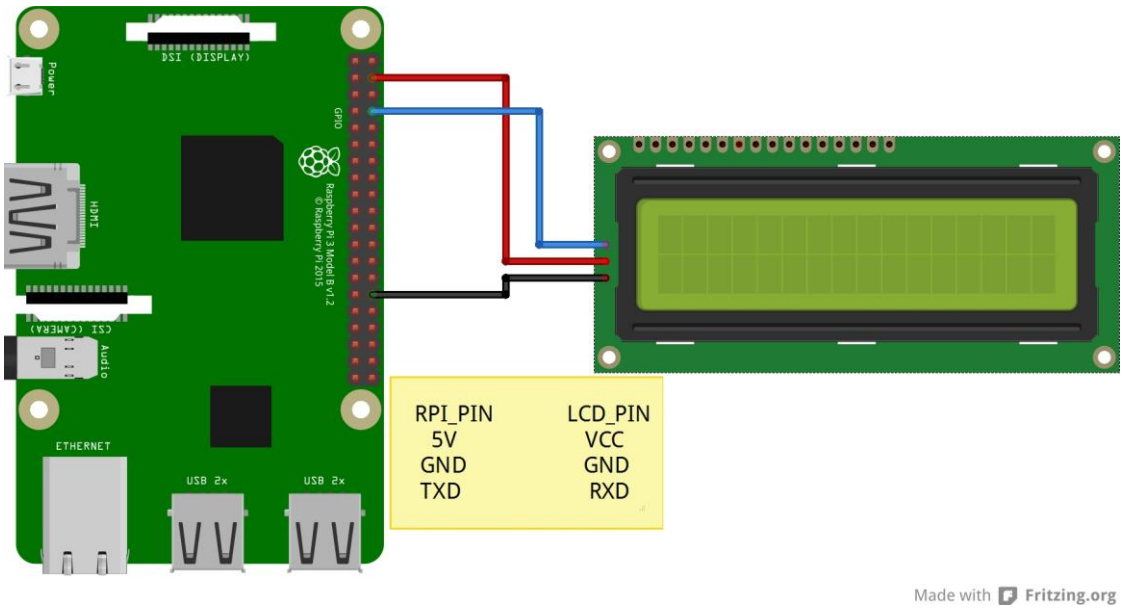
Hardware requirements:

Hardware	Picture	Quantity
Raspberry pi		1
LCD 16*2		1
Bread Board		1
Jumper Wires		As require

Pin Configuration:

LCD_PIN	RPI_PIN
VCC	5V
GND	GND
RXD	TXD

Connection diagram:



Compile and run:

For compile and run follow step 5 to step 9 from operation demo.

Application effect:

After executing code, LCD displays strings.