

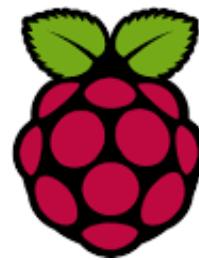


Raspberry Pi and GrovePi

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1. Introduction to Raspberry Pi



RaspberryPi

What is Raspberry Pi?

- Credit card size single board computer or a Programmable PC. The board features a processor, RAM and typical hardware ports you find with most computers.
- Developed in U.K. by Raspberry - Pi foundation in 2009
- Concept Initiated by Eben Upton who works at Broadcom
- Supported by “University of Cambridge Computer Laboratory & Broadcom”
- Has been a revolution in the market with over 3 million units sold

Why Raspberry Pi?

- Very Low Cost (\$25 – Rs 1550/- for Model A & \$35 – Rs 2200/- for Model B/B+)
- Great tool for Learning Programming, Computers & Concepts of Embedded Linux, etc
- Support for all Age Groups (School Children, College Undergraduates, Professional Developers, Programmers)
- Supports & runs Free and Open Source Linux OS
- Consumes less than 5W of Power
- Supports Full HD Video Output (1080p), Multiple USB Ports , etc
- Fun to learn & explore. You are limited by your imagination

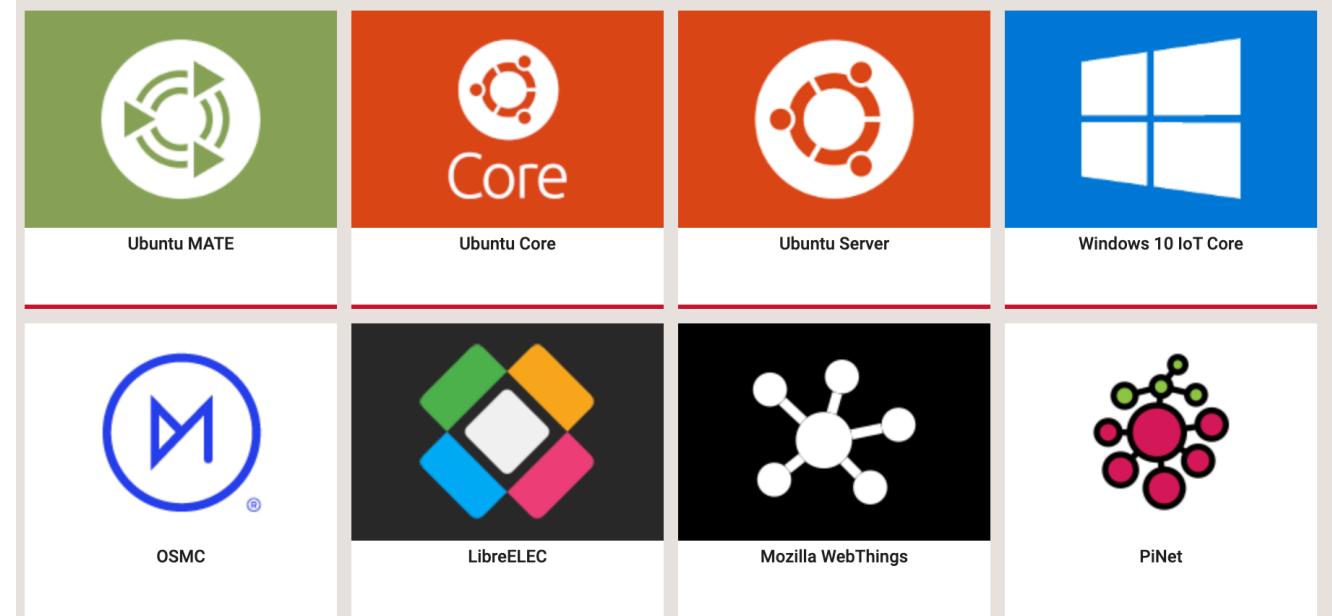
Operating System

- **Raspbian** is the Debian-based official operating system for **all** models of the Raspberry Pi.



Raspbian

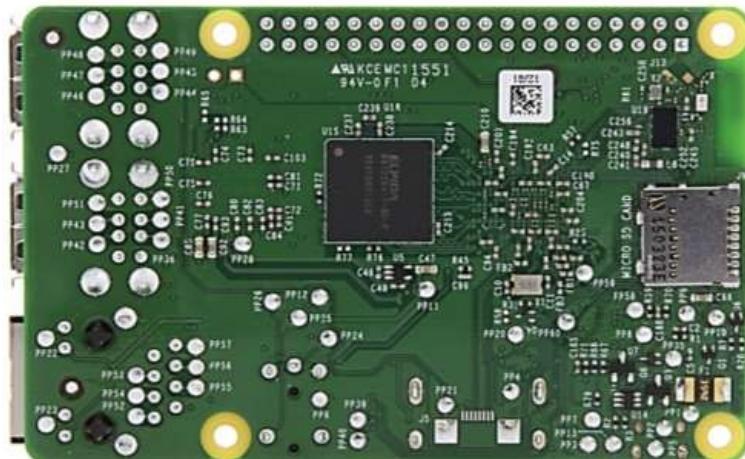
- Third-party operating system for Raspberry Pi are also available:



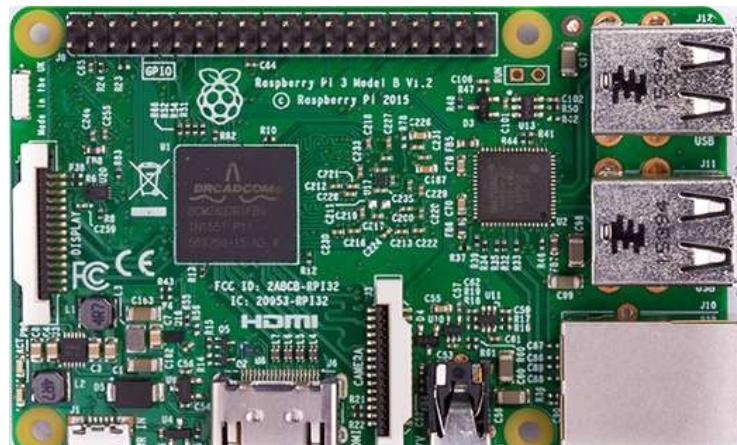
Programming

- By default, supporting Python as the educational language.
- Any language which will compile for ARMv6 can be used with the Raspberry Pi, so it's not limited to using Python.

Board Slots



Slot to insert micro SD card



Slots for USB Peripherals



Slot for Ethernet cable



Slot for HDMI cable



Slot to connect USB power cable

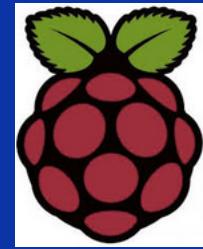


Arduino Vs Raspberry PI



Arduino is a [micro-controller](#). Micro-controller is a simple computer that can run one program at a time, over and over again. It is very easy to use.

Arduino is best used for simple repetitive tasks: opening and closing a garage door, reading the outside temperature and reporting it to Twitter, driving a simple robot.



Raspberry Pi is a general-purpose computer(**Mini PC**), usually with a Linux operating system, and the ability to run multiple programs. **It is more complicated to use than an Arduino.**

Raspberry Pi is best used when you need a full-fledged computer: driving a more complicated robot, performing multiple tasks, doing intense calculations (as for Bitcoin or encryption)

The other product

Inforce 6320: Application Ready Platform for IoT edge networking devices based on the Qualcomm® Snapdragon™ 410 Processor



Smart Lighting



Resource Monitoring



Analytics



Surveillance

RPI Models

IBM



RPI 0



RPI 1 Model A+



RPI 1 Model B+



RPI 2 Model B



RPI 3 Model B



RPI 3 Model A+



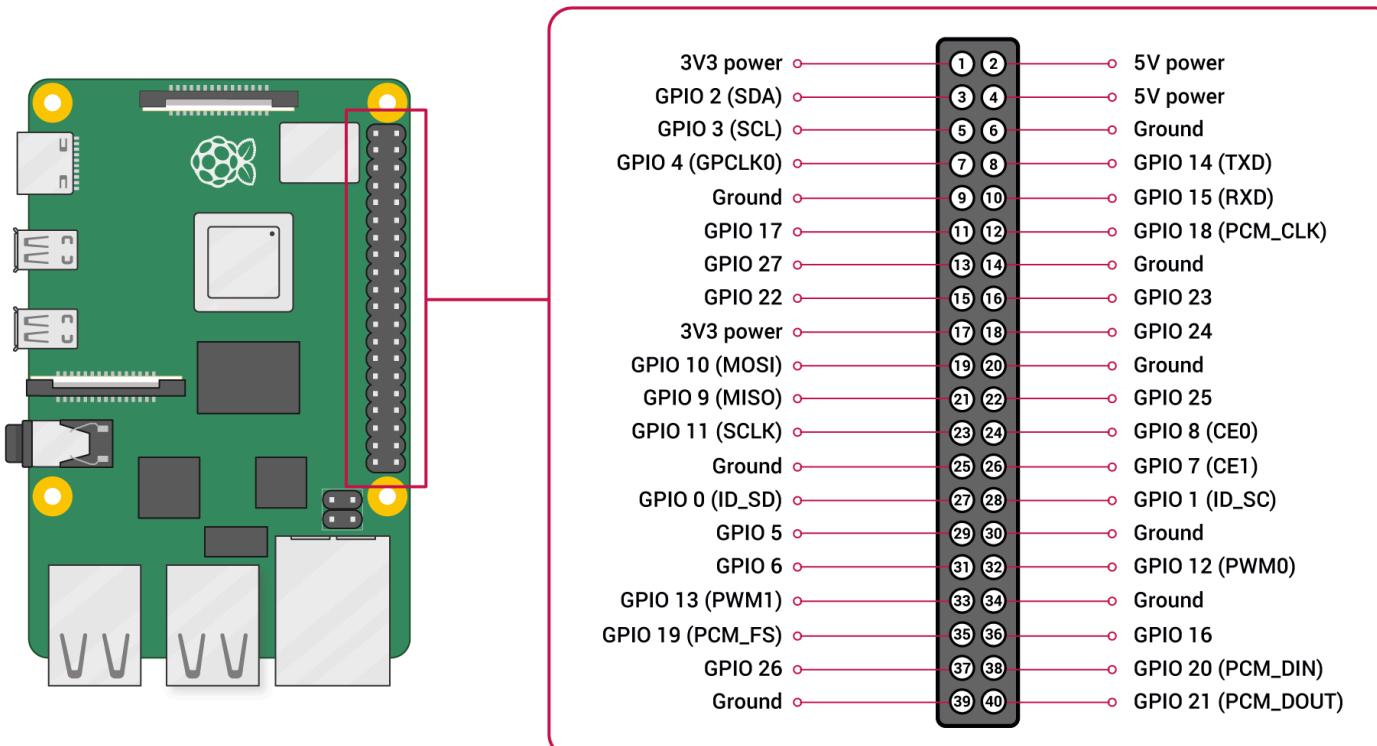
RPI 3 Model B+



RPI 4 Model B

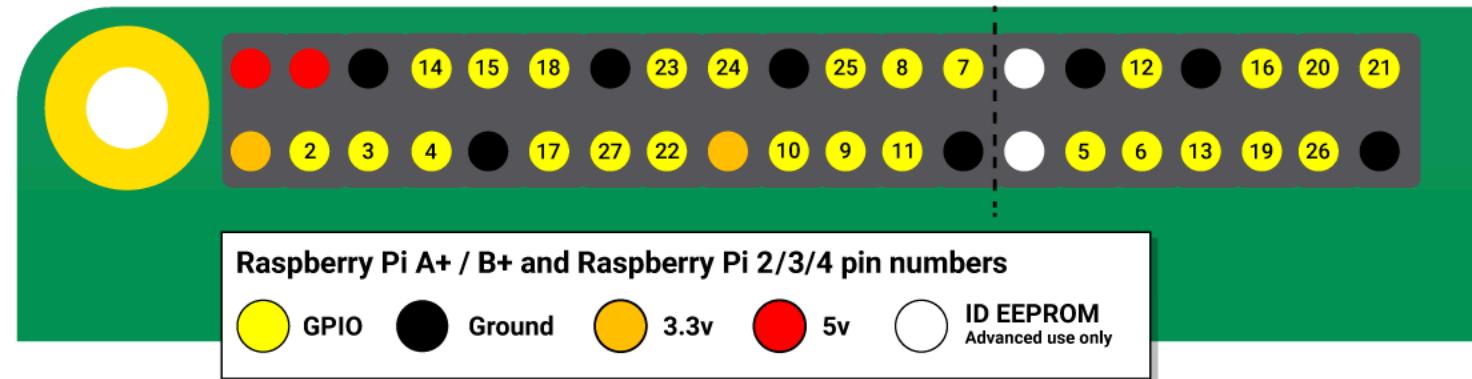
GPIO on Raspberry Pi

- A powerful feature of the Raspberry Pi is the row of GPIO (general-purpose input/output) pins along the top edge of the board.
- A 40-pin GPIO header is found on all current Raspberry Pi boards (unpopulated on Pi Zero and Pi Zero W). Prior to the Pi 1 Model B+ (2014), boards comprised a shorter 26-pin header.



GPIO on Raspberry Pi

- Any of the GPIO pins can be designated (in software) as an input or output pin and used for a wide range of purposes.



Note: the numbering of the GPIO pins is not in numerical order; GPIO pins 0 and 1 are present on the board (physical pins 27 and 28) but are reserved for advanced use.

GPIO on Raspberry Pi

- Voltages

Two 5V pins and two 3V3 pins are present on the board, as well as a number of ground pins (0V), which are unconfigurable. The remaining pins are all general purpose 3V3 pins, meaning outputs are set to 3V3 and inputs are 3V3-tolerant.

- Outputs

A GPIO pin designated as an output pin can be set to high (3V3) or low (0V).

- Inputs

A GPIO pin designated as an input pin can be read as high (3V3) or low (0V). This is made easier with the use of internal pull-up or pull-down resistors. Pins GPIO2 and GPIO3 have fixed pull-up resistors, but for other pins this can be configured in software.

GPIO pinout

- It's important to be aware of which pin is which. A handy reference can be accessed on the Raspberry Pi by opening a terminal window and running the command `pinout`. This tool is provided by the [GPIO Zero](#) Python library, which it is installed by default on the Raspbian desktop image (not on Raspbian Lite).

```

pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi: ~ $ pinout
+---+
| 0000000000000000 J8
| 1000000000000000
Pi Model 3B V1.2
|D| +---+ |S| +---+
|S| |SoC| |I| |A| +---+
|I| +---+ |C| +---+
PWR | HDMI | I | A | V
+---+ +---+ +---+ +---+
Revision : a02082
SoC      : BCM2837
RAM      : 1024Mb
Storage   : MicroSD
USB ports : 4 (excluding power)
Ethernet ports : 1
Wi-fi    : True
Bluetooth : True
Camera ports (CSI) : 1
Display ports (DSI): 1

J8:
  3V3 (1) (2) 5V
  GPIO2 (3) (4) 5V
  GPIO3 (5) (6) GND
  GPIO4 (7) (8) GPIO14
  GND (9) (10) GPIO15
  GPIO17 (11) (12) GPIO18
  GPIO27 (13) (14) GND
  GPIO22 (15) (16) GPIO23
  3V3 (17) (18) GPIO24
  GPIO10 (19) (20) GND
  GPIO9 (21) (22) GPIO25
  GPIO11 (23) (24) GPIO08
  GND (25) (26) GPIO07
  GPIO00 (27) (28) GPIO01
  GPIO05 (29) (30) GND
  GPIO06 (31) (32) GPIO12
  GPIO13 (33) (34) GND
  GPIO19 (35) (36) GPIO16
  GPIO26 (37) (38) GPIO20
  GND (39) (40) GPIO21

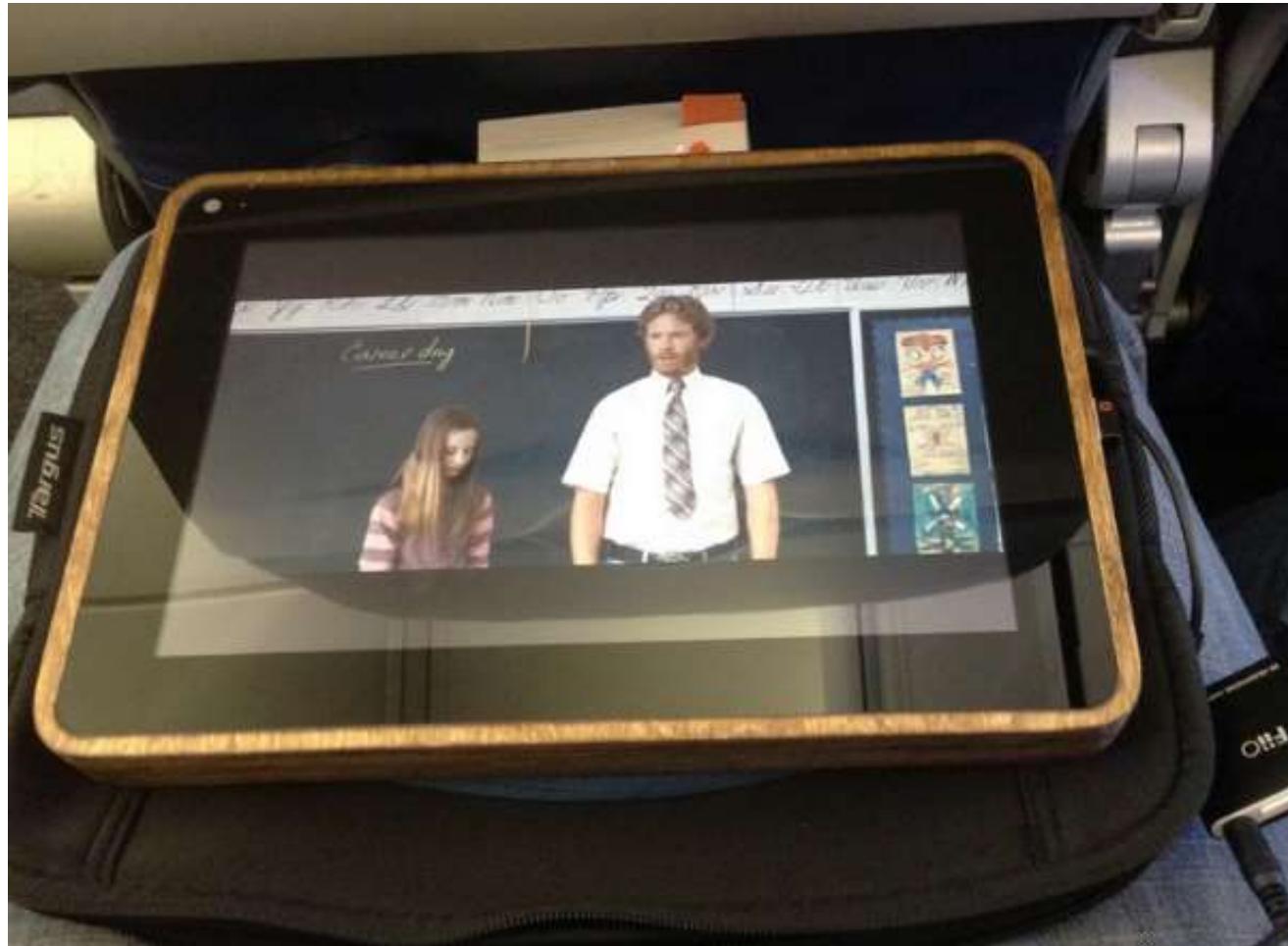
For further information, please refer to https://pinout.xyz/
pi@raspberrypi: ~ $

```

Handle with Care

- The Raspberry Pi was built to be used, but not abused. Every P.C.B. should be handled with care.
- Handle the Pi only by the edges of the board itself. Avoid touching or holding any of the components on the board.
- Rough Handling can cause solder points to fail and may result in short circuits, but be careful with the GPIO pins as well.
- While connecting Hardware, double check the connections and then power it up.
Raspberry Pi GPIO's are not 5V tolerant.

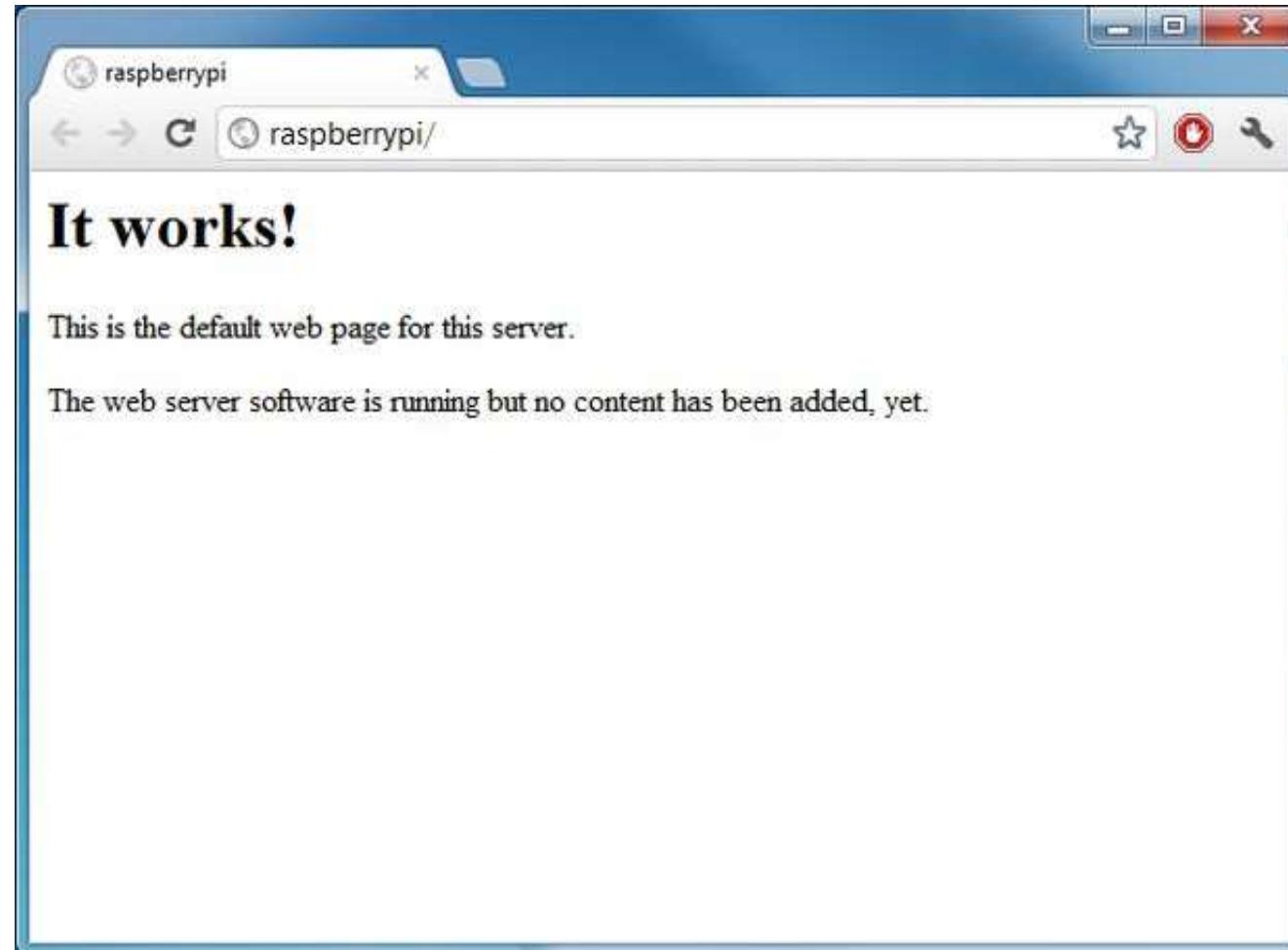
RPI Projects - PiPad: Tablet Using Raspberry Pi



RPI Projects - PiPhone : Using Raspberry Pi



RPI Projects - Running a Web server on Raspberry Pi



RPI Projects - Iridis-Pi : Supercomputer using Raspberry Pi (64 Processors, 1 TB of Memory)



RPI Projects - Low Cost HD Surveillance Camera



2. Introduction to GrovePi



- The GrovePi is an open-source platform for connecting Grove Sensors to the Raspberry Pi. Create IoT (Internet of Things) devices and inventions without the need of soldering!
- Its official API is written in Python, but it can also be interfaced with in other languages such as C, C#, Go and NodeJS. These other variations of the same library came from the contributors.

GrovePi Features

- GrovePi+ is a system with 15 Grove 4-pin interfaces that brings Grove sensors to the Raspberry Pi. It is the newest version compatible with Raspberry model B/B+ and A+ perfectly.
- GrovePi+ is an easy-to-use and modular system for hardware hacking with the Raspberry Pi, no need for soldering or breadboards: plug in your Grove sensors and start programming directly.
- Grove is an easy to use collection of more than 100 inexpensive plug-and-play modules that sense and control the physical world. By connecting Grove Sensors to the Raspberry Pi, it empowers your Pi in the physical world. With hundreds of sensors to choose from Grove families, the possibilities for interaction are endless.

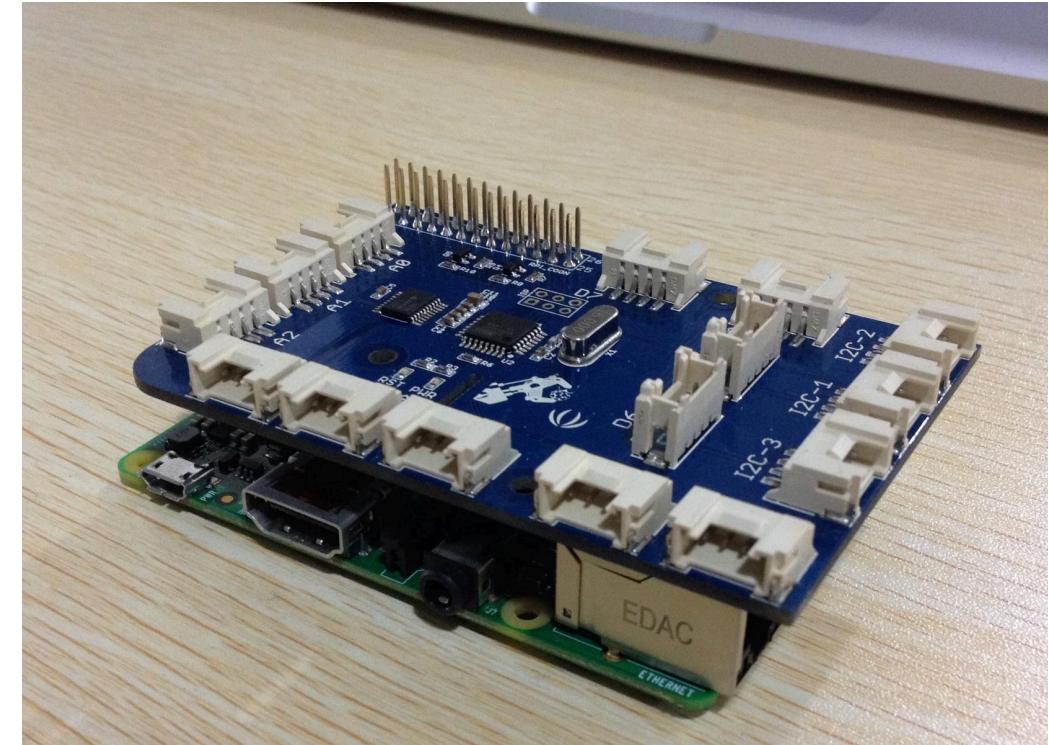
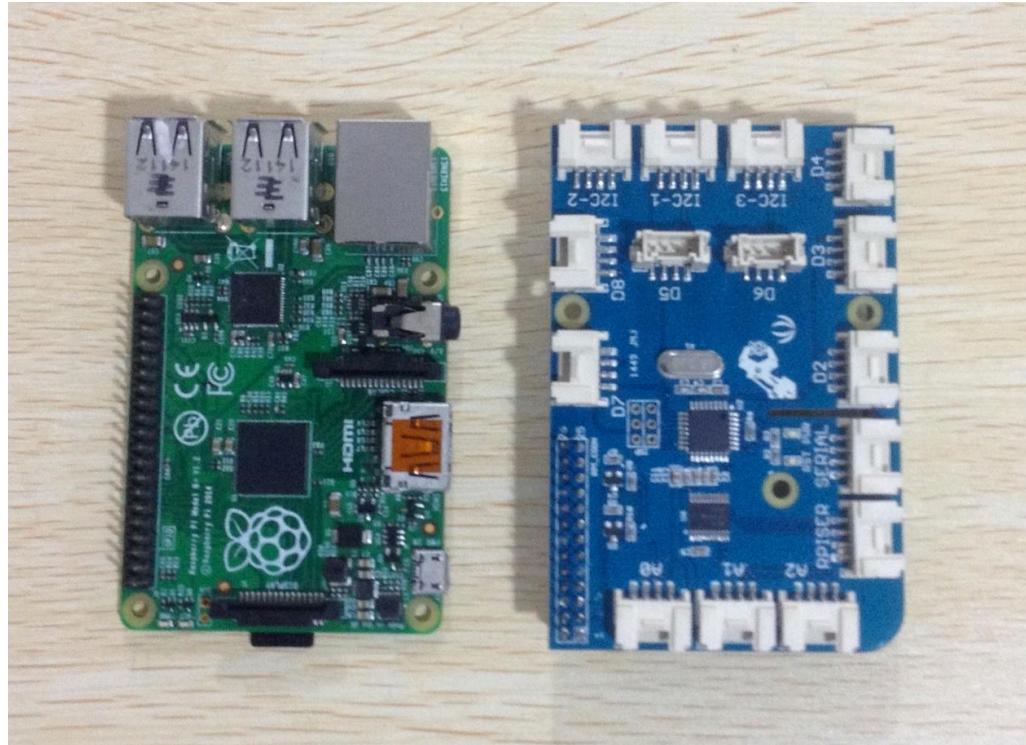
GrovePi Features

- 7 digital Ports
- 3 analoge Ports
- 3 I2C ports
- 1 Serial port connect to GrovePi
- 1 Serial port connect to Raspberry Pi
- Grove header Vcc output Voltage: 5Vdc

Getting started with GrovePi

- Connect the GrovePi to the Raspberry Pi

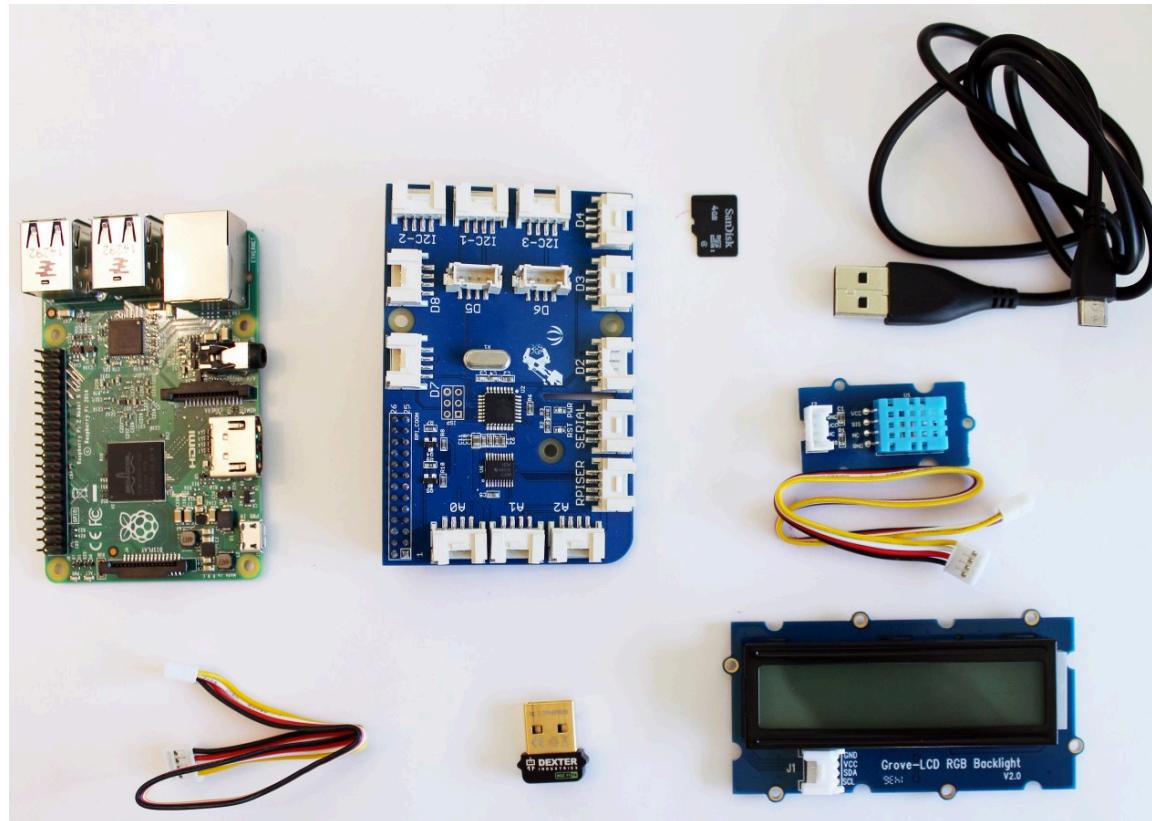
First, mount your GrovePi on the Raspberry Pi. The GrovePi slides over top of the Raspberry Pi as shown in the picture below.



Ensure that the pins are properly aligned when stacking the GrovePi.

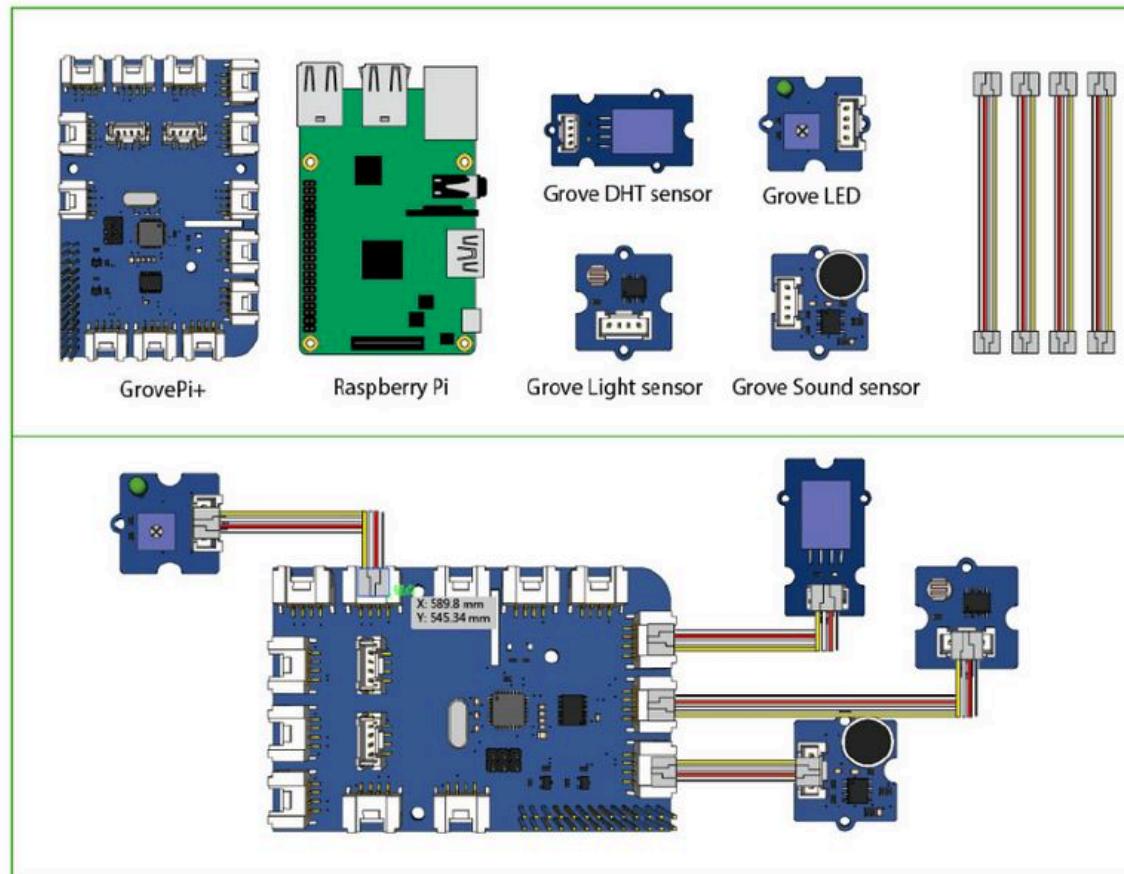
Home Weather Station

In this project, it uses a **Grove DHT (Digital Humidity and Temperature) sensor** as a Raspberry Pi temperature sensor. It uses a **Grove RGB LCD display**, connected to the Raspberry Pi, to show the temperature and humidity. It can be used as designed: a simple weather station for your home.



Sensor Twitter Feed

In this project it uses the GrovePi with the Grove LED, DHT, light and sound sensor and tweet the value live to the internet. It can be used to make a live Sensor Twitter Feed powered by the Raspberry Pi and the GrovePi.



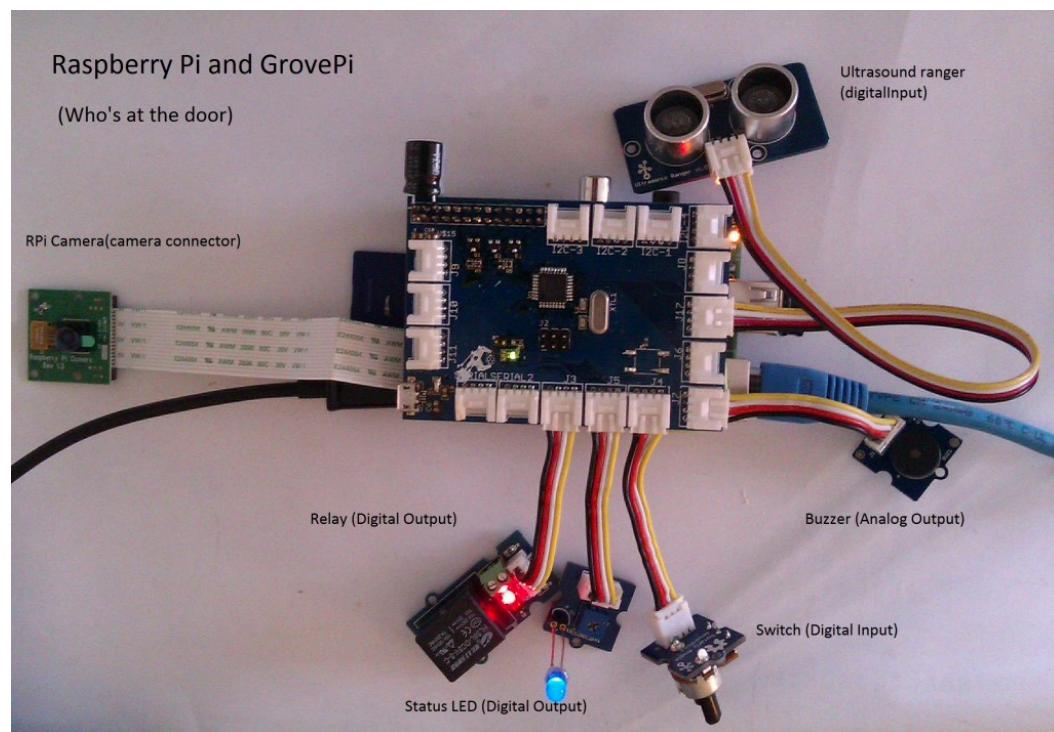
A screenshot of a Twitter profile for **DexterIndustriesLab** (@DexterIndLab). The profile picture is a white square with a blue plus sign. The bio is empty. The statistics show 24 tweets, 5 following, and 0 followers. There is an 'Edit profile' button. The 'Tweets' section displays three recent tweets from the user:

- DexterIndustriesLab** @DexterIndLab 1m
DI Lab's Temp: 24.26, Light: 75, Sound: 141
[Expand](#)
- DexterIndustriesLab** @DexterIndLab 1m
DI Lab's Temp: 24.35, Light: 75, Sound: 141
[Expand](#)
- DexterIndustriesLab** @DexterIndLab 1m
DI Lab's Temp: 24.43, Light: 75, Sound: 141
[Expand](#)

Who's At The Door

Using some sensors for the Grove system, connected them to the Raspberry Pi, along with a Raspberry Pi Camera, to add some security to the living places.

This project uses an Ultrasound Sensor to detect if anyone has entered the room. It uses a Raspberry Pi Camera to take a photo of the intruder, and the Raspberry Pi sends an e-mail to the end user. It also added a few actuators like a status LED, a relay used to control any electronic circuit, a power switch to turn the entire thing on and off, and a buzzer which makes a loud sound whenever someone comes in.



Movement
Detected



No Movement

A terminal window showing the output of a Python script named 'mail_file.py'. The output indicates the system is working, taking an image, connecting to a mail server, sending the email, and finally sending the mail.

```
pi@raspberrypi: ~
root@raspberrypi:/home/pi/Desktop/other/mail# python mail_file.py
System Working
Welcome
Image Shot
Connected to mail
Sending the mail
Mail sent
```

