

## Introduction and using of HQ camera

### 1. Environmental requirements

- 1)The Raspberry Pi has burned the image of the Raspberry Pi system.
- 2)The Raspberry Pi has connected the monitor, keyboard and mouse.
- 3)The Raspberry Pi can connect to the network and open the SSH service.

### 2. Introduction of HQ camera

- 1)The HQ camera is compatible with C-mount or CS-mount lenses.
- 2)The camera specifications are as follows:

	High Quality Camera
<b>Sensor</b>	Sony IMX477
<b>Sensor resolution</b>	4056 × 3040 pixels (12.33MP)
<b>Image size</b>	Diagonal 7.857 mm (Type 1/2.3)
<b>Pixel size</b>	1.55 × 1.55 μm
<b>Image modes</b>	4056 × 3040 2028 × 1520 2028 × 1080 1012 × 760

The shooting parameters are as follows:

### HQ Camera

Mode	Resolution	Aspect Ratio	Frame rates	Video*	Image	FoV	Binning/Scaling
1	2028 × 1080	169:90	0.1-50 fps	○		Partial	2 × 2 binned
2	2028 × 1520	4:3	0.1-50 fps	○		Full	2 × 2 binned
3	4056 × 3040	4:3	0.005-10 fps	○	○	Full	None
4	1012 × 760	4:3	50.1-120 fps	○	○	Full	4 × 4 scaled

Note:

- 1)By default, the camera will automatically switch between sensor input modes according to the parameters of the given raspistill or raspivid command. We can use the -md switch (or the sensor\_mode constructor in picamera) to force the sensor to any of the above four discrete modes.

- 2) You need to manually specify the resolution and frame rate, they should be within the specified range. Capture a pattern with partial field of view from the center of the sensor.
- 3) Video recording is limited to a maximum resolution of 1080p (1920 × 1080).

### 3. Open the Raspberry Pi camera

- 1) Open the Raspberry Pi terminal
- 2) Input following command.

**sudo raspi-config**

```
pi@raspberrypi:~ $ sudo raspi-config
```

- 3) Choose [Interfacing Options], and press "Enter".

```
Raspberry Pi 4 Model B Rev 1.1

Raspberry Pi Software Configuration Tool (raspi-config)

1 Change User Password Change password for the current user
2 Network Options       Configure network settings
3 Boot Options          Configure options for start-up
4 Localisation Options  Set up language and regional settings to match your
5 Interfacing Options   Configure connections to peripherals
6 Overclock             Configure overclocking for your Pi
7 Advanced Options      Configure advanced settings
8 Update               Update this tool to the latest version
9 About raspi-config    Information about this configuration tool

<Select>                <Finish>
```

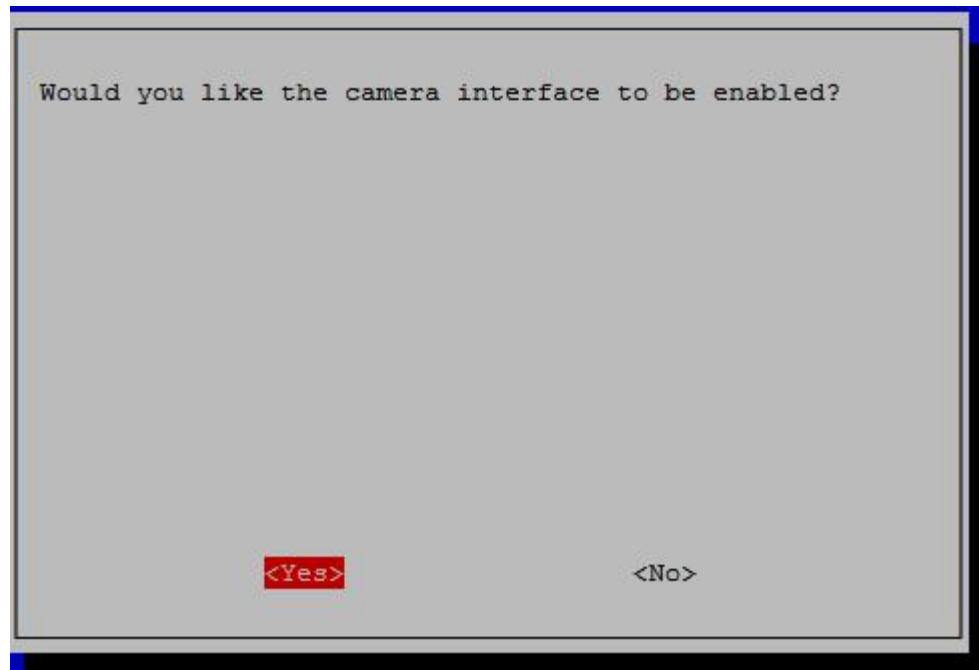
4. Choose [Camera], and press "Enter".

```
Raspberry Pi Software Configuration Tool (raspi-config)

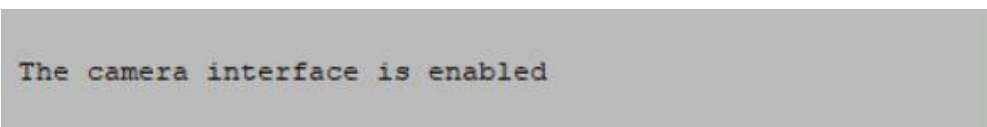
P1 Camera      Enable/Disable connection to the Raspberry Pi Camera
P2 SSH         Enable/Disable remote command line access to your Pi using
P3 VNC         Enable/Disable graphical remote access to your Pi using Rea
P4 SPI         Enable/Disable automatic loading of SPI kernel module
P5 I2C         Enable/Disable automatic loading of I2C kernel module
P6 Serial      Enable/Disable shell and kernel messages on the serial conn
P7 1-Wire      Enable/Disable one-wire interface
P8 Remote GPIO Enable/Disable remote access to GPIO pins

<Select>                <Back>
```

5. Choose [Yes].



6. The prompt shown in the figure below indicates that the camera is turned on.



7. Choose [Finish] and reboot Raspberry Pi.



#### 4. Check camera

We can view the current camera through the command `ls/dev/`

If you see video0, you've detected the camera.

```

pi@raspberrypi:~ $ ls /dev
argon-h264mem  media0      shm          tty38        vcio
argon-hevcmem  mem         snd          tty39        vc-mem
argon-intcmem  memory_bandwidth spidev0.0    tty4         vcs
argon-vp9mem   mmcblk0     spidev0.1    tty40        vcs1
autofs         mmcblk0p1   stderr       tty41        vcs2
block          mmcblk0p2   stdin        tty42        vcs3
btrfs-control  mqqueue     stdout       tty43        vcs4
bus            net         tty          tty44        vcs5
cachefiles     network_latency tty0         tty45        vcs6
char           network_throughput tty1         tty46        vcs7
console        null        ttyl0        tty47        vcsa
cpu_dma_latency port        ttyl1        tty48        vcsa1
cuse           ppp         ttyl2        tty49        vcsa2
disk           ptmx        ttyl3        tty5         vcsa3
dri            pts         ttyl4        tty50        vcsa4
fb0            ram0        ttyl5        tty51        vcsa5
fd             ram1        ttyl6        tty52        vcsa6
full           ram10       ttyl7        tty53        vcsa7
fuse           ram11       ttyl8        tty54        vcsa
gpiochip0      ram12       ttyl9        tty55        vcsa-cma
gpiochip1      ram13       tty2         tty56        vcsu
gpiochip2      ram14       tty20        tty57        vcsu1
gpiomem        ram15       tty21        tty58        vcsu2
hidraw0        ram2        tty22        tty59        vcsu3
hwrng          ram3        tty23        tty6         vcsu4
i2c-1          ram4        tty24        tty60        vcsu5
initctl        ram5        tty25        tty61        vcsu6
input          ram6        tty26        tty62        vcsu7
kmsg           ram7        tty27        tty63        vga_arbiter
log            ram8        tty28        tty7         vhci
loop0          ram9        tty29        tty8         video0
loop1          random      tty3         tty9         video10
loop2          raw         tty30        ttyAMA0      video11
loop3          rfkill      tty31        ttyprintk    video12
loop4          rpivid-h264mem tty32        ttyS0        watchdog
loop5          rpivid-hevcmem tty33        uhid         watchdog0
loop6          rpivid-intcmem tty34        uinput       zero
loop7          rpivid-vp9mem tty35        urandom
loop-control   serial0     tty36        v4l
mapper         serial1     tty37        vchiq
pi@raspberrypi:~ $

```

## 5.The test camera takes pictures

**raspistill** -----This command is to get the static image

The picture below shows the parameter information about the command displayed directly by the command.



```

pi@raspberrypi:~ $ raspistill

"raspistill" Camera App (commit )

Runs camera for specific time, and take JPG capture at end if requested

usage: raspistill [options]

Image parameter commands

-q, --quality      : Set jpeg quality <0 to 100>
-r, --raw          : Add raw Bayer data to jpeg metadata
-l, --latest       : Link latest complete image to filename <filename>
-t, --timeout      : Time (in ms) before takes picture and shuts down (if not specified, set to 5s)
-th, --thumb       : Set thumbnail parameters (x:y:quality) or none
-d, --demo         : Run a demo mode (cycle through range of camera options, no capture)
-e, --encoding     : Encoding to use for output file (jpg, bmp, gif, png)
-x, --exif         : EXIF tag to apply to captures (format as 'key=value') or none
-tl, --timelapse   : Timelapse mode. Takes a picture every <t>ms. %d == frame number (Try: -o img_%04d.jpg)
-fp, --fullpreview : Run the preview using the still capture resolution (may reduce preview fps)
-k, --keypress     : Wait between captures for a ENTER, X then ENTER to exit
-s, --signal       : Wait between captures for a SIGUSR1 or SIGUSR2 from another process
-g, --gl           : Draw preview to texture instead of using video render component
-gc, --glcapture   : Capture the GL frame-buffer instead of the camera image
-bm, --burst       : Enable 'burst capture mode'
-dt, --datetime    : Replace output pattern (%d) with DateTime (MonthDayHourMinSec)
-ts, --timestamp   : Replace output pattern (%d) with unix timestamp (seconds since 1970)
-fs, --framestart  : Starting frame number in output pattern(%d)
-rs, --restart     : JPEG Restart interval (default of 0 for none)

GL parameter commands

-gs, --glscene     : GL scene square,teapot,mirror,yuv,sobel,vscm_square
-gw, --glwin       : GL window settings <'x,y,w,h'>

Common Settings commands

-?, --help         : This help information
-w, --width        : Set image width <size>
-h, --height       : Set image height <size>
-o, --output       : Output filename <filename> (to write to stdout, use '-o -'). If not specified, no file is saved
-v, --verbose      : Output verbose information during run
-cs, --camselect   : Select camera <number>. Default 0
-md, --mode        : Force sensor mode. 0=auto. See docs for other modes available
-gps, --gpsdexif   : Apply real-time GPS information to output (e.g. EXIF in JPG, annotation in video (requires libgps.so.22)

Preview parameter commands

-p, --preview      : Preview window settings <'x,y,w,h'>
-f, --fullscreen   : Fullscreen preview mode
-op, --opacity     : Preview window opacity (0-255)
-n, --nopreview    : Do not display a preview window
-dn, --dispnum     : Display on which to display the preview window (dispmanx/tvservice numbering)

```

After the Raspberry Pi desktop displays 1 second, camera take a picture, save it to the current directory, and name it image.jpg

**raspistill -t 1000 -o image.jpg**

```

pi@raspberrypi:~ $ raspistill -t 1000 -o image.jpg
pi@raspberrypi:~ $ ls
audio.mp3      image.jpg      NetworkService  Public
Desktop        MagPi          Notebook        Templates
Documents      mu_code       opencv-4.1.2   Videos
Downloads      Music         Pictures        Yahboom_Project
pi@raspberrypi:~ $

```

You can open the file manager to view image.jpg, the maximum resolution is 4056 \* 3040 by default.

image.jpg (4056x3040) 31%

