3.1.1 Drive camera

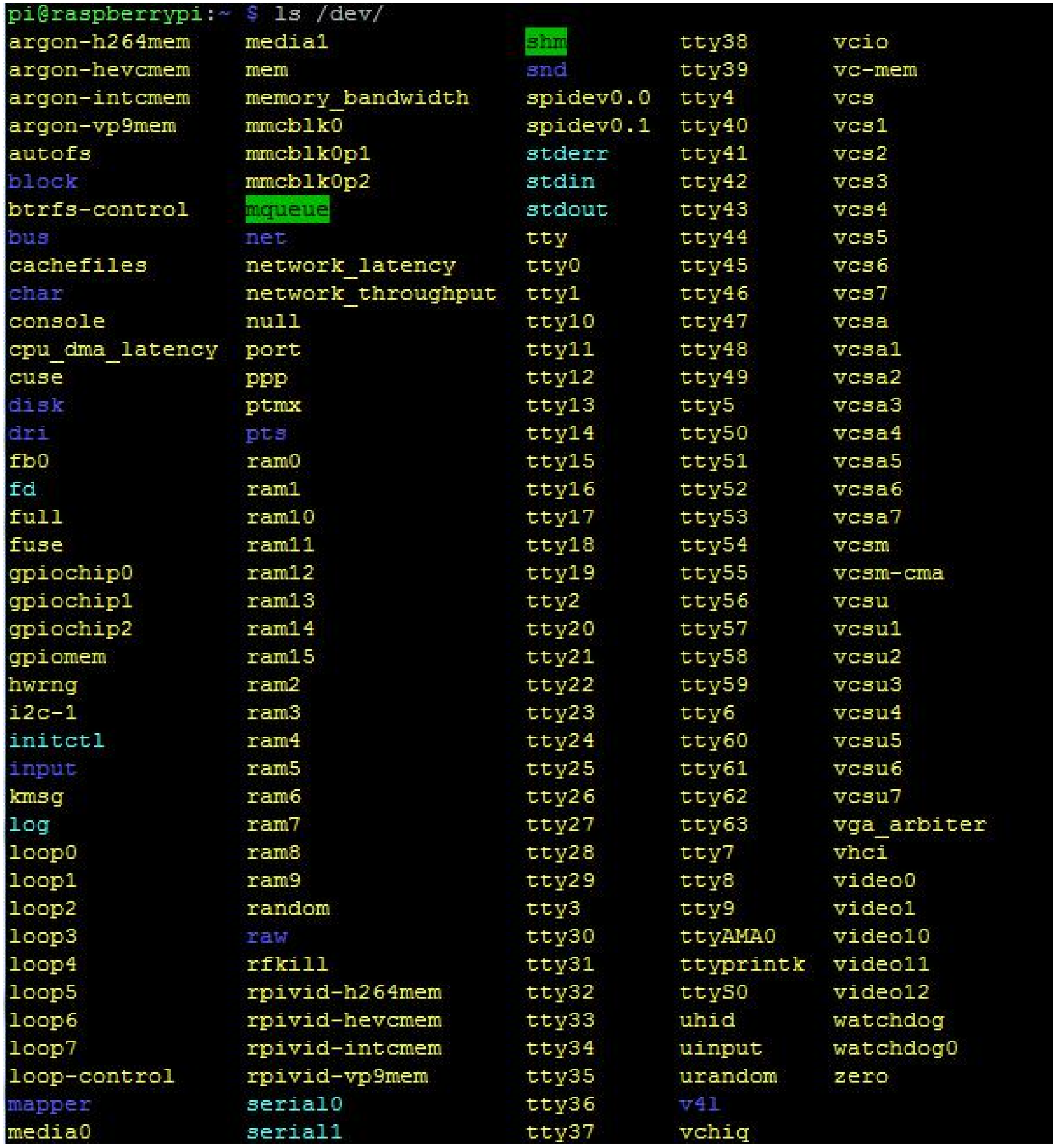
Common API functions used by OpenCV:

1. **cv2.VideoCapture()**

cap = cv2.VideoCapture(0)

The parameter in VideoCapture () is 0, which means Raspberry Pi video0.

(Note: You can view the current camera through the command ls/dev/)



```
pi@raspberrypi:~ $ ls /dev/
argon-h264mem    media1              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    mqueue              stdout     tty43      vcs4
bus              net                 tty        tty44      vcs5
cachefiles       network_latency     tty0       tty45      vcs6
char             network_throughput  tty1       tty46      vcs7
console          null                tty10      tty47      vcsa
cpu_dma_latency  port                tty11      tty48      vcsa1
cuse             ppp                 tty12      tty49      vcsa2
disk             ptmx                tty13      tty5       vcsa3
dri              pts                 tty14      tty50      vcsa4
fb0              ram0                tty15      tty51      vcsa5
fd               ram1                tty16      tty52      vcsa6
full             ram10               tty17      tty53      vcsa7
fuse             ram11               tty18      tty54      vcsm
gpiochip0        ram12               tty19      tty55      vcsm-cma
gpiochip1        ram13               tty2       tty56      vcsu
gpiochip2        ram14               tty20      tty57      vcsu1
gpiomem          ram15               tty21      tty58      vcsu2
hwrng            ram2                tty22      tty59      vcsu3
i2c-1            ram3                tty23      tty6       vcsu4
initctl          ram4                tty24      tty60      vcsu5
input            ram5                tty25      tty61      vcsu6
kmsg             ram6                tty26      tty62      vcsu7
log              ram7                tty27      tty63      vga_arbiter
loop0            ram8                tty28      tty7       vhci
loop1            ram9                tty29      tty8       video0
loop2            random              tty3       tty9       video1
loop3            raw                 tty30      ttyAMA0    video10
loop4            rfkill              tty31      ttyprintk  video11
loop5            rpivid-h264mem      tty32      ttyS0      video12
loop6            rpivid-hevcmem      tty33      uhid       watchdog
loop7            rpivid-intcmem      tty34      uinput     watchdog0
loop-control     rpivid-vp9mem       tty35      urandom    zero
mapper           serial0             tty36      v4l
media0           serial1             tty37      vchiq
```

cap = cv2.VideoCapture("…/1.avi")

VideoCapture("…/1.avi"), This parameter indicates that if the path of the video file is entered, the video is opened.

2.**cap.set()**

Camera parameters common configuration methods:

capture.set(CV_CAP_PROP_FRAME_WIDTH, 1920); # Width

capture.set(CV_CAP_PROP_FRAME_HEIGHT, 1080); # Height

```
capture.set(CV_CAP_PROP_FPS, 30);                    # Frame
capture.set(CV_CAP_PROP_BRIGHTNESS, 1);             # Brightness 1
capture.set(CV_CAP_PROP_CONTRAST,40);               # Contrast 40
capture.set(CV_CAP_PROP_SATURATION, 50);            # Saturation 50
capture.set(CV_CAP_PROP_HUE, 50);                   # Hue 50
capture.set(CV_CAP_PROP_EXPOSURE, 50);              # Visibility 50
```

Parameter explanation:

```
#define CV_CAP_PROP_POS_MSEC  0
// Calculate the current position in milliseconds
#define CV_CAP_PROP_POS_FRAMES     1
// Calculate the current position in frame
#define CV_CAP_PROP_POS_AVI_RATIO  2   // Relative position of the video
#define CV_CAP_PROP_FRAME_WIDTH    3    // Width
#define CV_CAP_PROP_FRAME_HEIGHT   4    // Height
#define CV_CAP_PROP_FPS            5     // Frame rate
#define CV_CAP_PROP_FOURCC         6    // 4 Character encoding
#define CV_CAP_PROP_FRAME_COUNT    7    // Video frames
#define CV_CAP_PROP_FORMAT         8    // Video format
#define CV_CAP_PROP_MODE           9
// Backend specific value indicating the current capture mode.
#define CV_CAP_PROP_BRIGHTNESS    10    // Brightness
#define CV_CAP_PROP_CONTRAST      11   // Contrast
#define CV_CAP_PROP_SATURATION    12 // Saturation
#define CV_CAP_PROP_HUE           13   // Hue
#define CV_CAP_PROP_GAIN          14 // Gain
#define CV_CAP_PROP_EXPOSURE      15 // Exposure
#define CV_CAP_PROP_CONVERT_RGB   16
// Mark whether the image should be converted to RGB.
#define CV_CAP_PROP_WHITE_BALANCE 17 // White balance
#define CV_CAP_PROP_RECTIFICATION 18 // Stereo camera calibration mark (note:
only support DC1394 v2)
```

3.cap.isOpened()

Return true indicates open camera successful and false indicates open camera failure

4.ret,frame = cap.read()

cap.read () reads the video frame by frame. ret and frame are the two return values of the cap.read () function.

ret is a Boolean value, if the read frame is correct, it will return true, If the file has not been read to the end, it returns False.

Frame is the image of each frame, which is a three-dimensional matrix.

5.cv2.waitKey(n)

n represents the delay time, if the parameter is 1, it means a delay of 1ms to switch to the next frame of image.
If the parameter is too large, such as cv2.waitKey (1000), it will freeze because of the long delay.
The parameter is 0, such as, cv2.waitKey (0) only displays the current frame image, which is equivalent to video pause.

6.cap.release() and destroyAllWindows()
Call cap.release () to release the video.
Call destroyAllWindows () to close all image windows.

About Code
Since our entire tutorial runs in JupyterLab, we must understand the various components inside.
Here we need to use the image display component.

1.Import library

```
import ipywidgets.widgets as widgets
```

2.Set Image component

```
image_widget = widgets.Image(format='jpeg', width=600, height=500)
```

3.Display Image component

```
display(image_widget)
```

4.Open camera and read image

```
image = cv2.VideoCapture(0)          # Open camera
ret, frame = image.read()            # Read camera data
```

5.Assignment to components

```
#Convert the image to jpeg and assign it to the video display component
image_widget.value = bgr8_to_jpeg(frame)
```

```
import cv2
import ipywidgets.widgets as widgets
import threading
import time

#Set camera display component
image_widget = widgets.Image(format='jpeg', width=600, height=500)
display(image_widget)          # display camera component
```

```
#bgr 8 to jpeg format
import enum
import cv2
```

```
def bgr8_to_jpeg(value, quality=75):
        return bytes(cv2.imencode('.jpg', value)[1])
```

```
image = cv2.VideoCapture(0)                # Open camera

# width=1280
# height=960
# cap.set(cv2.CAP_PROP_FRAME_WIDTH,width)    # set width of image
# cap.set(cv2.CAP_PROP_FRAME_HEIGHT,height)    # set height of image

image.set(3,600)
image.set(4,500)
image.set(5, 30)    # set frame
image.set(cv2.CAP_PROP_FOURCC, cv2.VideoWriter.fourcc('M', 'J', 'P', 'G'))
image.set(cv2.CAP_PROP_BRIGHTNESS, 40)    #set brightness -64 - 64    0.0
image.set(cv2.CAP_PROP_CONTRAST, 50)      #set contrast -64 - 64    2.0
image.set(cv2.CAP_PROP_EXPOSURE, 156)    #set exposure value 1.0 - 5000 156.0

ret, frame = image.read()          # read camera data
image_widget.value = bgr8_to_jpeg(frame)
```

```
while 1:
        ret, frame = image.read()
        image_widget.value = bgr8_to_jpeg(frame)
        time.sleep(0.010)
```

```
image.release()     #After using the object, we need to release the object, otherwise
when we use the object again, the system will prompt that the object be occupied,
making it unusable.
```

The camera screen is shown below：