

Raspberry Pi Tutorial

Phumiphat Charoentananuwat 6372093721

Nisawan Ngambenjavichaikul 6372066821

Software and Hardware Requirement

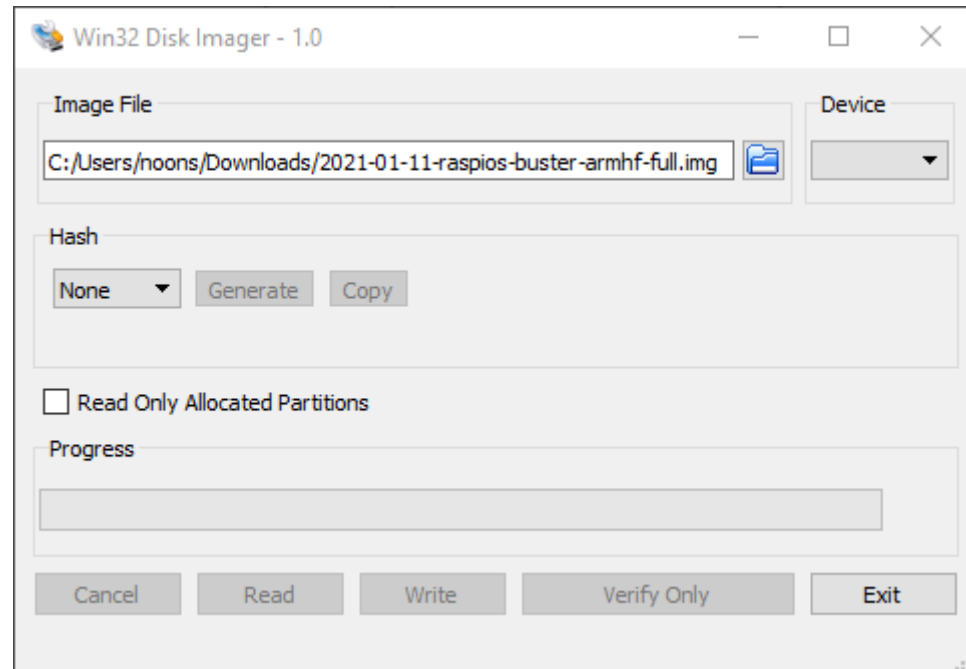
- Win32DiskImager
- Visual Studio Code with Remote-SSH Extension (Optional)
- VNC Viewer (Optional)
- SD card
- Keyboard
- Mouse
- HDMI monitor

Workflow

- Install Raspbian OS into SD card
- Setup system
 - Enable camera
 - Enable ssh (Optional)
 - Enable VNC (Optional)
- Install OpenCV
- Test camera and OpenCV
- Implement laplacian and canny edge detection

Install Raspbian OS

- Download Raspbian image from <https://www.raspberrypi.org/software/operating-systems/#raspberry-pi-os-32-bit>
- Install by Win32DiskImager



Hardware setup



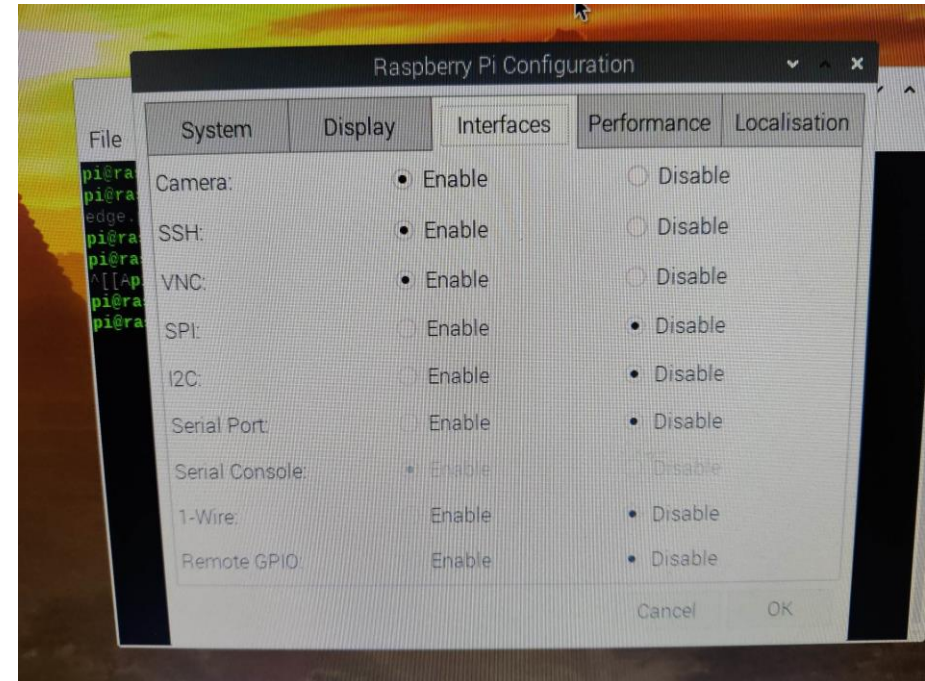
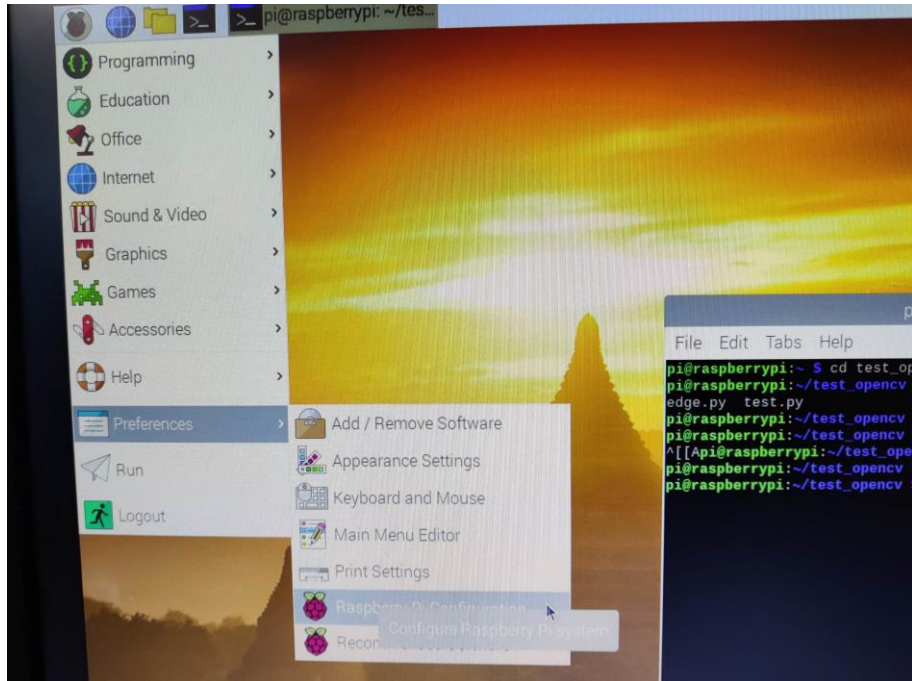
usb keyboard

usb mouse

Power supply

HDMI monitor

System setup

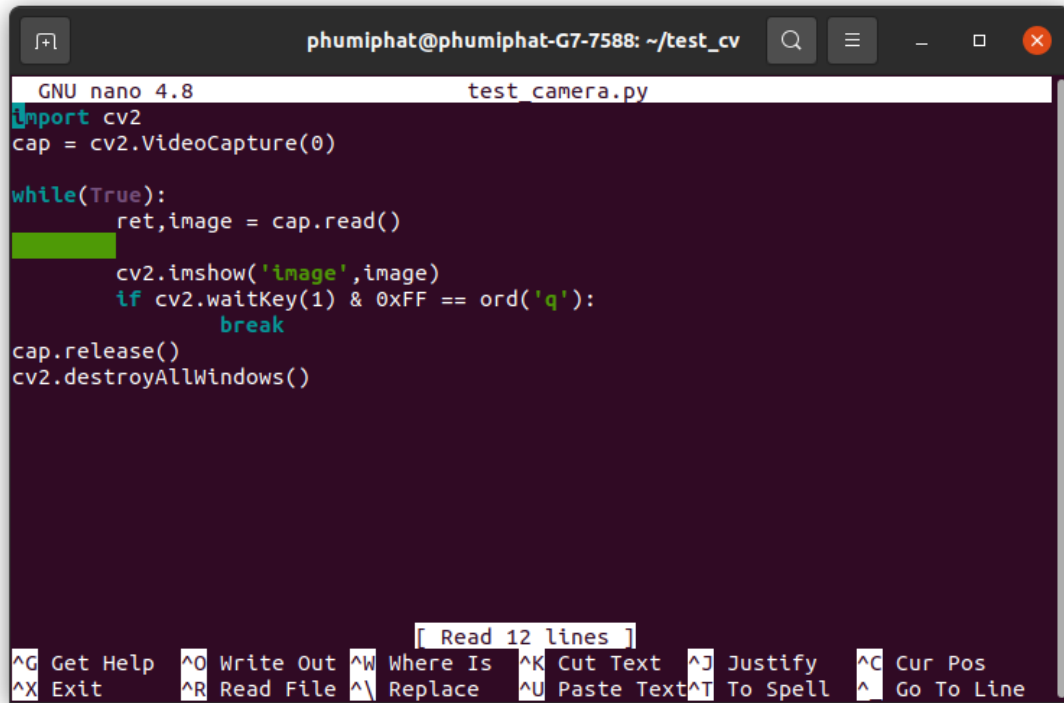


Install OpenCV

- System update
 - `sudo apt-get update`
 - `Sudo apt-get upgrade`
 - `Sudo rpi-update`
- Install dependencies image and video io
 - `sudo apt-get install libjpeg-dev libtiff5-dev libjasper-dev libpng12-dev -y`
 - `sudo apt-get install libavcodec-dev libavformat-dev libswscale-dev libv4l-dev -y`
 - `sudo apt-get install libxvidcore-dev libx264-dev`
- Install HiGUI
 - `Sudo apt-get install libgtk2.0-dev libgtk-3-dev -y`
 - `Sudo apt-get install libatlas-base-dev gfortran -y`
- Install OpenCV
 - `Sudo apt-get install python3-opencv`

Experiment (1)

- Test picamera and OpenCV

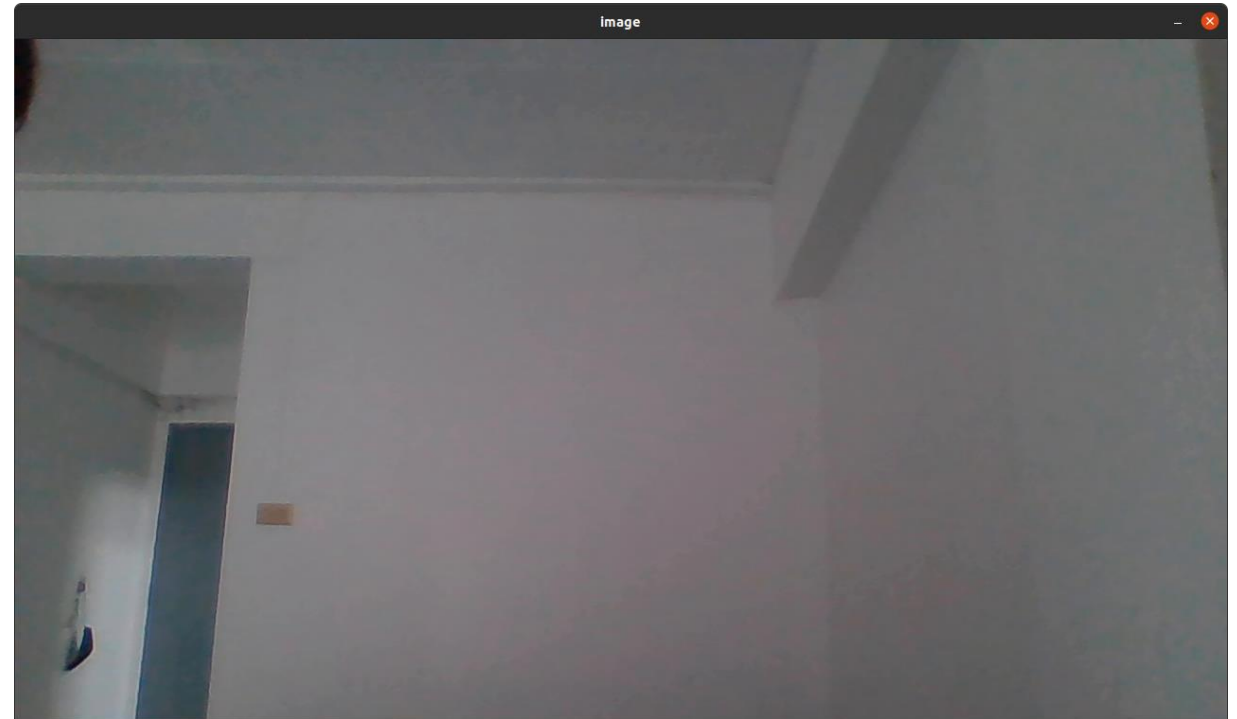


A screenshot of a terminal window titled 'phumiphat@phumiphat-G7-7588: ~/test_cv'. The window shows the GNU nano 4.8 text editor editing a file named 'test_camera.py'. The code in the editor is as follows:

```
import cv2
cap = cv2.VideoCapture(0)

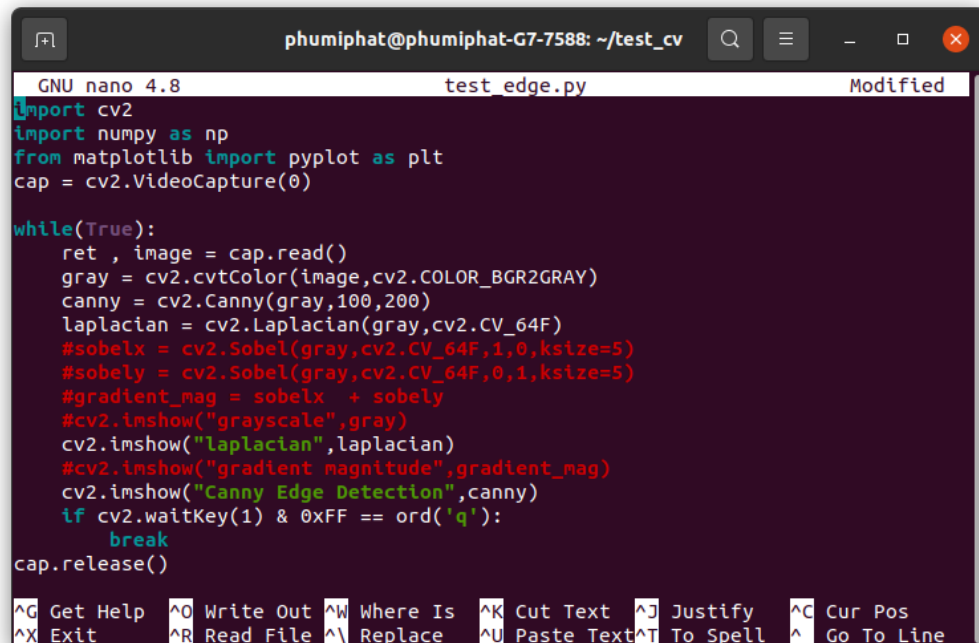
while(True):
    ret,image = cap.read()
    cv2.imshow('image',image)
    if cv2.waitKey(1) & 0xFF == ord('q'):
        break
cap.release()
cv2.destroyAllWindows()
```

At the bottom of the terminal, there is a status bar with various keyboard shortcuts: ^G Get Help, ^O Write Out, ^W Where Is, ^K Cut Text, ^J Justify, ^C Cur Pos, ^X Exit, ^R Read File, ^_ Replace, ^U Paste Text, ^T To Spell, and ^_ Go To Line. A small box above the status bar indicates 'Read 12 lines'.



Experiment (2)

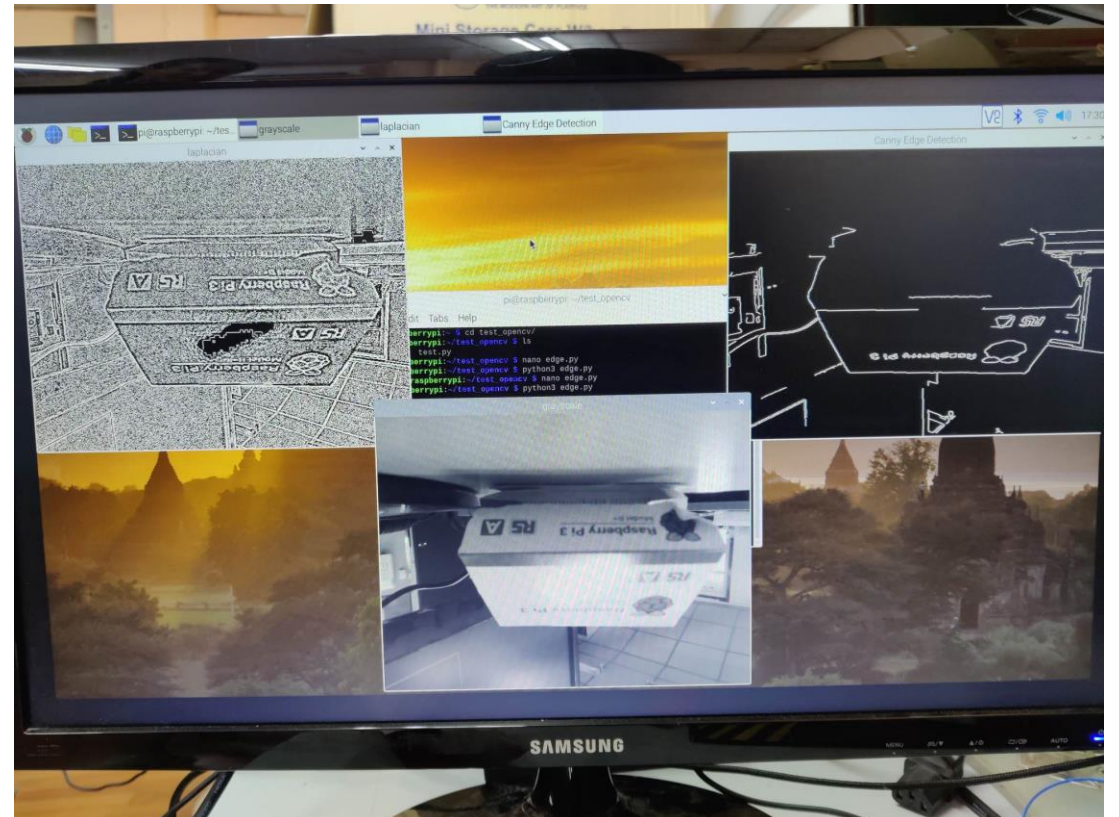
- Implement laplacian and canny edge on raspberry pi



```
phumiphat@phumiphat-G7-7588: ~/test_cv
GNU nano 4.8      test_edge.py      Modified
import cv2
import numpy as np
from matplotlib import pyplot as plt
cap = cv2.VideoCapture(0)

while(True):
    ret, image = cap.read()
    gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
    canny = cv2.Canny(gray, 100, 200)
    laplacian = cv2.Laplacian(gray, cv2.CV_64F)
    #sobelx = cv2.Sobel(gray, cv2.CV_64F, 1, 0, ksize=5)
    #sobely = cv2.Sobel(gray, cv2.CV_64F, 0, 1, ksize=5)
    #gradient_mag = sobelx + sobely
    #cv2.imshow("grayscale", gray)
    cv2.imshow("laplacian", laplacian)
    #cv2.imshow("gradient magnitude", gradient_mag)
    cv2.imshow("Canny Edge Detection", canny)
    if cv2.waitKey(1) & 0xFF == ord('q'):
        break
cap.release()

^G Get Help  ^O Write Out ^W Where Is  ^K Cut Text  ^J Justify  ^C Cur Pos
^X Exit      ^R Read File ^_ Replace  ^U Paste Text ^T To Spell  ^_ Go To Line
```



Demo video : <https://www.youtube.com/watch?v=3j-d8IbfJ8I>

Problem : Error 404 : not found IP

```
pi@raspberrypi:~ $ sudo apt-get install cmake
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  cmake-data libjsoncpp1 librhash0
Suggested packages:
  cmake-doc ninja-build
The following NEW packages will be installed:
  cmake cmake-data libjsoncpp1 librhash0
0 upgraded, 4 newly installed, 0 to remove and 116 not upgraded.
Need to get 198 kB/4,326 kB of archives.
After this operation, 22.3 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Err:1 http://mirror1.ku.ac.th/raspbian/raspbian buster/main armhf libjsoncpp1 armhf 1.7.4-3
      404 Not Found [IP: 158.108.4.211 80]
Err:2 http://mirror1.ku.ac.th/raspbian/raspbian buster/main armhf librhash0 armhf 1.3.8-1
      404 Not Found [IP: 158.108.4.211 80]
E: Failed to fetch http://mirror1.ku.ac.th/raspbian/raspbian/pool/main/libj/libjsoncpp/libjsoncpp1_1.7.4-3_armhf.deb 404 Not Found [IP: 158.108.4.211 80]
E: Failed to fetch http://mirror1.ku.ac.th/raspbian/raspbian/pool/main/r/rhash/librhash0_1.3.8-1_armhf.deb 404 Not Found [IP: 158.108.4.211 80]
E: Unable to fetch some archives, maybe run apt-get update or try with --fix-missing?
```

Problem : Error 404 : not found IP

- Solve by :
 - Sudo nano /etc/apt/source.list

```
deb http://raspbian.raspberrypi.org/raspbian/ stretch main contrib non-free rpi #  
Uncomment line below then 'apt-get update' to enable 'apt-get source' #deb-src  
http://raspbian.raspberrypi.org/raspbian/ stretch main contrib non-free rpi
```

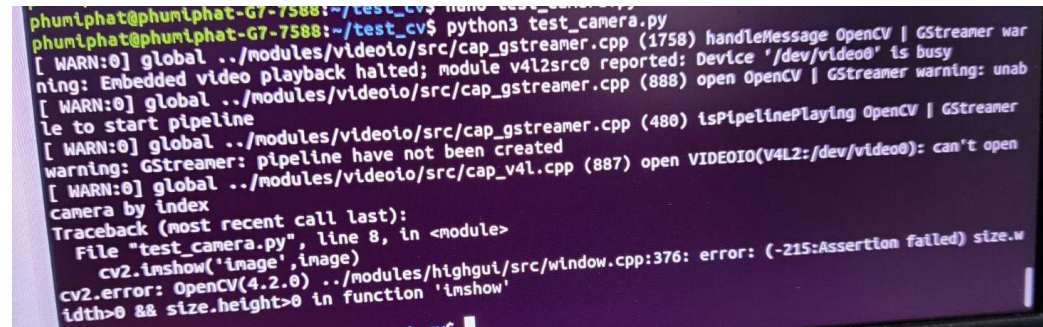
- Go to <http://www.raspbian.org/RaspbianMirrors>

Asia	Taiwan	Free Software Lab, NCHC	(ftp http)://free.nchc.org.tw/raspbian/raspbian
Asia*	Taiwan	Ubuntu-TW Local Team + OSS Planet	(http rsync)://mirror.ossplanet.net/raspbian/raspbian/ ftp://mirror.ossplanet.net/mirror/raspbian/raspbian/
Asia	Bangladesh	dhakaCom Limited	(http ftp)://mirror.dhakacom.com/raspbian/
Asia	Thailand	Kasetsart University	(http rsync)://mirror1.ku.ac.th/raspbian/raspbian/
Asia	Thailand	Khon Kaen University	(http ftp)://mirror.kku.ac.th/raspbian/raspbian/
Asia	Philippines	Rise	(http ftp)://mirror.rise.ph/raspbian/raspbian

- Select one url and replace the url above that got highlight.
- Then try to do the previous command again.

Problem : Can't access camera

- Can't access camera because it wasn't released.



```
phumiphat@phumiphat-G7-7588:~/test_cv$ nano test_camera.py
phumiphat@phumiphat-G7-7588:~/test_cv$ python3 test_camera.py
[ WARN:0] global ../modules/videoio/src/cap_gstreamer.cpp (1758) handleMessage OpenCV | GStreamer warning: Embedded video playback halted; module v4l2src0 reported: Device '/dev/video0' is busy
[ WARN:0] global ../modules/videoio/src/cap_gstreamer.cpp (888) open OpenCV | GStreamer warning: unable to start pipeline
[ WARN:0] global ../modules/videoio/src/cap_gstreamer.cpp (480) isPipelinePlaying OpenCV | GStreamer warning: GStreamer: pipeline have not been created
[ WARN:0] global ../modules/videoio/src/cap_v4l.cpp (887) open VIDEOIO(V4L2:/dev/video0): can't open camera by index
Traceback (most recent call last):
  File "test_camera.py", line 8, in <module>
    cv2.imshow('image', image)
cv2.error: OpenCV(4.2.0) ../modules/highgui/src/window.cpp:376: error: (-215:Assertion failed) size.width>0 && size.height>0 in function 'imshow'
```

- We got this problem in ubuntu laptop. But we think it can appear in Rpi too.
- At first, we tried to disable camera and kill process tree. But it didn't work.
- Finally, we used **sudo reboot** to reset the system.