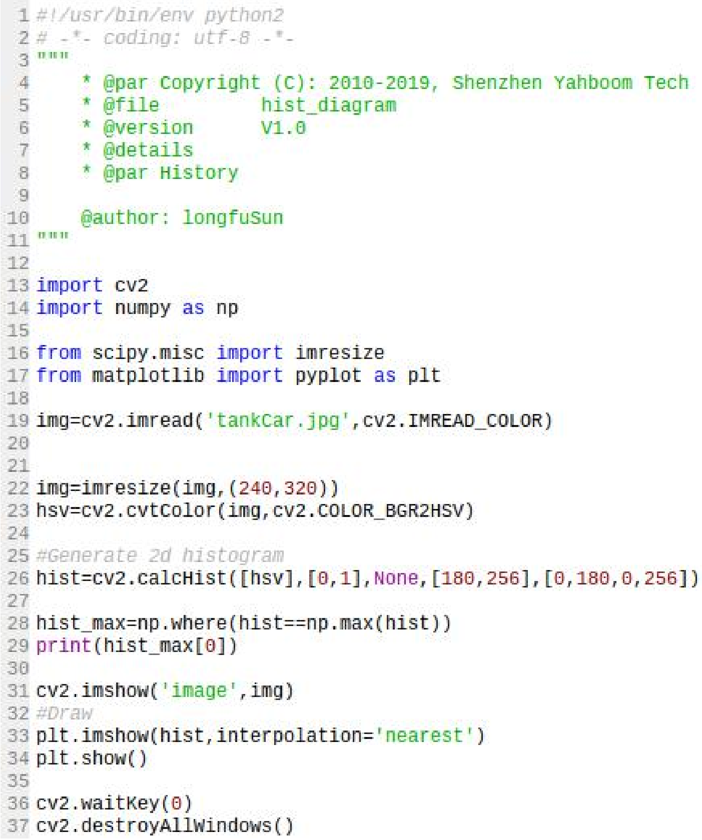
Chapter5: OpenCV color detection

1.1 2D color histogram

In the HSV color space, H (hue) can be used to represent common colors. We can calculate the histogram of H (hue) in the image, and combine the range of common color H to recognize the color. OpenCV also possess 2D (two-dimensional) histograms, (color histogram (H-S, hue-saturation).)

The histogram can be used to identify colors more accurately. Below is the demo of 2D histogram.



```python
#!/usr/bin/env python2
# -*- coding: utf-8 -*-
"""
    * @par Copyright (C): 2010-2019, Shenzhen Yahboom Tech
    * @file         hist_diagram
    * @version      V1.0
    * @details
    * @par History

    @author: longfuSun
"""

import cv2
import numpy as np

from scipy.misc import imresize
from matplotlib import pyplot as plt

img=cv2.imread('tankCar.jpg',cv2.IMREAD_COLOR)


img=imresize(img,(240,320))
hsv=cv2.cvtColor(img,cv2.COLOR_BGR2HSV)

#Generate 2d histogram
hist=cv2.calcHist([hsv],[0,1],None,[180,256],[0,180,0,256])

hist_max=np.where(hist==np.max(hist))
print(hist_max[0])

cv2.imshow('image',img)
#Draw
plt.imshow(hist,interpolation='nearest')
plt.show()

cv2.waitKey(0)
cv2.destroyAllWindows()
```

The source code of the program is located at:

/home/pi/yahboom/pixel_number/hist_diagram.py

The result is as shown in the figure1-1 below. The x-axis is the S-value and the y-axis is the H-value. In the 2D histogram, it can be seen that H=105, S=230, indicating that there are more blue regions in the picture. By judging the H and S values, the color can be recognized in a single scene with a background comparison.

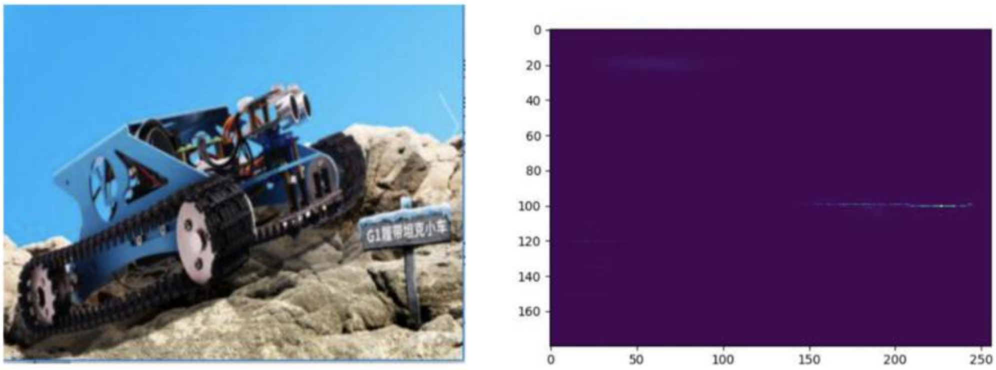
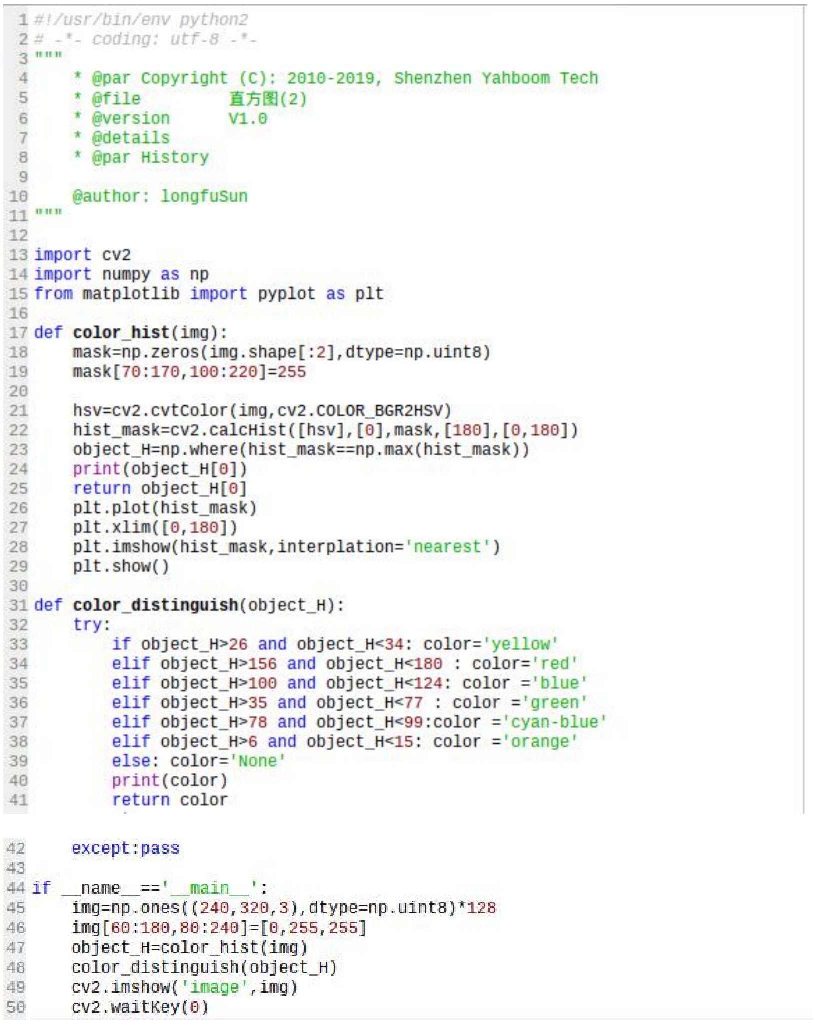


Figure1-1 Generate a 2D color histogram for a graph

Next, we use the one-dimensional (H value) histogram in the statistical 2D color histogram to achieve color recognition. The demo of 2D histogram as shown in the figure below.

The source code of the program is located at:

/home/pi/yahboom/pixel_number/pixel_diagram.py



```
#!/usr/bin/env python2
# -*- coding: utf-8 -*-
"""
    * @par Copyright (C): 2010-2019, Shenzhen Yahboom Tech
    * @file         直方图(2)
    * @version      V1.0
    * @details
    * @par History

    @author: longfuSun
"""

import cv2
import numpy as np
from matplotlib import pyplot as plt

def color_hist(img):
    mask=np.zeros(img.shape[:2],dtype=np.uint8)
    mask[70:170,100:220]=255

    hsv=cv2.cvtColor(img,cv2.COLOR_BGR2HSV)
    hist_mask=cv2.calcHist([hsv],[0],mask,[180],[0,180])
    object_H=np.where(hist_mask==np.max(hist_mask))
    print(object_H[0])
    return object_H[0]
    plt.plot(hist_mask)
    plt.xlim([0,180])
    plt.imshow(hist_mask,interplation='nearest')
    plt.show()

def color_distinguish(object_H):
    try:
        if object_H>26 and object_H<34: color='yellow'
        elif object_H>156 and object_H<180 : color='red'
        elif object_H>100 and object_H<124: color ='blue'
        elif object_H>35 and object_H<77 : color ='green'
        elif object_H>78 and object_H<99:color ='cyan-blue'
        elif object_H>6 and object_H<15: color ='orange'
        else: color='None'
        print(color)
        return color

    except:pass

if __name__=='__main__':
    img=np.ones((240,320,3),dtype=np.uint8)*128
    img[60:180,80:240]=[0,255,255]
    object_H=color_hist(img)
    color_distinguish(object_H)
    cv2.imshow('image',img)
    cv2.waitKey(0)
```

The result is as shown in the figure 1-2 below. The ROI image operation is used to identify the yellow block.

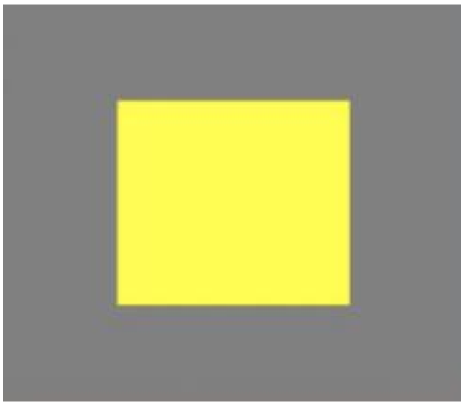


Figure 1-2