Chapter3: HSV color space conversion（RGB-HSV）

1.1 Introduction to color space

RGB is also known as the three primary color space. Any color can be a mixture of these three colors. However, the effective processing of the image in the color space is generally performed in the HSV space. HSV (Humidity, Saturation, Brightness Value) is a color space created according to the intuitive characteristics of the color, also called the hexagonal cone model.
Detail: https://blog.csdn.net/taily_duan/article/details/51506776

HSV space is wider and more convenient than RGB space recognition.

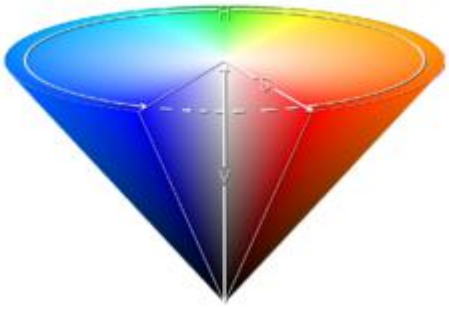

Figure 1-1 HSV color space model

1.2 Three color spaces conversion (gray BGR HSV)

The common two color conversion methods: BGR->Gray and BGR->HSV.
!!!Note: Gray and HSV cannot be converted to each other.
Color space conversion function:
cv2.cvtColor(input_image, flag)
BGR->Gray: flag is cv2.COLOR_BGR2GRAY
BGR->HSV: flag is cv2.COLOR_BGR2HSV

The value range of the HSV color space in OpenCV: H [0, 179] S [0, 255] V [0, 255]

	black	gray	white	red		orange	yellow	green	verdant	blue	purple
hmin	0	0	0	0	156	11	26	35	78	100	125
hmax	180	180	180	10	180	25	34	77	99	124	155
smin	0	0	0	43		43	43	43	43	43	43
smax	255	43	30	255		255	255	255	255	255	255
vmin	0	46	221	46		46	46	46	46	46	46
vmax	46	220	255	255		255	255	255	255	255	255

Figure 1-2 Range of commonly used colors

The source code of the program is located

/home/pi/yahboom/colorBlock/colorBlock.py

The program is shown below:

```
* @par Copyright (C): 2010-2019, Shenzhen Yahboom Tech
* @file         colorBlock
* @version      V1.0
* @details
* @par History
* @author       LongfuSun
"""

import cv2
import numpy as np

#Create picture and Color block
img=np.ones((240,320,3),dtype=np.uint8)*255
img[100:140,140:180]=[0,0,255]
img[60:100,60:100]=[0,255,255]
img[60:100,220:260]=[255,0,0]
img[140:180,60:100]=[255,0,0]
img[140:180,220:260]=[0,255,255]

#Hsv threshold of yellow and red
yellow_lower=np.array([26,43,46])
yellow_upper=np.array([34,255,255])
red_lower=np.array([0,43,46])
red_upper=np.array([10,255,255])

#Color space conversionbgr->hsv
hsv=cv2.cvtColor(img,cv2.COLOR_BGR2HSV)

#Build a mask and use a mask
mask_yellow=cv2.inRange(hsv,yellow_lower,yellow_upper)
mask_red=cv2.inRange(hsv,red_lower,red_upper)
mask=cv2.bitwise_or(mask_yellow,mask_red)
res=cv2.bitwise_and(img,img,mask=mask)

cv2.imshow('image',img)
cv2.imshow('mask',mask)
cv2.imshow('res',res)
cv2.waitKey(0)
cv2.destroyAllWindows()
```

The phenomenon is shown below:

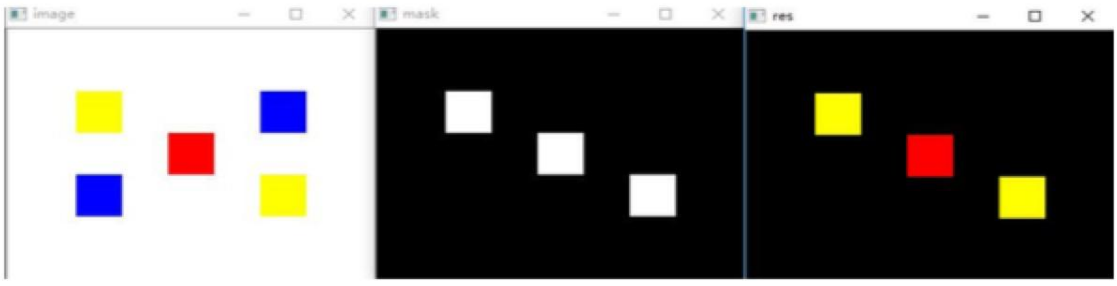

Figure 1-3 Color space conversion identifies the yellow and red parts of the image

About mask: mask may be used in extracting regions of interest, masking certain regions of the image, extracting structural features, and making special images.