12.Multiple color recognition

Experimental objectives

The main purpose of this lesson is to achieve the function of recognizing multiple colors simultaneously.

Frame objects of different colors (red, yellow, blue, green) based on their LAB values.

The reference code path for this experiment is **K210_ Broad\05 AI\multi_ Color_ Recognition.py**

Experimentation

Use this routine to burn the K210 development board to the Python factory firmware.

1. Import relevant libraries and initialize cameras and LCD displays

```
import sensor
import time
import lcd

lcd.init()
sensor.reset()
sensor.set_pixformat(sensor.RGB565)
sensor.set_framesize(sensor.QVGA)
sensor.skip_frames(time = 100)
sensor.set_auto_gain(False)
sensor.set_auto_whitebal(False)

clock = time.clock()
```

2. Writing threshold ranges for color lab values

```
color_thresholds = [
    (31, 69, 27, 58, 14, 36),# Red
    (14, 61, -39, -6, 0, 14), # Green
    (14, 66, 1, 38, -56, -12),# Blue
    (49, 77, -8, 52, 16, 60),# Yellow
]
color_strings = ['Red', 'Green', 'Blue', 'Yellow']
```

3. Create a new while loop to recognize the colors of the images captured by the camera and display the recognition results on the screen

```
while True:
    clock.tick()
    img = sensor.snapshot()
    for color_idx, threshold in enumerate(color_thresholds):
        blobs = img.find_blobs([threshold], pixels_threshold=100,
area_threshold=100, merge=True, margin=10)
        if blobs:
            for blob in blobs:
                color_new = (255 , 255,255)
                if color_idx == 0 :
                    color_new = (255 , 0,0)
                elif color_idx == 1:
                    color_new = ( 0,255 ,0)
                elif color_idx == 2:
                    color_new = ( 0,0,255)
                elif color_idx == 3:
                    color_new = ( 255,255,0)
                img.draw_rectangle(blob.rect(), color=color_new,thickness = 3)
                img.draw_cross(blob.cx(), blob.cy(), color=color_new)
                img.draw_string(blob.cx() + 10, blob.cy() - 10,
color_strings[color_idx], color=color_new)
    lcd.display(img)
    print(clock.fps())
```

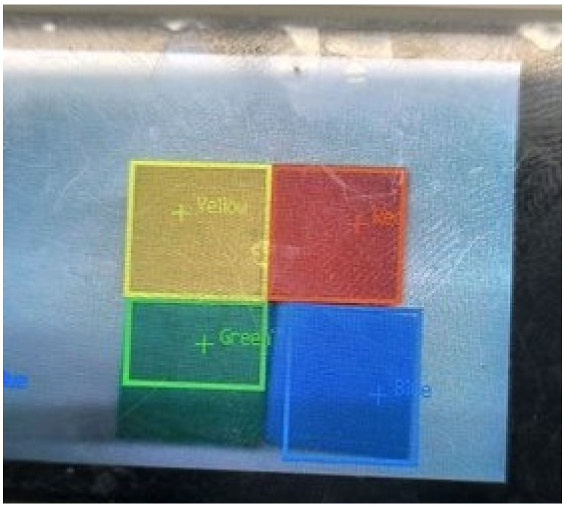
Experimental Results

Connect the K210 development board to the computer through a type-c data cable, click the connect button in the CanMV IDE, and after the connection is completed, click the run button to run the routine code.

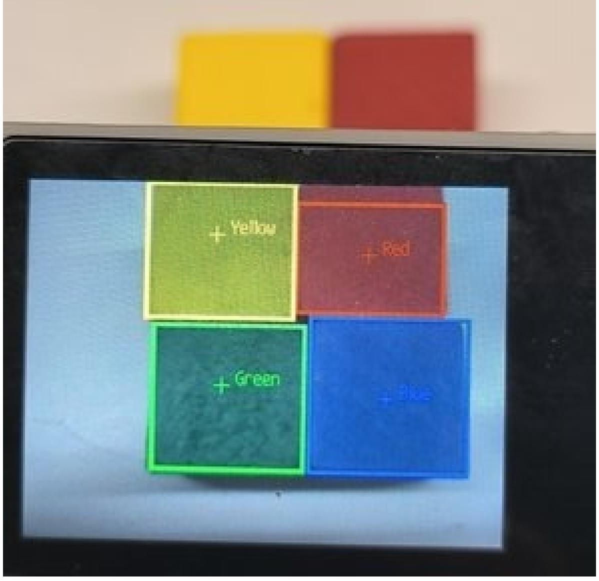
You can also download the code as main.py and run it on the K210 development board.

After the system initialization is completed, the LCD displays the camera image and begins to recognize the image, displaying the recognized colors on the screen.

- The following image is the result recognized by the OV2640 camera



- The following image shows the recognition result of GC2145 camera



Experimental Summary

The main function of multi color recognition is to analyze the LAB value of colors, and then compare it with the LAB value of colors collected by the camera for analysis. If it meets the requirements, draw a box and label the corresponding color to indicate recognition.

This method has a significant impact on the ambient light of the identified color, and the value of LAB may vary depending on the ambient light.

The following will introduce how to modify the value of LAB or add other colors besides the tutorial based on ambient light.

Add new colors for recognition

Add the color and threshold you want to recognize in the following program, as shown in the following figure

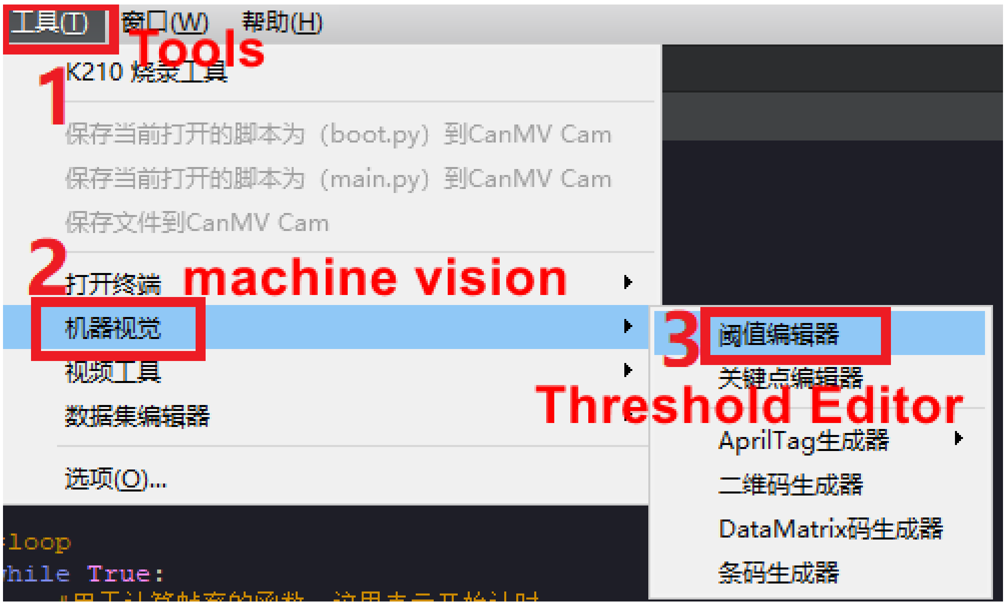
```
color_thresholds = [
    (31, 69, 27, 58, 14, 36),# Red
    # Green
    (14, 61, -39, -6, 0, 14),
    (14, 66, 1, 38, -56, -12),# Blue
    (49, 77, -8, 52, 16, 60),# Yellow
    (LAB value to be added) # DIY's LAB value needs to be modified by oneself
]
color_strings = ['Red', 'Green', 'Blue', 'Yellow','Custom colors that need to be added'] #Modify
```

Obtain the LAB threshold that requires color increase

若需要获取新增颜色的 LAB 阈值，或者是根据环境光要修改的颜色LAB值。都可以通过 CanMV IDE 的工具获取。

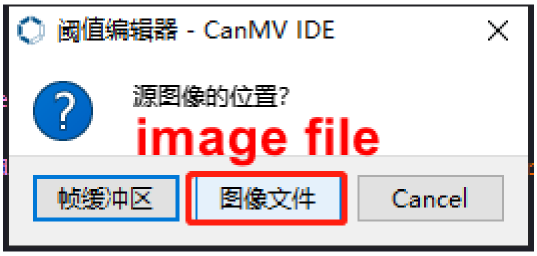
If you need to obtain the LAB threshold for new colors, or modify the LAB value of colors based on ambient light. All can be obtained through the tools of CanMV IDE.

1. Double click on the CanMV IDE to open it, click on "Tools ->Machine Vision ->Threshold Editor", and select the Threshold Editor tool.

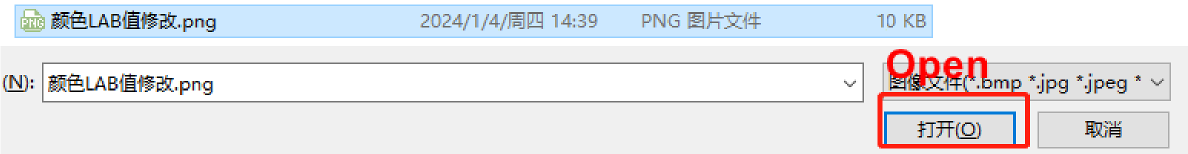


2.Click on "Image File"

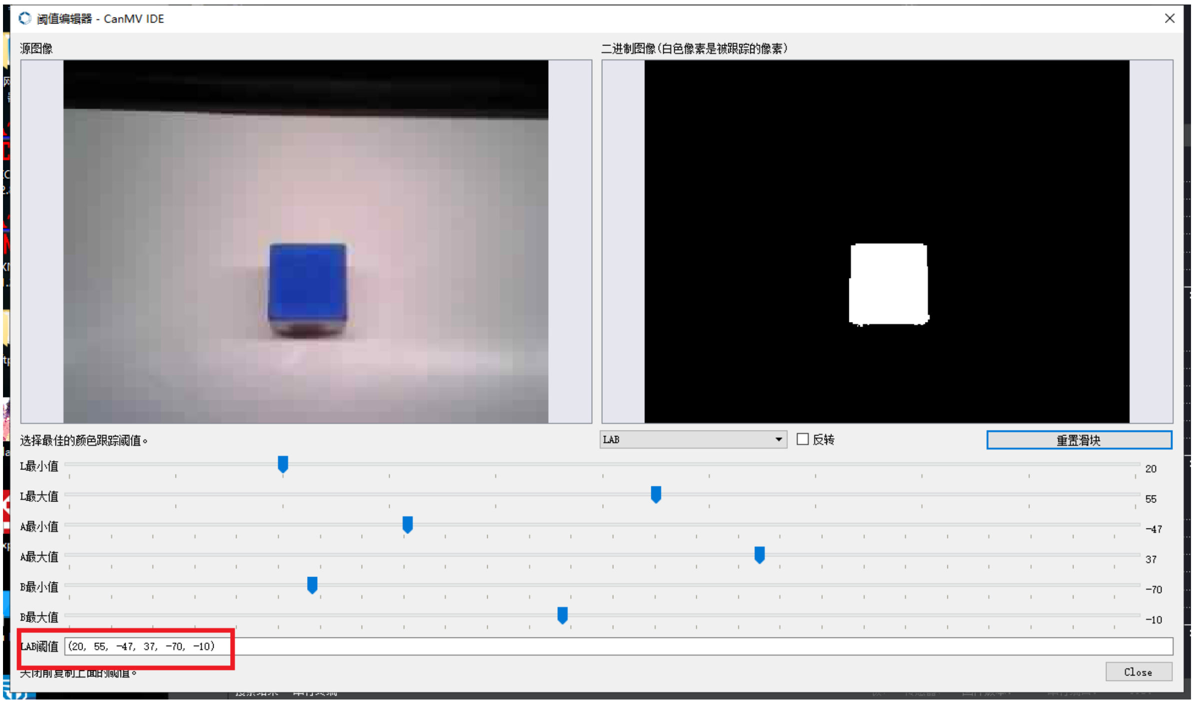
You can also click on the frame buffer (this method of obtaining LAB values is not explained in this tutorial, please note that k210 needs to be connected to cammv, and cammv cannot disable the frame buffer)



3.Choose and prepare images that contain new colors that need to be added, or images that recognize colors based on the current ambient light (try to choose images with a clean background and no interference from other colors)



4.Drag the slider until all recognized color areas are white and all other areas are black. Record the obtained LAB threshold.



L最小值 20
L最大值 55
A最小值 -47
A最大值 37
B最小值 -70
B最大值 -10
LAB阈值 (20, 55, -47, 37, -70, -10)

关闭前复制上面的阈值。

5.Simply put the obtained threshold into the source code.