# 4. Color tracking



## 4.1 Gameplay Introduction

This course mainly uses the CSI camera of the RDK-X3 board to obtain the picture of the camera, select a color, then put the object of the selected color into the camera picture, frame the object of this color with a circle in the picture in real time, move the object of this color, and the circle will track the object of this color. Note that the car does not move during this process, but the camera image draws a circle to track the color object.

## 4.2 Core Content analysis

Color_HSV defines the HSV value of the color. Due to the color difference and light influence of the object color, if the recognition of a certain color effect is inaccurate, you can adjust the course according to the color HSV value. After adjusting the best effect, record the data and update the HSV value of the corresponding color.

```
Color_HSV = {
    'Red': ([0, 43, 46], [10, 255, 255]),
    'Green': ([35, 43, 46], [77, 255, 255]),
    'Blue': ([100, 43, 46], [124, 255, 255]),
    'Yellow': ([26, 43, 46], [34, 255, 255])
}
```

Tracks red objects by default.

```
color_lower = np.array(Color_HSV["Red"][0])
color_upper = np.array(Color_HSV["Red"][1])
```

Each time the key is pressed, the color_lower and color_upper values of the color HSV are updated.

```
def on_button_clicked(b):
    global color_lower, color_upper, g_stop_program
    ALL_Uncheck()
    b.icon = 'check'
    with output:
        print("Button clicked:", b.description)
    if b.description == Name_widgets['Close_Camera'][g_ENABLE_CHINESE]:
        g_stop_program = True
        time.sleep(.1)
        g_camera.release()
        b.icon = 'uncheck'
```

```
    elif b.description == Name_widgets['Red'][g_ENABLE_CHINESE]:
        color_lower = np.array(np.array(Color_HSV["Red"][0]))
        color_upper = np.array(np.array(Color_HSV["Red"][1]))
    elif b.description == Name_widgets['Green'][g_ENABLE_CHINESE]:
        color_lower = np.array(np.array(Color_HSV["Green"][0]))
        color_upper = np.array(np.array(Color_HSV["Green"][1]))
    elif b.description == Name_widgets['Blue'][g_ENABLE_CHINESE]:
        color_lower = np.array(np.array(Color_HSV["Blue"][0]))
        color_upper = np.array(np.array(Color_HSV["Blue"][1]))
    elif b.description == Name_widgets['Yellow'][g_ENABLE_CHINESE]:
        color_lower = np.array(np.array(Color_HSV["Yellow"][0]))
        color_upper = np.array(np.array(Color_HSV["Yellow"][1]))
```

The program function of processing the camera picture will read the image of the camera, and then analyze the HSV value, get the position information of the color object, draw it with a circle box, and finally display it through the image control.

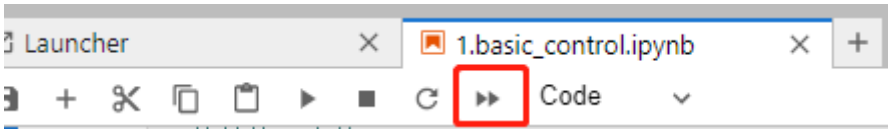
```
def task_processing():
    global color_lower, color_upper, g_stop_program
    t_start = time.time()
    m_fps = 0
    while g_camera.isOpened():
        if g_stop_program:
            break
        ret, frame = g_camera.read()
        hsv = cv2.cvtColor(frame, cv2.COLOR_BGR2HSV)
        mask = cv2.inRange(hsv, color_lower, color_upper)
        cnts = cv2.findContours(mask.copy(), cv2.RETR_EXTERNAL,
cv2.CHAIN_APPROX_SIMPLE)[-2]
        if len(cnts) > 0:
            cnt = max (cnts, key = cv2.contourArea)
            (color_x, color_y), color_radius = cv2.minEnclosingCircle(cnt)
            if color_radius > 10:
                cv2.circle(frame, (int(color_x), int(color_y)),
int(color_radius), (255,0,255), 2)
        m_fps = m_fps + 1
        fps = m_fps / (time.time() - t_start)
        if (time.time() - t_start) >= 2:
            m_fps = fps
            t_start = time.time() - 1
        cv2.putText(frame, "FPS " + str(int(fps)), (10,20),
cv2.FONT_HERSHEY_SIMPLEX, 0.5, (0,255,255), 1)
        image_widget.value = bgr8_to_jpeg(frame)
        time.sleep(.01)
```

## 4.3 Gameplay operation

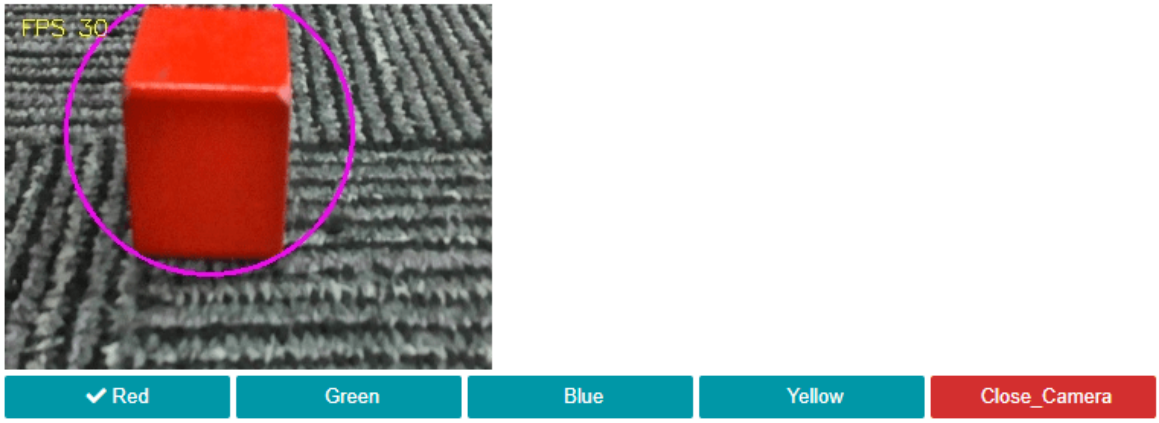
Open the jupyterLab client and find the code path:

```
/root/sunriseRobot/Samples/2_AI/04_color_tracking/color_tracking.ipynb
```

Click Run All Cells, and then drag to the bottom to see the generated controls.




The camera will track red objects, and if you need to track other objects, click the button below to switch.




Finally click the Close_Camera button to close the camera.