Multi-color recognition

Introduction to the results of routine experiments

The example code for this section is located in: [Source code/05.Color/03.multi_color_recognition.py]

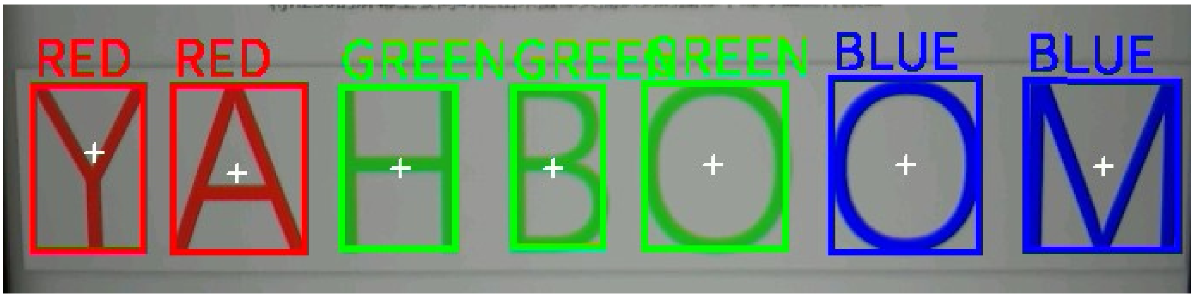
We use CanMV IDE to open the sample code and connect K230 to the computer via USB.

Open the sample code, find the THRESHOLDS array, and find the index of the color you want to track/identify in the array.

For adding methods, we can see the [Add custom colors] section in the previous section.

Click the Run button in the lower left corner of CanMV IDE.

The K230 screen will simultaneously frame the red, green and blue colors of the image captured by the camera.



Code Explanation

The peripherals we will use in this section are mainly camera modules

Line segment detection is implemented by the find_blobs() method in K230, which belongs to the image module

Complete code

```
import time, os, sys
from media.sensor import *
from media.display import *
from media.media import *

# 显示参数 / Display parameters
DISPLAY_WIDTH = 800    # LCD显示宽度 / LCD display width
DISPLAY_HEIGHT = 480   # LCD显示高度 / LCD display height

# 颜色阈值(LAB色彩空间) / Color thresholds (LAB color space)
# (L Min, L Max, A Min, A Max, B Min, B Max)
COLOR_THRESHOLDS = [
    (0, 66, 7, 127, 3, 127),    # 红色阈值 / Red threshold
    (42, 100, -128, -17, 6, 66),     # 绿色阈值 / Green threshold
    (43, 99, -43, -4, -56, -7),       # 蓝色阈值 / Blue threshold
]

# 显示颜色定义 / Display color definitions
DRAW_COLORS = [(255,0,0), (0,255,0), (0,0,255)]  # RGB颜色 / RGB colors
COLOR_LABELS = ['RED', 'GREEN', 'BLUE']           # 颜色标签 / Color labels

def init_sensor():
    """初始化摄像头 / Initialize camera sensor"""
    sensor = Sensor()
    sensor.reset()
    sensor.set_framesize(width=DISPLAY_WIDTH, height=DISPLAY_HEIGHT)
    sensor.set_pixformat(Sensor.RGB565)
    return sensor

def init_display():
    """初始化显示 / Initialize display"""
    Display.init(Display.ST7701, to_ide=True)
    MediaManager.init()

def process_blobs(img, threshold_idx):
    """处理颜色区块检测 / Process color blob detection"""
    blobs = img.find_blobs([COLOR_THRESHOLDS[threshold_idx]])
    if blobs:
        for blob in blobs:
            # 绘制检测框和标记 / Draw detection box and markers
            img.draw_rectangle(blob[0:4], thickness=4,
color=DRAW_COLORS[threshold_idx])
            img.draw_cross(blob[5], blob[6], thickness=2)
            img.draw_string_advanced(blob[0], blob[1]-35, 30,
                                   COLOR_LABELS[threshold_idx],
                                   color=DRAW_COLORS[threshold_idx])

def main():
    try:
        # 初始化设备 / Initialize devices
        sensor = init_sensor()
        init_display()
        sensor.run()

        clock = time.clock()
        while True:
            clock.tick()

            # 捕获图像 / Capture image
            img = sensor.snapshot()

            # 检测三种颜色 / Detect three colors
            for i in range(3):
                process_blobs(img, i)

            # 显示FPS / Display FPS
            fps_text = f'FPS: {clock.fps():.3f}'
            img.draw_string_advanced(0, 0, 30, fps_text, color=(255, 255, 255))

            # 显示图像并打印FPS / Display image and print FPS
            Display.show_image(img)
            print(clock.fps())

    except KeyboardInterrupt as e:
        print("用户中断 / User interrupted: ", e)
    except Exception as e:
        print(f"发生错误 / Error occurred: {e}")
    finally:
        # 清理资源 / Cleanup resources
        if 'sensor' in locals() and isinstance(sensor, Sensor):
            sensor.stop()
        Display.deinit()
        MediaManager.deinit()

if __name__ == "__main__":
    main()
```

Code structure

Basic settings:

- Set the display resolution to 640×480
- The detection thresholds for red, green, and blue are defined using the LAB color space.
- The DRAW_COLORS and COLOR_LABELS arrays are used to draw markers and display color labels

Major improvements:

- Detect three colors simultaneously
- Add color labels and text annotations to detected objects
- Simplified color processing logic

Workflow:

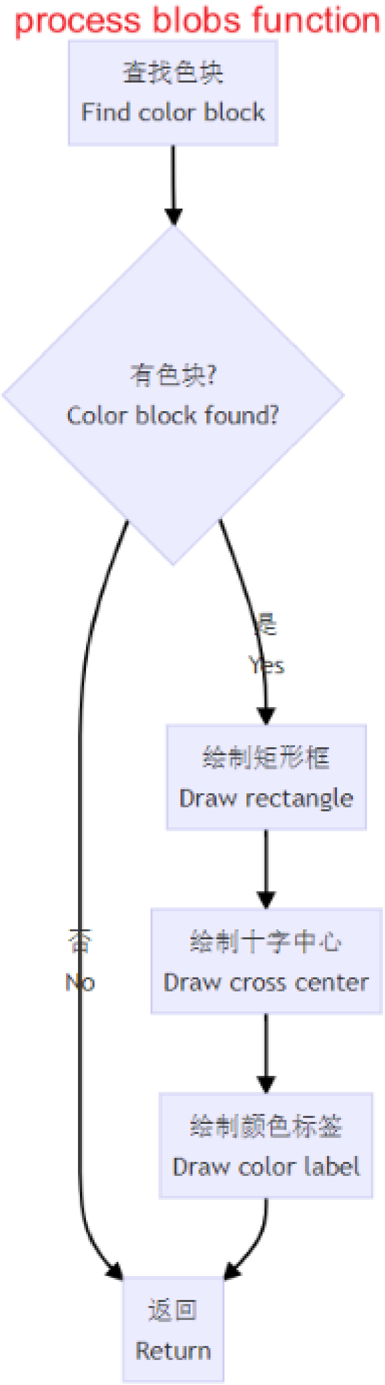
- Initialize the camera and display
- After entering the main loop:
  - Continuous image capture
  - Detect three colors in sequence
  - Draw rectangles, cross marks, and color labels for each detected object

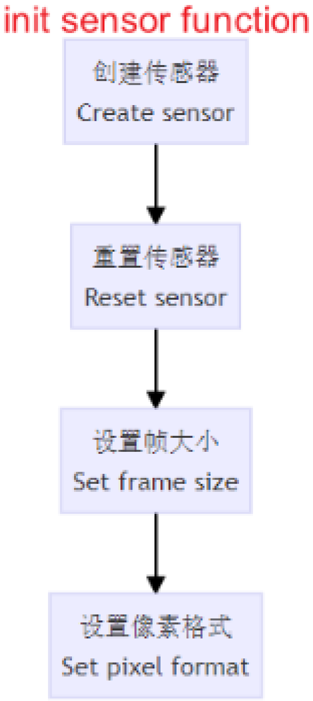
    - Display frame rate information

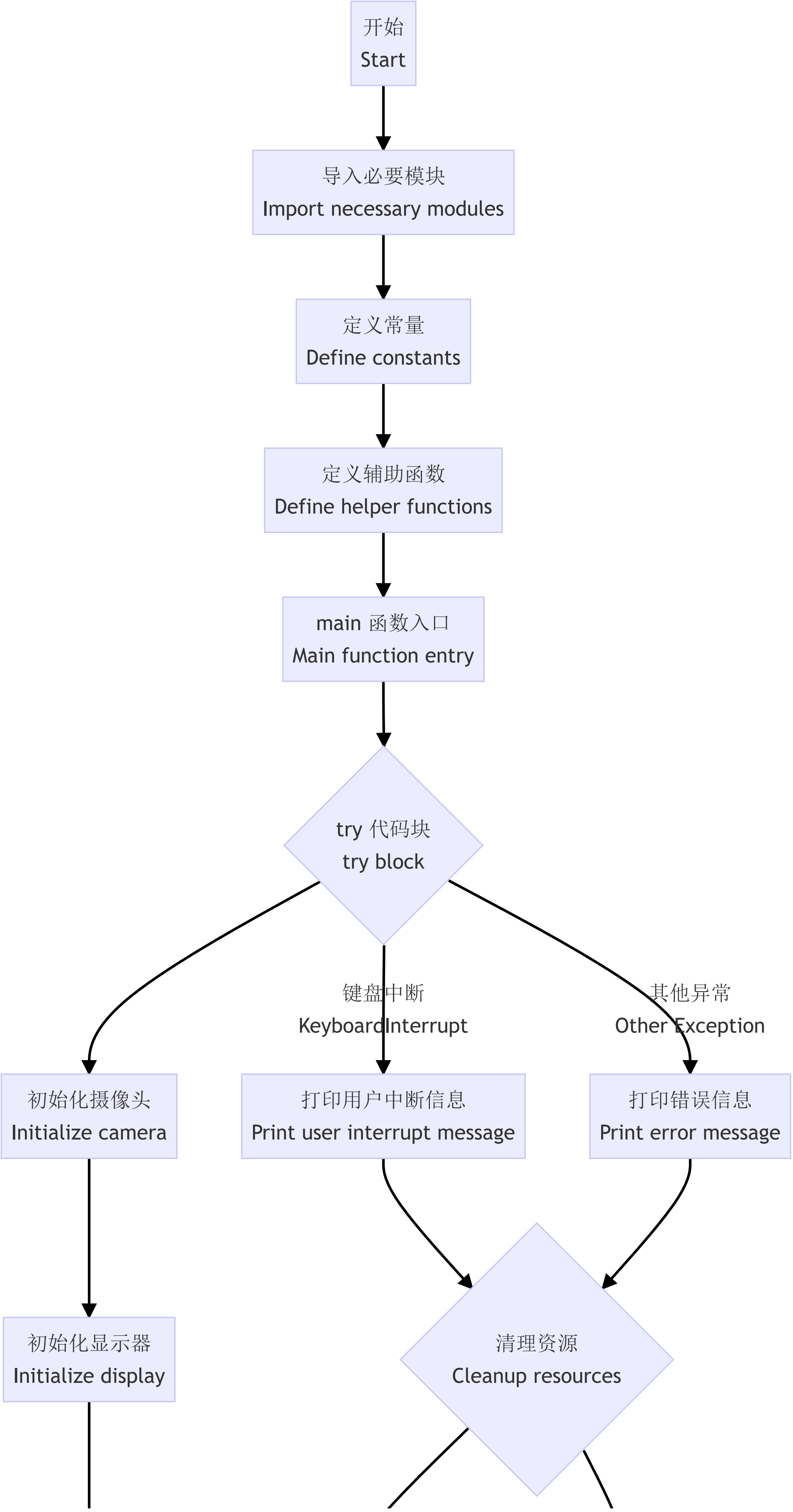
Exception handling:

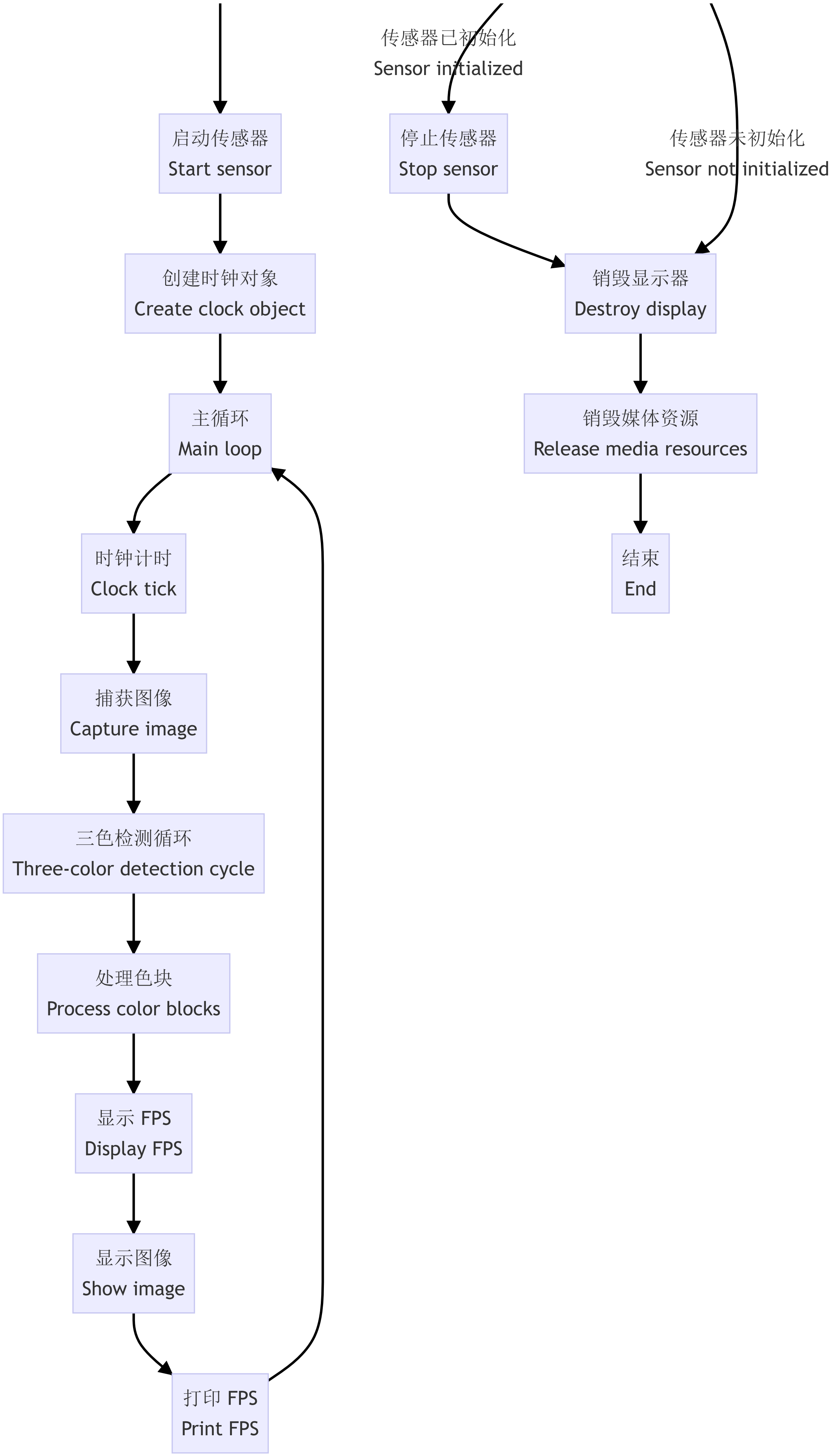
- The complete exception handling mechanism is retained
- Ensure that hardware resources are released correctly when the program ends

The detailed flow chart is as follows:






开始
Start
导入必要模块
Import necessary modules
定义常量
Define constants
定义辅助函数
Define helper functions
main 函数入口
Main function entry
try 代码块
try block
键盘中断
KeyboardInterrupt
其他异常
Other Exception
初始化摄像头
Initialize camera
打印用户中断信息
Print user interrupt message
打印错误信息
Print error message
初始化显示器
Initialize display
清理资源
Cleanup resources


传感器已初始化
Sensor initialized
启动传感器
Start sensor
停止传感器
Stop sensor
传感器未初始化
Sensor not initialized
创建时钟对象
Create clock object
销毁显示器
Destroy display
主循环
Main loop
销毁媒体资源
Release media resources
时钟计时
Clock tick
结束
End
捕获图像
Capture image
三色检测循环
Three-color detection cycle
处理色块
Process color blocks
显示 FPS
Display FPS
显示图像
Show image
打印 FPS
Print FPS