

## Research of Ball Position Detection Device

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**Abstract.** In the cricket control system, the moving position of the ball on the plane should be accurately detected. Not only to identify the ball, but also to get the coordinates of the center point of the ball, and transfer it to the host computer, and then use the PID control algorithm to control the movement of the plane, so as to achieve the purpose of controlling the ball. In this paper, OPENMV is used to recognize the ball, and the edge detection algorithm is used to obtain the location of the center point, and other interference signals are filtered by the software filtering algorithm. It has the advantages of high speed, accurate location and high accuracy.

### Introduction

In recent years, in the National Undergraduate Electronic Design Competition, the control class is becoming more and more demanding. From one-dimensional to two-dimensional to multidimensional, the difficulty of control is higher and higher. The cricket control system is a typical automatic control class, which requires regular movement of the ball in the plane. Therefore, the motor is used to control the plane moving up and down in the direction of X and Y, so as to control the movement of the car.

### Hardware Design

The camera circuit is shown in figure 1. Using 300 thousand pixel OV7725 camera, the ball can be accurately identified, and its accurate location is calculated. The resolution of the camera should not be too high. If it is too high, it will bring some difficulties to the data acquisition and processing. The main control uses STM32F765 high-performance microprocessor, based on ARM Cortex-M7 core technology, the main speed of up to 216MHz. Is a 32 bit microprocessor, rich in resources, can quickly deal with data collected by the camera.

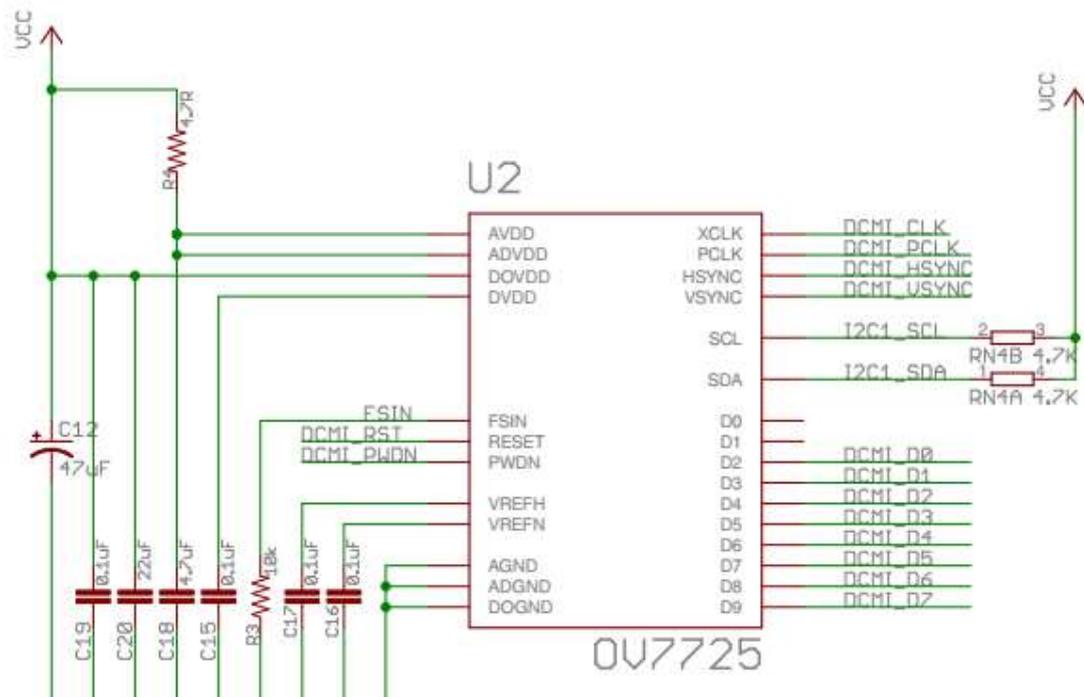


Figure 1 camera circuit diagram

## Software Program

In software design, the edge detection algorithm is used to identify the location of the ball, and the location information is sent through the serial port. It is developed under the python IDE. The following is the main code:

```
import sensor, image, time
import json
from pyb import UART
from pyb import LED
#led = LED(1)
#led.toggle()
#led.on()
#led.off()
yellow_threshold = ( 45, 90, -40, 0, 0, 90)
sensor.reset()
sensor.set_pixformat(sensor.RGB565)
sensor.set_framesize(sensor.QQVGA)
sensor.skip_frames(10)
sensor.set_auto_whitebal(False)
clock = time.clock()
uart = UART(3, 460800)
def find_max(blobs):
    max_size=0
    for blob in blobs:
        if blob.pixels() > max_size:
            max_blob=blob
            max_size = blob.pixels()
    return max_blob
```

```

while(True):
    clock.tick() # Track elapsed milliseconds between snapshots().
    img = sensor.snapshot()

#blobs = img.find_blobs([green_threshold])
    blobs = img.find_blobs([yellow_threshold])

invert=False
    if blobs:
        #output_str = json.dumps(blobs)
        #output_str=json.dumps(b[5],b[6]) #方式2
        #output_str="[%d,%d]" % (b[5],b[6])
        max_blob=find_max(blobs)
        output_str="\r\n%d,%d" % (max_blob.cx(),max_blob.cy())
        output_str1="%d,%d" % (max_blob.cx(),max_blob.cy())
        #print("%d,%d" % (max_blob.cx(),max_blob.cy()))
        print(output_str1)
        #x_error = max_blob[5]-img.width()/2
        #h_error = max_blob[2]*max_blob[3]-size_threshold
        #print("x error: ", x_error)
        #img.draw_rectangle(max_blob[0:4],color=(0,255,0)) # rect
        img.draw_circle(max_blob[5], max_blob[6],int(max_blob[2]/2),color=(255,0,0))

# cx, cy

        #img.draw_circle(50, 50, 30)
        img.draw_cross(max_blob[5], max_blob[6],color=(255,0,0)) # cx, cy
        #uart.write("\r\n%d,%d" % (max_blob.cx(),max_blob.cy()))
        #uart.write("S")
        uart.write("%d,%d\r\n" % (max_blob.cx(),max_blob.cy()))
        #uart.write("G")
        led = LED(1)
        led.toggle()
        led.on()

    #else:

        #led.off()
        #led = LED(2)
        #led.toggle()
        #led.on()
        #print(clock.fps())

```

## Summary

This paper expounds the principle and method of using OPENMV to recognize the position of small ball, and realizes the design of hardware circuit. At Python IDE Software programming is carried out to realize the recognition of small ball position. And the edge detection algorithm is used to find the center point and transmit it to the host computer by serial port. The design has certain practical value.

## Reference

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