

Design of Automatic Patrol Line Car Based On Camera

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Abstract. Camera technology is widely used in face recognition, color recognition and graphic image recognition. But the amount of information is very large when the camera is collected, so it is necessary to use high-performance microprocessor for data acquisition, and to identify different objects with a certain algorithm. This paper used the camera to detect the black line, and the edge detection of black lines is used to realize the edge detection algorithm, the control of the car along the black line tracking. The utility model has the advantages of strong identification ability, strong anti-interference ability, etc.

Introduction

In recent years, camera has been widely used in color recognition and face recognition. Moreover, with the improvement of microprocessor processing ability and recognition algorithm, the camera can recognize small objects and enhance the recognition ability. Through the identification of black and white lines, the car is controlled along the black line. The black line tracking using the edge detection algorithm, has the advantages of fast recognition speed, strong anti infection ability etc..

Hardware Design

Motor drive circuit design

The motor drive circuit is shown in figure 1. TB6612 is a motor driver IC produced by the Toshiba Co in Japan. It has the advantages of small size, high integration and strong driving ability. Suitable for driving small DC motors. The motor speed of the motor is controlled by PWMA and PWMB in the diagram. PG1 and PE7 control the direction of the 1 way motor, PE8 and PE9 control the direction of the other 1 motors. The supply voltage is 5V.

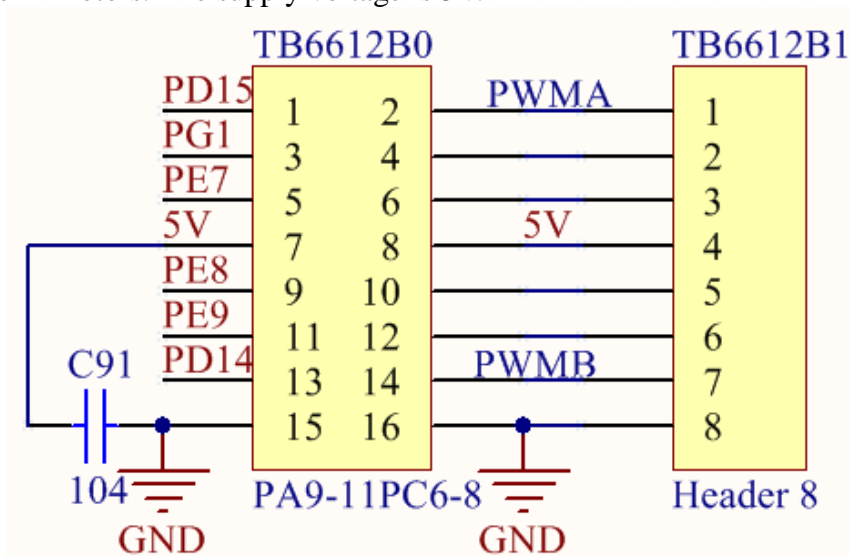


Figure 1. TB6612 motor drive circuit diagram

Camera Acquisition Circuit Design

The camera acquisition circuit is shown in figure 2. Processing the collected signal using high

performance microprocessor STM32F765, information processing 50 frames per second, suitable for image processing, the edge detection algorithm can accurately identify a variety of colors, and the output of its center coordinates.



Figure 2. Camera acquisition circuit design

Software Program

In this design, under openmv, programming with Python language. Black line identification, motor control and so on. Some code is given below:

```
import sensor, image, time
import json
from pyb import UART
yellow_threshold = ( 45, 90, -40, 0, 0, 90)
sensor.reset()
sensor.set_pixformat(sensor.RGB565)
#sensor.set_framesize(sensor.QQVGA) sensor.set_framesize(sensor.QQVGA)
#VGA: 640x480
sensor.skip_frames(10)
sensor.set_auto_whitebal(False)
clock = time.clock()
uart = UART(3, 115200)
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])
```

```

if blobs:
    #print(len(blobs))
    #data=[]
    for b in blobs:
        if b[4]>100:
            #print(b)
            #print('sum :', len(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= (max_blob.cx(),max_blob.cy())
            output_str1=% (max_blob.cx(),max_blob.cy())
            #print("%d,%d" % (max_blob.cx(),max_blob.cy()))
            print(output_str1)
            uart.write(% (max_blob.cx(),max_blob.cy()))
            #uart.write("\r\n%d,%d" % (b[5],b[6]))
            #uart.write(output_str)
            #print(b[5],b[6])
            #data=[]
            img.draw_rectangle(b[0:4]) # rect
            img.draw_cross(b[5], b[6]) # cx, cy
        print(clock.fps())

```

Summary

This paper expounds the principle and method of color recognition with camera, and uses high performance microprocessor STM32F765 to collect and process camera data. The hardware circuit design is given, and the programming with Python script language in openmv, realizes the accurate identification of black and white line, the control of the car, go straight turn left, turn right, to realize the automatic tracking function, has a certain practical value.

References

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