

# Design of Intelligent Inspection Car based on STM32

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**Abstract.** in the field of security monitoring of warehouse and workshop in family life and large enterprises, the traditional custody and maintenance mode is obviously out of line with the development of The Times, which not only consumes manpower and material resources, but also increases the security risk. Therefore, we design a mobile monitoring and real-time transmission of monitoring results of the intelligent inspection car. The motion control system takes STM32 as the controller, and the tracking and setting route of the car is controlled by linear CCD and motor for patrol inspection, or the movement of the car is controlled by android mobile APP, and ultrasonic ranging is adopted to avoid obstacles. DHT11 sensor was selected to collect the temperature, humidity and smoke concentration of the environment, which was transmitted to the mobile phone through ESP8266. Camera, WiFi remote image transmission control, real-time transmission of the picture taken by the car to the mobile phone or PC terminal; Add an alarm, which will alarm when the concentration, temperature and humidity of the smoke reach the preset value.

**Keywords:** STM32, tracking, APP, sensor, WiFi image transmission, remote.

## 1. Introduction

At present, the Internet of things (iot) technology is widely used. Many everyday objects can add communication functions to transmit specific information. In the field of video surveillance, hd intelligent video monitoring has been very popular, but in many cases, especially in the family life and each big enterprise warehouse, factory building security monitoring field, the traditional supervision and maintenance mode and the development of the era of derailment, obviously not only the manpower cost, and increase the security risks, such as: high temperature drying room, explosion-proof chemical reaction chamber and so on, may also cause harm to the safety of inspection personnel. According to statistics, the annual loss caused by the failure of regular inspection of the enterprise's warehouse accounts for about 5% of the enterprise's cost [1]. Therefore, based on STM32 single chip microcomputer, the author designed an intelligent car that can be used for automatic inspection. It can be applied not only to the family of a single-family villa, but also to the warehouse and workshop of various enterprises. The car is equipped with a camera to carry out inspection in accordance with the prescribed route, and the mobile phone can control its inspection route in the inspection process, so as to check the places that are not normally inspected. This car is not limited by environmental factors, instead of manual inspection, eliminate hidden dangers, nip in the bud. And simple operation, low cost, can achieve real-time monitoring and remote control.

## 2. Hardware Structure

### 2.1 Basic Parameters of the Vehicle Model

Table. 1 Basic Parameters of the Vehicle Model

Motor speed	500rpm
Motor speed ratio	1:30
Maximum speed	1.2m/s
Load capacity	4kg
Steering gear model	TBSN-2701
Steering torque	15kg.cm
Turned to the way	The steering gear of the front wheel turns
Drive way	The rear wheel is driven by double motors, and the differential speed is available
Plate material	Aluminum alloy
The motor power	7W
Motor operating voltage	7-13V
Encoder working voltage	5V
Working voltage of steering gear	4.8-6V

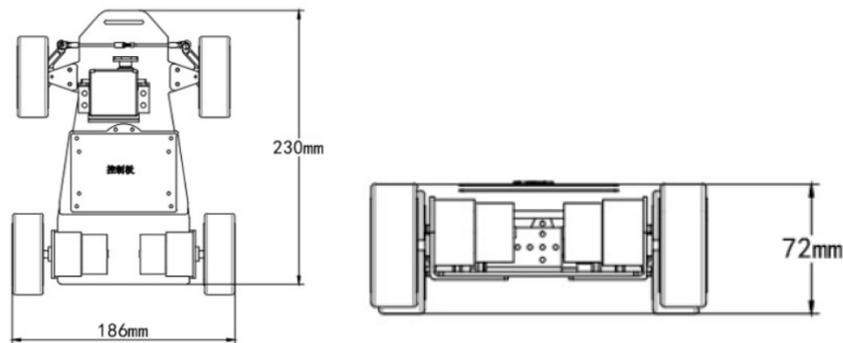


Fig. 1 two-dimensional drawing of vehicle model

### 2.2 Control Panel

The control board adopts STM32F103C8T6 as the controller and contains motor drive. The control board is as follows:

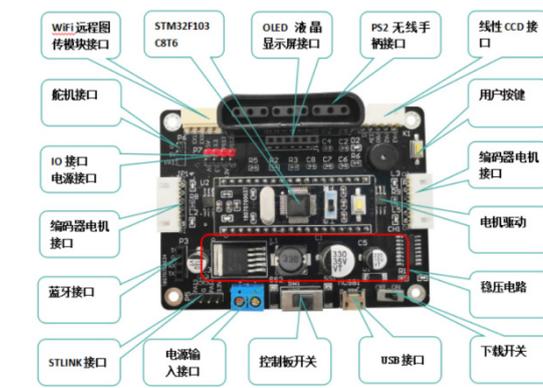


Fig. 2 control panel

### 2.3 Encoder Motor and High-precision Digital Motor

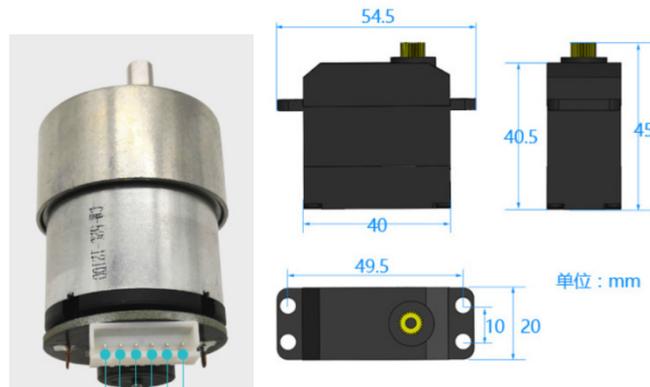


Fig. 3 encoder motor and high precision digital motor

## 3. Operating Principle

### 3.1 Overview Diagram of Operation Principle

The intelligent vehicle mainly includes tracking obstacle avoidance module, sensor acquisition and processing module, camera shooting and image transmission module.

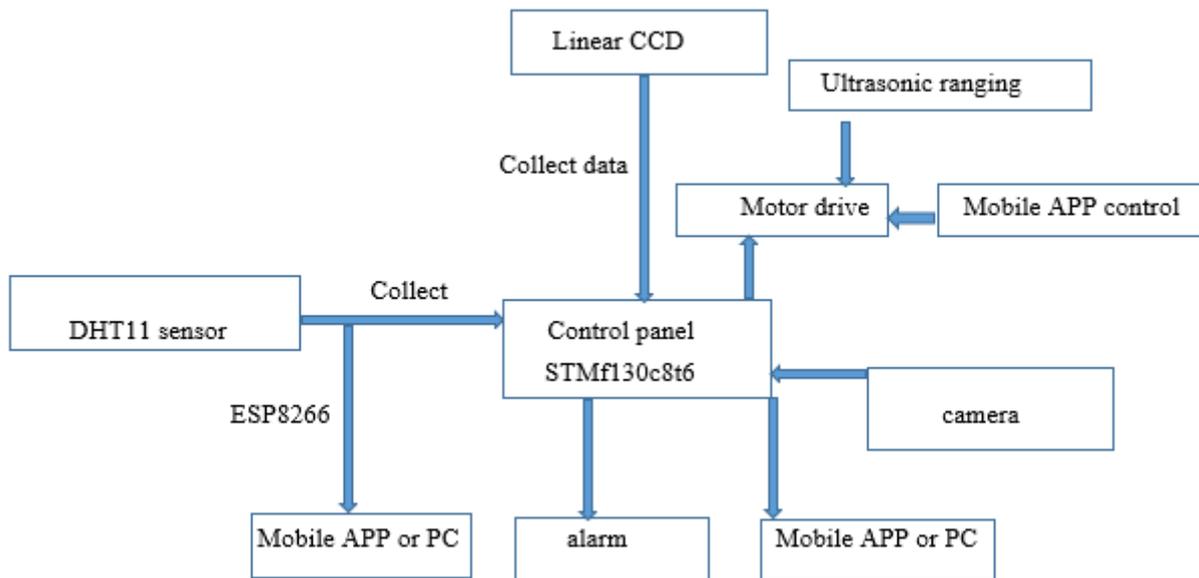


Fig. 4 overview diagram of operation principle

### 3.2 Tracking Principle

Linear CCD according to different color of light reflected different so when exposure to black and white line transformation of value is not the same, CCD through to the value of the transmission to the STM32 MCU, MCU value judgment and processing of CCD feedback, according to the different judgment result will be different commands sent to the motor and steering gear, so as to realize tracking function [2]. In this process, the control panel can also be connected by bluetooth, so that the mobile phone APP can be used to remotely control the direction of the car. And added ultrasonic ranging device, can effectively avoid obstacles, avoid the car and other objects in the process of collision, accident. Part of the procedure for tracking judgment and instruction is as follows:

```

int main(void)
{
int k,a=30,ii,aold1=0,aold2=0;
aold2=aold1;
aold1=a;
a=get_blackline();
if(0<a&& a<42)//60
{
Dac1_Set_Vol(1600);
LED1=1;LED3=0;LED2=0;
}
else if(128>a&& a>58)//92
{
Dac1_Set_Vol(3250);
LED3=1;LED2=0;LED1=0;
}
else
{
Dac1_Set_Vol(1);
LED2=1;LED3=0;LED1=0;
}
}

```

### 3.3 Principle of DHT11 Sensor

The DHT11 sensor can collect the temperature, humidity and smoke concentration value of the external environment in real time, and directly transmit the collected data to the control board, which makes a judgment on the parameter value. When any of the collected temperature, humidity and smoke concentration value reaches the preset value, the alarm will give an alarm. The specific value of data can be monitored in real time through ESP8266 transmission to mobile APP.

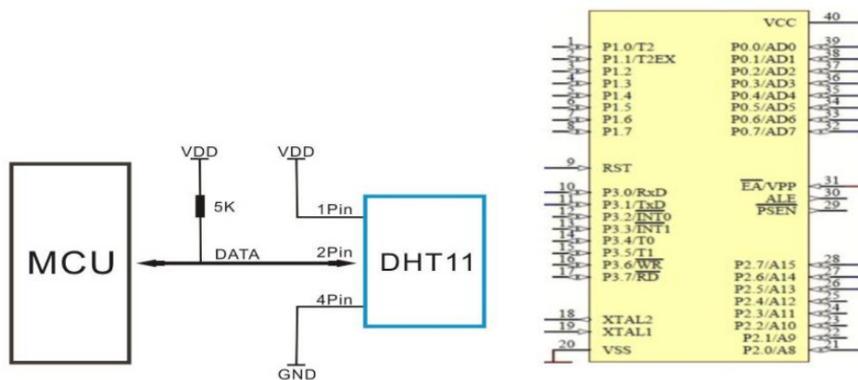


Fig. 5 schematic diagram and wiring diagram of DHT11 sensor

### 3.4 Principle of Camera

The camera equipped with the smart car can adjust the direction through the steering gear, and the pictures taken during the inspection can be transmitted to the mobile phone APP or PC through WiFi, and can also be monitored in real time through video. The schematic diagram of the camera is as follows:

