

Design of Back Channel and Circuit Based on Single Chip Microcomputer

Xiaosong Huang ^a, Guoliang Wu, Shuai Wang

School of Shandong University of Science and Technology, Shandong 266590, China.

^a1129715585@qq.com

Abstract

at present, the control of single-chip microcomputer develops rapidly due to the convenience of the use of single-chip microcomputer and the insight of the system. The design is a flow chart and circuit diagram designed with the reverse path of the control system as the core.

Keywords

51 microcontroller, control loop.

1. Design and Theory of Vehicle Control in Reverse Passage

In industrial control system, MCU always needs to operate on the control object. Therefore, in such a system, there must be a backward channel. The backward channel is the output channel interface to the control object after the computer realizes the control operation processing.

According to the control signal requirements of output and control objects of single-chip microcomputer, the backward channel has the following characteristics[1]:

- (1) it is an output channel, and the output control signal is used to drive the controlled object.
- (2) small signal output and large power control require the control signal to have certain power driving ability;
- (3) close to the control object, the environment is bad, resulting in serious electromagnetic and mechanical interference

The design of backward channel mainly includes:

- (1) number/mode conversion, converting binary digital quantity or frequency quantity to analog quantity;
- (2) power drive to meet the power requirements of controlled objects;
- (3) prevent and control interference, eliminate the influence caused by interference and ensure the normal operation of the system

A reversible PWM converter is used to realize the left and right turns of electric cars. The main circuit of reversible PWM converter has H type and T type. We adopted the commonly used bipolar H converter in our design, which is a bridge circuit composed of four three-pole power transistors and four relay diodes. The circuit diagram of the bipolar H - type invertible PWM converter is shown. [2]

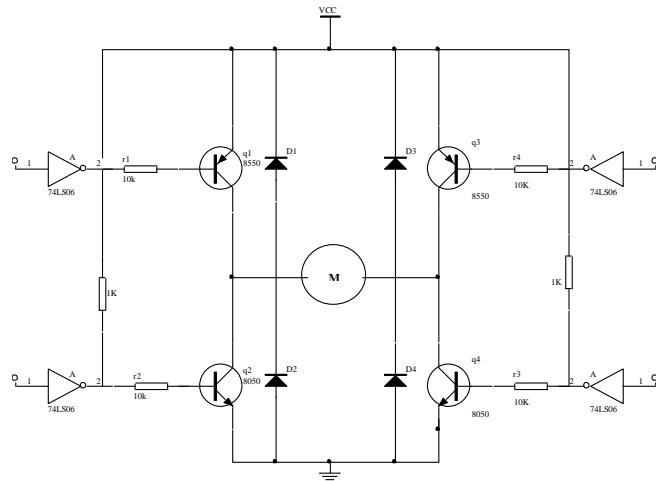
The advantages of bipolar PWM converter are as follows:

The main circuit is simple and requires few power devices.

The switching frequency is high, the current is easy to be continuous, the harmonic is low, the motor loss and the heat are small.

Low speed performance, high stability accuracy, wide speed range;

The system has wide frequency band, fast dynamic response and strong dynamic anti-disturbance capability



2. Pulse Width Modulation Principle

Basic principle of pulse width modulation (PWM) : the control method is to control the on-off and off of the switching device of the inverter circuit, so that the output end can get a series of pulses with the same amplitude, and use these pulses to replace the sine wave or the required waveform. In other words, multiple pulses are generated in the half cycle of the output waveform, so that the equivalent voltage of each pulse is sinusoidal waveform, and the output is smooth and the low-order harmonics are less. By modulating the width of each pulse according to certain rules, the output voltage of the inverter circuit can be changed as well as the output frequency. [3]

For example, if the sine half wave is divided into N equal parts, the sine half wave can be regarded as a waveform composed of N connected pulses. These pulses are of the same width, and they all have a different amplitude, and the top of the pulse is not a horizontal line, but a curve, and the amplitude of each pulse varies sine. If the above pulse sequence is replaced by the same number of rectangular pulse sequences with equal amplitude and different width, the middle point of the rectangular pulse coincides with the middle point of the corresponding sine equipartition, and the area of the rectangular pulse and the corresponding sine part (i.e., impulse) are equal, a set of pulse sequences is obtained, which is the PWM waveform. It can be seen that the pulse width varies according to the sinusoidal rule. According to the same principle of equal impulse effect, PWM waveform and sine half-wave are equivalent. For the negative half cycle of sine, the PWM waveform can be obtained by the same method.

In the PWM waveform, the amplitude of each pulse is the same. To change the amplitude of the equivalent output sine wave, the width of each pulse can be changed according to the same proportional coefficient.

According to the above principle, the width and interval of each pulse of PWM waveform can be calculated accurately after the sine wave frequency, amplitude and the number of pulses in half a period are given. The required PWM waveform can be obtained by controlling the on-off of switch devices in the circuit according to the calculation results. [4]

2.1 Logical Delay

In reversible PWM converter, the jumper on both ends of the power of the upper and lower two transistor frequently change the job. As a result of the transistor off during a period of down time, storage time and current term, cut-off time during this period the transistor has not completely shut off. [5]If during this period has another transistor conduction, will cause two tube pass, so that the power

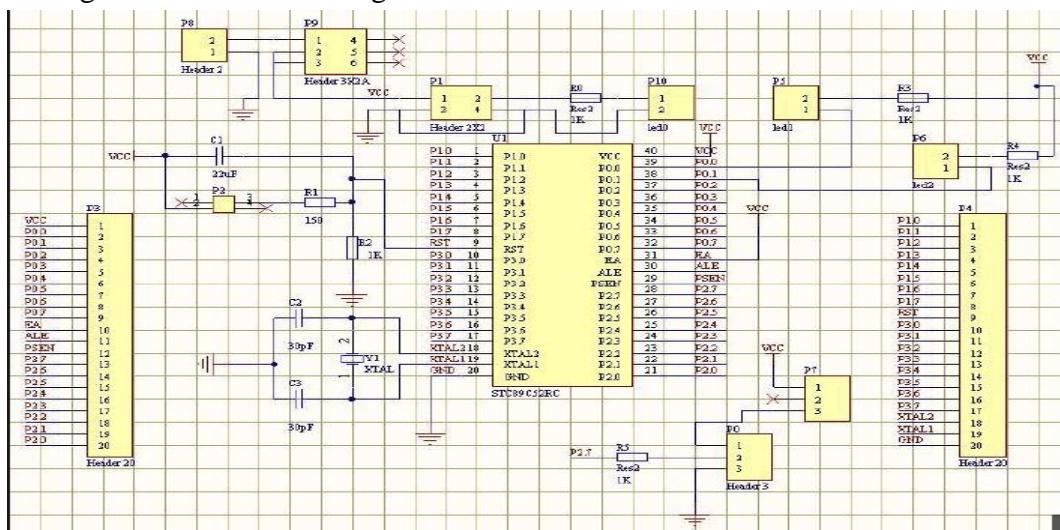
supply is negative short circuit. To avoid this kind of situation, set up by the RC circuit composed of delay link.

2.2 Power Supply Design

The power supply of this design is the on-board power supply. In order to ensure reliable power supply, the power supply of MCU system and power servo system adopts high power and large capacity battery. The working power of the sensor USES a small and light dry battery.

2.3 Circuit

For the main control circuit, this module mainly analyzes the acquisition signal, and gives the PWM wave control motor speed, starting and stopping. And detect the obstacle alarm and other functions. The circuit diagram is shown in the figure



3. Conclusion

Through design and research of the plan found that single chip microcomputer control system for low cost control, to a certain extent function library call simple easy to use, easy and for the development of open source applications, as well as a lot of advantages, through the design of learning more further deepen understanding of the single chip microcomputer control theory, through the consult reference and draw lessons from the existing solution measures to exist some disadvantages in SCM control system for the supplement, but as a result of the limitation of personal knowledge and ability in research on scheme design is still a lot of deficiencies and defects, these still need to solve.

References

- [1] li guangdi et al. Fundamentals of single-chip microcomputer [M]. Beijing aerospace press, 2001.
- [2] tang junzhai et al. Single chip microcomputer principles and application metallurgy industry press, 2003.9.
- [3] ma zhongmei et al., application program design of single-chip microcomputer in C language, Beijing university of aeronautics and astronautics press, 2003.
- [4] xue junyi, zhang yanbin, yu he-song fan bo, principles and applications of the 16-bit single-chip microcomputer in lingyang, Beijing university of aeronautics and astronautics press, 2003.
- [5] hou yuanyuan, et al. Principles and graduation design of lingyang single-chip microcomputer in 2006, science press.