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Aiming at training students' creative ability teaching reform and practice of "assembly language and microcomputer technology "course practice design

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Abstract: Assemble language and micro computer technology course practice design is very practical, some problems existing in the traditional teaching methods and teaching contents of this course design, in order to develop the students' ability of creative and independent thinking, the author's teaching group has carried on the reform to the course design practice. In this paper, several reformation schemes of microcomputer course design system in new innovative design are proposed, and the design contents and design ideas are expounded. These examples have been presented for relevant experimental or teaching staff reference. A better practical effect is achieved through the reform practice to aim at training students' creative and practicalability.

Keywords: Microcomputer Technology, Course Design, Reform Practice

1. INTRODUCTION

The course of "Assembly Language and Microcomputer Technology", also known as "Principles and Applications of Microcomputer" is a compulsory course in computer science and technology major. Its content is relatively complicated and needs to be memorized. Assembly language is not as clear and clear as advanced languages. Students generally feel more boring to learn this course only by theoretical teaching, in order to promote students' interest , we arrange two weeks of course design in the syllabus after the end of the course. Through curriculum design aims to improve students' practical ability to further understand the working characteristics of the X86 series of computers, in-depth understanding of the assembly language and the performance of the learned chips, improve the ability of students to comprehensively use microcomputer technology. Curriculum design is an essential practice process, using about two weeks to complete a small computer hardware system applications.

2. THE SHORTCOMINGS IN THE COURSE DESIGNBEFORE REFORM

As a result of the limitation of teaching conditions, the past subjects are usually fixed, so students are not free to play their own ideas, even from the previous students to copy ready-made design ideas and programs, that leads to low motivation and plagiarism.

In order to improve students' study interest and innovation ability to obtain better teaching results, the design and arrangement of the course design subjects have been reformed. From the course design contents to arrange a number of optional topics, so that students can make a choice according to their own ability, and according to the experimental conditions to give students the right to choose the subjects. In this way, students must provide total solutions to solve the key technologies for the design system from two aspects of the hardware circuit and software design. Finally, the hardware and software design is combined together to constitute an innovative and practical small hardware system.

3. CLASSIFICATION OF COURSE DESIGN

3.1 According to the different time length of classes

1. A/D, D/A conversion: typical issues such as single-channel analog voltage acquisition circuit.
2. Data display (including digital tube, dot matrix display, diode): typical issues such as elevator control system, Traffic signal lights system design by microcomputer control.
3. Sensor: typical issues such as temperature display system.
4. Motor: typical issues stepping motor control.

3.2 According to the different professional objects

1. Major of Computer science and technology, students are mainly in programming design (8086 assembly language or C language).
2. Majors of Network engineering and Internet of Things engineering, students are mainly based on the system architecture design, understanding the application characteristics of the chip.
3. Majors of mechanical, The mechanical major once set up microcomputer technology course design in the past teaching plan, students are mainly in the electrical motor application research.

4. ORGANIZATION OF COURSE DESIGN

Students can choose their partners to form a group including two students, each one with their own responsibilities.

For some of students with the more solid-based professional knowledge, we also encourage them to freely choose the subjects according to their own interests, teachers are responsible for the review and guidance.

In order to enable students to make full use of their spare time, so they are not restricted by time and space constraints, we allow students to bring the development board back to the dorm to do their works, we have proposed to the development board manufacturers using USB power supply section, the latest experimental box USB port power has realized the USB power supply ,so that students can use the board anywhere and anytime, it doesn't must to be done in the laboratory.

5. DESIGN FOR COURSE DESIGN SCHEMES

5.1Design for analog voltage acquisition circuit and program

1 Contents of design

The contents of this subject is limited to two week to complete. An analog voltage acquisition circuit and the corresponding program are designed by using the programmable interface chip 8253, 8255A, ADC0809 and microcomputer internal interrupt controller 8259A. (imported from reserved IRQ2 or IRQ10)

Using ADC0809 to design a single-channel analog voltage acquisition circuit, which requires the analog voltage value of the connecting channel to be collected. One side of the collected digital quantity is sent to the LED display, one side is sent to display on the computer screen, each line shows 5 Data, after collecting 100 data to stop the acquisition process.The collection process can be interrupted by pressing ESC key.

2 Ideas for design

1. 4.7K Ω potentiometer connected to one end of +5 V, one end of the ground, adjust the potentiometer to get the analog voltage changes, the voltage connected to a channel ADC0809 input (such as IN0), ADC0809 clock 500KHz, 8253 on the breadboard Clock 1MHz or 2MHz after the division, 8253's port address: 300H ~ 303H.
2. ADC0809 would begin to conversion when the program starts (ADC0809 completing a

conversion time is about 120 μ s), the ADC0809 EOC pin signal is used as an interrupt signal, if the conversion has completed, the interrupt service program will start. The interrupt service program reads the analog-digital conversion results, One side of the collected digital quantity is sent to the LED display, one side is sent to display on the computer screen.

3. 8255A used as the interface between the CPU and ADC0809 chip, ADC0809 control signals (such as OE, ALE, START, etc.) can be provided by the Port C of the 8255A, after the analog-digital conversion can be by port A of 8255Areading, by port B of 8255A output to the LEDs. 8255A port address: 304H ~ 307H.
4. The decoding circuit is provided by 74LS138.. The 74LS245 is used for bidirectional transmission and isolation between the bus and the 8255A.

5.2Cross traffic lights control system design

1 Contents of design

A cross traffic lights control system based on microcomputer control is design by using programmable interface chip 8253, 8255A and 8259.

Through two weeks training ,students should master the using methods of interface chip 8253, 8255A, 8259 and other programmable devices, decoders 74LS138, 8-way in-phase tri-state bidirectional bus transceiver 74LS245, six buffers / driver / inverter 74LS06 and seven sections of digital tube.

1. Functional requirements

When the program starts，the state of the traffic lights are the horizontal and vertical direction of red and green LEDs has an initial state to the contrary, the yellow LEDs in both horizontal and vertical directions are not lighted.

Using the 8253 produces a 0.5 second timing signal, which is sent to the 8259 by bus. The value of each second is converted to seven segments code output by the Port C of 8255A, then refresh seven segments digital tubes.

Seven-segment display on the digital tubes for a period of 10 seconds, showing the numbers from 0 to 9, when the seven segments digital tubes display is 4 to 0, the horizontal and vertical direction of the yellow LEDs change every second controlled by port A and port B of 8255A, that is light and off each 0.5 seconds. When the seven segments digital tubes display time is 0, the horizontal and vertical direction of the red and green LEDs by controlled port A and port B of 8255Ato complete the switch, the yellow LEDs are off, seven segments digital tubes display from 9 again.

2 Ideas for design

1. Address decoding circuit is designed by 74LS138, 8255A port address: 300H ~ 303H, 8253 port address: 304H ~ 307H.
2. The 74LS245 is used for bidirectional transmission and isolation between the bus and 8253、8255A.
3. A 0.5s timing circuit is designed by using the clock (1MHz or 2MHz) and 8253 on the bread board. The timing signal is sent to the IRQ2 or IRQ10 of the bus to 8259.
4. Port A and Port B of 8255A control the level and vertical direction of the six LEDs to change, port C controls seven segments digital tubes to change, A 200Ω resistor connects between the port C and seven segments digital tubes.
5. A 74LS06 contains six non-gates, and its input comes from one bit of the Port A or Port B, and the output connects the negative electrode of the LEDs.

6. Each of the LEDs' positive pole is connected with pins of resistor chain from 2 to 9, and the resistor chain pin 1 is connected to the VCC (+5V).

3The key technologies

1. A method of reasonable allocation of three ports of parallel interface chip controls 12 traffic lights and digital tube to timing display.
2. Connection and separation among microcomputer and parallel interface control chip, timer control chip.
3. Time - time dynamic adjustment and adjustment method.

4 Solutions

1. The parallel interface chip 8255A port A and port B port control 12 traffic lights display, each output port using 6 bits, 1 (high level) means light, 0 (low level)means off. The remaining bits of port A, port B the and port C connect digital tubes to display time,8253 as a timing chip.
2. The 74LS245 can connect and separate microcomputer bus and parallel interface chip, timer chip . The address decoding circuit is designed by 74LS138 .
3. The timing time is designed to 1 minute with two digital tubes display, to the time less than or equal to 5 seconds when yellow lights every 0.5 seconds to switch on and off ,the timing display 0 second when the direction of the two red lights and green lights switch. Timing can be dynamically adjusted by software.

5 Program flow char

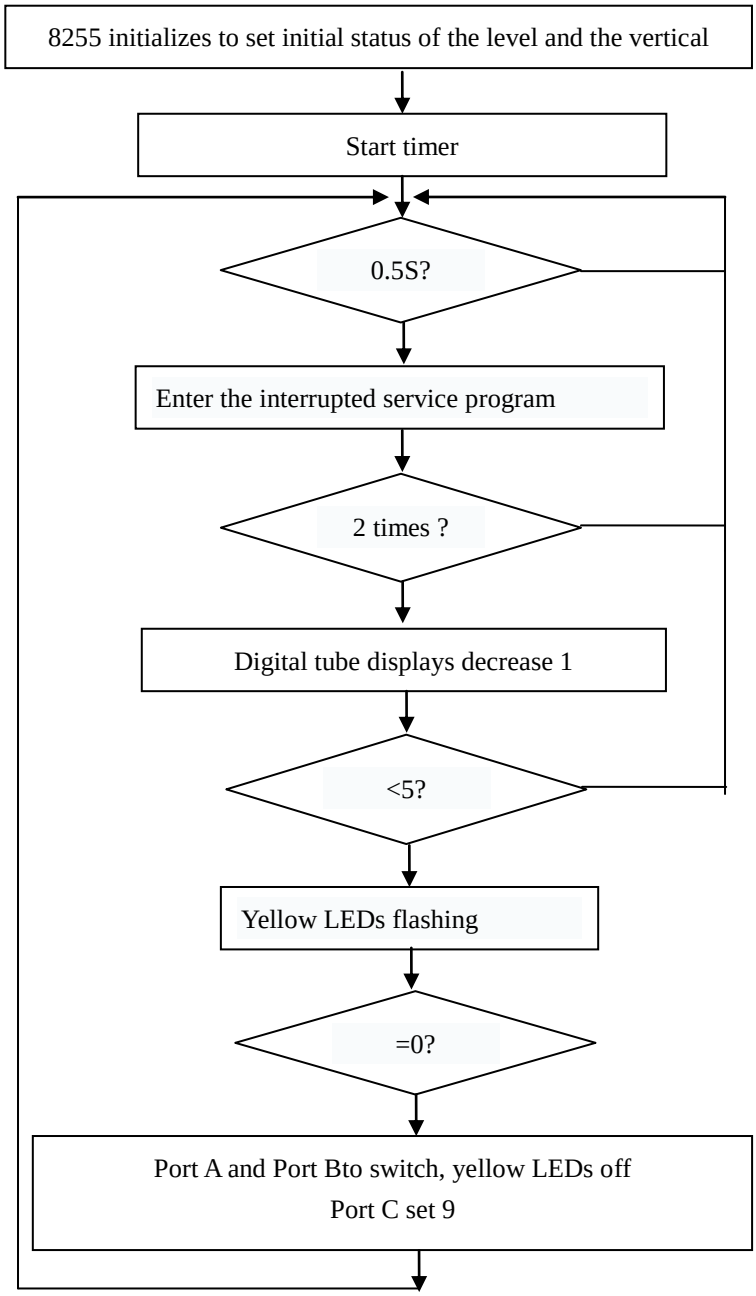

Fig1Program flow chart of cross traffic lights control system

Limited to the length of the article, only two typical topics are listed. In the practical process, we can also use the existing chips and equipment in the lab to allow them to make their own subjects according to the students' own interest. C language and X86 assembly language both can be used in the design process. It is recommended that computer majors should write programs in assembly language so as to give full play to the functions of assembly language control hardware circuit, so that students can fully understand the working principle of microcomputer. Non-computer major students usually do not have an assembly language programming course, it is best to use C language to write programs.

5. Conclusion

This paper analyzes the shortcomings of traditional teaching model and the serious crises face by microcomputer course design .The contents of these design subjects is closely related to the daily life, which are interesting. After the students have finished, they feel a sense of accomplishment. They are not difficult in general, with more devices and connections, and a certain amount of work. Most students finish the work in about 8 days.

Through the course reform, although it is increase the teachers' workload, but from the perspective of students, Course reform can improve students' initiative and help them understand the working principle of microcomputer, which can improve students' practical ability and creative spirit. The reform of the course design has practiced four consecutive session of students, four years practice results shows that the teaching reform proposals presented in this paper can systematically foster students' ability of using microcomputer principle and program tools means to analysis and solve problems in practice, and achieve the aim of promoting students' ability in practice and application.

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