Study on Assemble Language Programming Teaching Reform

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Abstract. Assemble language programming is a course with combination of software and hardware. Theory is as important as practice in this course. Assemble language is a low-level language which is hardware oriented. This course is more difficult to master compared with high-level language for it is uninteresting. This paper analyzes the position of the course in computer teaching system, the effect of the course and the existing problems of the course. Some reform measures to the problems existed in the course are suggested in the paper.

Introduction

Assembly language programming is an important professional basic course of computer science in institution of higher learning. It is the first class of other core curriculum which such as computer composition principle, interface technology, operating system, compiler principles and so on, playing a very important role in improving students’ programming capabilities, helping students understand how computers work and engage in software development and hardware applications. In practical applications, you can use the assembly language for computer system maintenance, operating system maintenance, operating system analysis, anti-virus analysis, and it can also be used to direct the development of embedded software. More importantly, assembly language is the only choice in dealing directly with the hardware. But the assembly language is a low-level language, a symbolic machine language. Compared with the advanced language, there are a large number of instructions and grammar rules to memory, no high-level language structured statements, program structure is not very obvious, debugging process is not easy to master, no powerful development tools can be used, it's boring, mechanical, abstract, and this leads to students' enthusiasm for this course is not high, assembly language programming has become a major difficulty for many students. Therefore, how to arrange teaching content, use appropriate teaching methods, give full play to the learning enthusiasm of student, improve teaching quality are the main subject of the current process of teaching the course.

The Course Status

Assembly language in more than half a century has greatly changed, accompanied by Intel microprocessors upgraded from 16 to 32 bit to 64, the hardware structure is changing at the same time, 80x86 instruction system is developed from 16 bit to 32 bit, continuously improve instruction set, the continuous extension of register, and assembly language work mode from DOS 16 real mode, development for the real mode and the Windows 32-bit protected mode under the two kinds of working mode. In addition, with the advent of the era of the Pentium processor, Windows, Unix, Linux and other operating systems have emerged, the application by the operating system to achieve control of the hardware, assembly language is no longer the only choice to write the operating system and other system programs, but written in assembly language source program compiled after get the goal of the
program is still in the two aspects of time, space, reflects the greater advantage. Operating system kernel design, process optimization in the Windows environment, code testing, encryption, decryption, analysis and prevention of the virus, Win32 assembly language has been widely used. In addition, for today's popular computer industry embedded system development prospects, in many embedded operating systems, memory management mode into real mode and protected mode, which is similar to the CPU and its operating mode in assembly language programming 386 Architecture, for such a processor operating system kernel boot program is mainly implemented in assembly language.

Although today's high-level computer languages emerge one after another, the use of high-level language compiler is running very fast, assembly language is still able to maximize the features of computer hardware, and remains the most effective language to meet the demanding requirements of real-time processing in the program execution time and space demanding, control the underlying hardware of the occasion. In addition, assembly language can also be mixed with advanced programming language to play their respective advantages and improve the efficiency of development and execution. Therefore, assembly language programming in the computer teaching system will still occupy an important position.

Problems in Teaching

Understanding of Nature of the Course Is not Clear, Learning Enthusiasm Is Not High

For part of the students, understanding of the purpose of assembly language course is not enough, they treat the assembly language as a purely programming language course, mistakenly think in the high-level language popular era assembly language is outdated and is of no use in the practical application, so they are not interested in this course.

Difficult to Program

As the assembly language program design involves the underlying computer hardware, learning content is boring and content requires memorizing is various. The start is difficult, not like computer high-level language which is easy to start and now holds an absolute advantage in the design of the application. High-level language, relative to assembly language, is close to human natural language, easy to learn and use, many functions with high-level language can be realized under a statement, while several or even dozens of statements are needed to achieve the same result for assembly language, which to a great extent dampens learning enthusiasm for part of students in the course.

Backward Course Content, Remains to Be Further Perfected

Today, including our school, assembly language programming course in most of the colleges and universities still adopts single task operating system DOS 8086 assembly language, the main teaching content is on the basis of learning the basic structure of the 8086 CPU and instruction set, in the DOS environment through soft interrupt of the BIOS and DOS system function calls for developing the application, although the 386 architecture based Pentium processors as teaching content, but for this part of the explanation is still mainly to real mode mainly, under the environment of windows 32-bit protected mode programming and application ability cultivation is still lacking, failed to reflect the courses of the times.
Teaching Reform Measures

In Terms of Teaching Content

For the existing teaching platform, the focus of teaching content should be transferred from DOS programming to Windows programming, with working principle of the real mode as the foundation, putting emphasis on the protection mode of the Win32 assembly language programming structure.

Teaching Methods and Means

Assembly language programming is a combination of software and hardware, theory and practice. Reforming teaching method and adopting various teaching methods to carry on the theory and practice teaching are necessary. The theory uses the case method teaching, comparative method teaching and analogy method teaching.

The assembler language is a kind of "symbolic" description language, which inevitably determines that it has the characteristics of many complex instructions and regulations, this is the main reason it is not easy for a student to grasp. Based on this reason, this part of the course instruction system uses case method of teaching, a lot of the instructions in the book will be integrate into a specific program, the instructions will also be introduced to solve concrete problems, which can improve students' ability to analyze and solve problems, at the same time can understand instructions naturally. In addition, contrast and analogy method can also be used in the teaching of this course, comparing assembly language programming with high-level language to find out the similarities and differences, which not only can make use of what they have learned to solve practical problems, but also can reflect the advantages of assembly language.

Make Full Use of the DEBUG

The assembler language is a language to "speak" hardware, concepts such as registers, memory, address, stack are abstract and very difficult to understand for those students who don’t understand computer hardware quite well, but there are tools such as DEBUG, which is relatively easy. For example, when we learned after the MOV instruction, for such an instruction MOV BX, 2000H, is transferred the immediate number 2000H to the BX register, and when we enter DEBUG, after an instruction input the following results appear (Fig. 1).

![Figure 1. Debug.](image_url)

In this simple process, students will see the address where the instruction is 13C4:0100 (Segment address is 13C4, offset for 0100). The results of the implementation of the MOV directive, the 2000H will be transferred to the BX register, the value of the BX register is 2000H, other storage remains...
unchanged. Through the DEBUG will make students intuitive see instruction function and using method, improve the students’ learning interest and learning effect.

**Conclusions**

Anyway, with the continuous development of computer technology, assembly language still occupies an important position in the whole computer teaching system, is an important basic course to connect computer hardware and software, how to improve the students’ interest in learning and the teaching effect of this course will still be the constantly discussed topics in the future.

**References**


