Application of Simulation Software in Analog Electronic Technology Teaching

Wei ZHANG¹, * and Jie LIU²

¹Automation and Electrical Engineering Institute of Linyi University, Linyi, Shandong, China
²Chemistry and Chemical Engineering Institute of Linyi University, Linyi, Shandong, China

*Corresponding author

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Abstract. Analog Electronic Technology is a theoretical and practical course, the theory is very abstract and difficult to understand, difficult for students to understand and accept, in order to solve this problem, we have introduced simulation software for teaching, through the simulation software, abstraction The working process of the circuit waveform, images, numbers and other forms of visual, image display in front of students. The article introduces the characteristics of simulation software in the teaching of analog electronic technology, helps to break through the difficulties of classroom teaching, helps to improve students' interest in learning, and helps to cultivate students' ability of innovation and entrepreneurship. Taking class B and class A and B power amplification circuits as an example, the article presents the students with intuitive waveform simulation through software simulation. The interface is simple and versatile, easy to learn and easy to use, which enhances students' understanding and mastery of circuits and improves teaching effectiveness.

Introduction

Analog electronic technology is a basic course in the professional series courses of electrical information, automation, computer, communication and other professional courses. It is a very important course. Analog electronic technology itself is a very abstract basic disciplines, but it has a very important role in itself, for technical work in the field of electronics, automation, the basis of electronic technology, has a very important value for the development of an electronic engineer It plays a vital role. However, analog electronic technology is very difficult to learn. The course has more abstract theoretical analysis and more practical application. Because of the abstraction, a lot of things cannot be understood without the actual experience of circuit design, manufacture and debugging. In traditional teaching, the theoretical analysis and the concrete practice are relatively disjointed. When it is analyzed theoretically, it is not abstract enough intuitive image, difficult for the students to understand and accept, so as to form the ideological obstacle of "electronic technology" Enthusiasm for "Electronic Technology" Courses.

The popularity and development of software simulation technology and multimedia technology broaden the teaching mode and make the teaching content of analog electronic technology visualize. Classroom teaching is no longer limited to the theoretical content, but the integration of theory and practice. It not only enriches the teaching content, but also makes the boring and difficult to understand complex things directly appear in front of the students, which greatly enhances the students' enthusiasm to participate in the study. Help to improve students' understanding of their basic theory and application circuits. The use of software simulation technology to improve the efficiency of learning and to promote the construction of learners' knowledge can find new ways and approaches for the current electronic technology teaching, provide theoretical guidance for electronic technology classroom and experimental teaching, reference and reference for teaching reform So as to improve the timeliness of electronic technology teaching and make a positive impact on electronic technology teaching and promote the application of advanced teaching theory of modern educational technology in electronic teaching and researching.
The Characteristics of Simulation Technology Used in Analog Circuit Teaching

The use of simulation software to teach, you can play the role of simulation software to promote the traditional teaching and experimental means to information technology, modernization, and thus promote the teaching methods, methods, content, mode change. Simulation software technology used in analog circuit teaching can give students a professional circuit analysis and a strong experimental environment. Virtual simulation software provides a large number of different types of components, can have thousands of types of components and various components of the ideal parameters, but also can be expanded, users can also create their own new components. Virtual simulation software provides a variety of virtual instruments, the same function and the actual instrument. User-friendly interface, easy to learn and use. The entire user interface is like an integrated electronic lab bench. The components needed to draw the circuit and the test equipment needed for the simulation can be dragged and dropped directly onto the screen and connected with a mouse click. Avoiding the repeated plugging and unplugging of the connecting wires in the traditional experiment and solving the common connecting wire fault problem. Simulation software has a strong simulation capabilities, to complete the effect of some hardware experiments can not be achieved. Simulation software for teaching has the following characteristics.

Help Break the Difficult Teaching in Class

The introduction of simulation technology into classroom teaching helps to improve the quality of classroom teaching. In the process of analog electronic classroom teaching, as the transistor used in the amplifying circuit in analog electronic technology, the FET is a non-linear device, the students have a process of understanding from the original linear circuit to the non-linear circuit. Qualitative analysis, quantitative calculation is a difficult point, the vast majority of students feel the analog circuit is very abstract, it is difficult to profoundly understand the principles of analog circuits and the actual function. Teachers use software simulation techniques applied to the analysis of circuits or components, while explaining the circuit principle, the use of simulation software to simulate the operation of the circuit and the output curve, through the real-time changes in the parameters of the circuit components synchronized output simulation curve, thus By contrast, students can more intuitively see the role of the various components to understand the value of the circuit due to the adjustment, the various components of the circuit performance improvement role in promoting the students understanding of the circuit principle, to master the role of components in the circuit Function, make it easier for students to master what they have learned, so as to improve the quality of classroom teaching.

Help to Improve Student Interest in Learning

Analog electronic technology is a professional and basic course with a strong theoretical and practical nature of electronics, electronics and information science. The quality of its teaching and its acceptance by students will directly affect the teaching results of the following related specialized courses. In the entire professional teaching process has a very important position. The course has the characteristics of more concepts, more content, more types of components, more circuit types, rapid development, introduction of engineering analysis and other characteristics, and the content is more abstract. The traditional teaching methods are as follows: firstly, students are introduced to the working principle of the circuit in the classroom, and then qualitative analysis and quantitative calculation are made to get the conclusion of the circuit-related characteristics. Finally, the examples are cited to demonstrate. Students acquire knowledge mainly through the teachers' writing and writing in the classroom, and deepen the understanding of theoretical knowledge through after-school reading, homework and experiments. This traditional teaching method has the following problems: First, it only focuses on teaching theoretical knowledge, cannot make students feel the authenticity of the circuit, and cannot judge the correctness of theoretical analysis programs. Second, theoretical analysis is usually tedious formula derivation or abstract illustration analysis, it is difficult to reflect the actual working process of the circuit, the lack of intuitive and vivid. Third, the theory is out of touch with the reality. Students cannot understand or even understand the
theory, resulting in the idea that analog circuits are "difficult to learn, abstract and tired of learning", thus losing their interest in learning. Finally, in the process of teaching and learning, there appear the phenomenon that students are dull and exhausted, the teachers' teaching is time-consuming and hard to be in-depth. The simulation software into the teaching of analog circuits, teachers can demonstrate the whole process of building circuit models with library components, after the theoretical analysis, the use of software simulation. This will enable students to strengthen the "perceptual knowledge", eliminating the "sense of abstraction," increased interest in learning. The simulation teaching makes the classroom teaching more vivid and intuitive, making some basic theories and basic concepts in analog circuit course easier to understand. Through the virtual instrument to analyze the circuit measurement, the analysis results visually displayed to help students understand the concept and principle of abstraction.

**Help to Develop Students Ability to Start a Business**

The purpose of experimental teaching of analog circuit course is to train the students' abilities of theory connection with reality, to develop students' ability of analyzing, designing and producing electronic circuits, so as to create conditions for further training students' engineering practice ability and independent innovation so as to achieve the ultimate goal of teaching . The logic, rigor and creativity of thinking are the problems in the training and training of acquired sciences. The difficulties encountered by students in the process of learning are mostly due to the lack of practical experience of students with objective phenomena and the difficulty of achieving the necessary results due to too little perceptual knowledge Perception recognizes the leap of abstract understanding. Simulation experiments can train students' logic. Since the content of the simulation can be randomized simulation, so that students closer to the physical experience, more simple than the one-way teaching more realistic. On the one hand, it can deepen the understanding of theoretical knowledge and on the other hand lay a good foundation for students to carry out scientific and technological innovation activities. "The use of simulation software can guide students to participate in the 'Challenge Cup', electronic competitions, the National Undergraduate Smart Car Race and other scientific and technological activities to cultivate their interest in science and technology innovation." Students in the National College Students Challenge Cup and the National Undergraduate Electronic Design Competition designed in the circuit scheme, many designs need to pass the simulation test on the simulation software, and the simulation software is used to simulate and prove the feasibility of the scheme so as to finally design the optimal solution. Students through these competitions, improve their own electronic circuit design capabilities and practical experience, help to cultivate students' ability of innovation and entrepreneurship.

**Simulation Circuit Examples**

Classroom analog circuit work process, so that students can clearly understand the circuit working principle and working process, to achieve the theory and practice of the close combination of the abstract principles become lively and interesting mobilize the enthusiasm of students to learn and improve teaching effectiveness. Adapted to our school training high-quality, applied personnel training objectives, to ensure the advanced teaching content. The following class A and B power amplifier circuit and Class B power amplifier circuit, for example, to show the results of simulation.
The introduction of virtual simulation into the classroom, experimental demonstration, the output waveform, so that students can intuitively see the Class B power amplifier crossover distortion, in order to solve the Class B amplifier crossover distortion must be set to the power amplifier tube static operating point. Amplifier circuit to work in A and B state, using Class B power amplifier, the output waveform, it is clear you can see the crossover to eliminate distortion. This can improve the efficiency of classroom teaching, mainly from the past is the theory of teaching, too much emphasis on the principle analysis, formula derivation, students sound dull, difficult to understand. Now we introduce the virtual experiment function of simulation software into the classroom. While explaining the theory, we use the multimedia to synchronize the demonstration and display the experimental results, visualize and abstract some abstract concepts, make up the theoretical abstraction, It is easy to achieve the combination of theory and practice, improve teaching effectiveness.

Conclusion
The simulation software into the Analog Electronic Technology classroom teaching, teaching more visual, flexible, closer to the actual project. Can greatly enhance students' abilities to analyze and solve problems, help students to understand the principles of circuits, enhance students' ability of innovation and entrepreneurship, and greatly enhance their interest in electronic circuit learning.
References


