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Application of EDA Technology in Electronic Engineering Design

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Abstract: The rapid development of EDA technology makes it more and more widely used in modern electronic system design, including IC design, circuit board wiring, function verification and simulation, and testing.Electronic engineering design is the core course of cultivating electrical information majors, which helps cultivate students' engineering ability, practical ability, innovative consciousness, systematic thinking, etc. Through the application of EDA Technology in all links of course implementation, including design scheme selection, unit circuit design and system debugging, the correctness and reliability of circuit design are greatly improved, and the application ability of students' electronic design software is greatly exercised.

Keywords: Electronic engineering design; EDA technology; Temperature control system; Optimal design

1. Concept of EDA Technology

EDA technology takes computer as a tool to scientifically and effectively integrate database, computational mathematics, graph theory, graphics, topological logic and optimization theory to form a new technology for electronic system. It is the latest achievement of computer technology, signal processing technology and signal analysis technology. The emergence of EDA technology not only better ensures the simulation, debugging and error correction at all levels of electronic engineering design, and brings strong technical support for its development, but also occupies a more and more important position in various fields such as electronics, communication, chemical industry, aerospace, biology and so on, which greatly reduces the work intensity of relevant practitioners.

2. Application of EDA Technology in electronic engineering design teaching

EDA technology has been fully developed in the university classroom. It is a technology that can be studied by science and engineering students and achieve excellent results in theory and practice. Electronic engineering design is a professional basic course for computer science and technology, electrical engineering, automation, data science and big data technology. The core practical course is to cultivate students' basic engineering quality and ability.

The task of this course is to complete the whole process of design, production and debugging of a small electronic system, mainly including the use of electronic simulation software, welding process training, unit circuit design and debugging, circuit system debugging under software and hardware environment, troubleshooting and solving of circuit faults, etc. By designing and simulating the circuit, students can understand each module's circuit principle and working process and then realize it according to the given simulation circuit. Finally, the functions of each module are measured in the overall system to obtain the corresponding experimental data.

This course integrates comprehensiveness, design and innovation, integrates the knowledge accumulated by students in different learning stages and different courses, and cultivates their comprehensive practical ability in electronic engineering design.

The architecture of the complete temperature control system is shown in Figure 1.

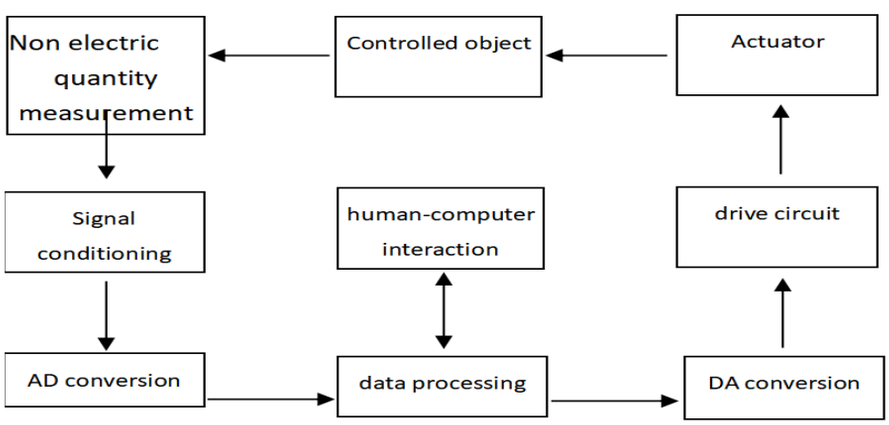

Figure 1 overall architecture of the system

3. Selection of design scheme

3.1 Comparison and selection of design schemes of regulated power supply

3.1.1 Linear voltage stabilizing circuit

The linear voltage stabilizing circuit uses transistors to adjust the voltage, and the transistors work in the amplification area.

The circuit has the characteristics of low power consumption, low ripple, good noise and low dynamic response. Integrated linear voltage stabilizing circuit adopts bandgap voltage reference circuit, which has good stability and low noise; There are many protection measures for overcurrent, short circuit and overheating; And it is easy to use without adjustment. Its specifications include the following series: Fixed positive pressure: 78xx, 78mxx, 78lxx fixed negative pressure: 79xx, 79mxx, 79lxx

3.1.2 Switching voltage stabilizing circuit

The regulator works in the on-off state and has the characteristics of low power consumption, low calorific value and high efficiency. However, due to the discontinuous input or output current, it has large ripple and noise, so it is not suitable for precision analog circuits; The energy storage element maintain the stability of the output voltage, and the dynamic response characteristics are poor. This type of voltage stabilizing circuit has complex circuit, many peripheral components and high requirements for components. There are four basic types of switching voltage stabilizing circuits: series type, parallel type, inductive energy storage type and buck type. All kinds of switching power supply circuits are derived from the above four basic circuits. The switching power supply circuit is complex and difficult to realize. The DC-DC converter is an integrated switching regulator designed based on the basic switching voltage stabilizing circuit. It has few peripheral components and is easy to realize. Low AC supply voltage and low output power. Scheme comparison and selection: according to the task requirements and design indicators, and comprehensively considering the reliability and implementation cost of the system, the implementation scheme of integrated linear voltage stabilizing circuit is decided.

3.2 Comparison and selection of transmitter design schemes

The main task of transmitter design is converting current to voltage and amplifying the voltage signal. Compared with the temperature measurement range of 0 ℃ - 100 ℃, the output current of AD592 has a linear relationship with temperature, strong anti-interference ability, accuracy meets the design requirements, fast response speed and easy realization of signal conditioning circuit. Determined as the preferred temperature sensor. The current output range of temperature sensor AD592 is 273 μA-373 μA. That is, at the 0 point of temperature measurement, the electric quantity signal output by the sensor is not 0. For the convenience of subsequent signal processing, the transmitter also needs to translate the voltage signal, so that the output voltage of the transmitter is also 0 for the 0 point of temperature measurement. In order to simplify the design circuit, the transmitter uses operational amplifier as the core operational element.

When using EDA software to simulate the circuit, carry out system simulation or structure simulation in the complete electronic design circuit to analyze and judge whether the electronic system is reasonable and scientific. Using EDA technology, the function transfer of each link in the electronic system can be realized. The transfer process is carried out by using the mathematical model in EDA software system. By using EDA technology for measurement, we can continue to evaluate the regional structure after the measurement, and judge whether the regional structure is reasonable and accurate. By analyzing the modeling of electronic design program, we can judge the scientificity and designability of design and the availability of various instructions related to electronic design. By using this technology, the overall level of electronic circuit design can be improved [1-2].

4. Effective analysis of circuit performance

EDA technology is an important part of analyzing effective circuit performance. In electronic engineering, data verification and circuit performance analysis are the basis of various theoretical analysis. However, when the traditionally electronic system design method is used for effective data evaluation and performance analysis, it is mechanically limited, which limits the accuracy of data measurement and functional circuit analysis. The emergence of these problems affects the design process of electronic products and affects the subsequent use of electronic products. However, the data measurement and analysis of regional feature efficiency can be successfully solved by using EDA technology. Using EDA technology can make the most complete and accurate electronic system design process. In addition, according to the technical characteristics of EDA, the limitations of traditional solutions can be effectively eliminated to achieve the overall quality of electronic products [3]. Examples are omitted.

5. Conclusion

The wide application of EDA Technology in electronic engineering design course has helped to achieve the teaching objectives of the course, and improved the high-level, innovative and challenging degree of the course. It is an important part of constructing high-quality undergraduate courses in Beijing. It also laid a solid foundation for the subsequent career development of students majoring in electrical information.

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