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The Application of Single Chip Microcomputer in the Teaching Reform of Undergraduate Sensors[1]

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Abstract: In engineering practice, the use of single-chip microcomputer and sensor is very common, and the courses related to single-chip microcomputer and sensor will also be set up in the electronic and electrical majors of undergraduate colleges. Single chip microcomputer and sensor are the key control system and data source in the whole electronic system. The application of single chip microcomputer in undergraduate sensor teaching reform is of great significance. Therefore, this paper starts with the current situation of undergraduate sensor teaching, analyzes the application of single-chip microcomputer in undergraduate sensor teaching reform, and puts forward the application path of single-chip microcomputer in undergraduate sensor teaching reform for reference.

Keywords: SCM; Undergraduate; Sensor Teaching; Reform; Application

Preface

The course of sensor technology introduces the measurement principle, measurement circuit and specific application of sensors commonly used in industry. The purpose of this course is to enable students to master the working principle of sensors and scientifically select and apply sensors. The traditional course teaching practice teaching generally uses CSY series sensor experimental system, and the teaching effect is not ideal. It is very important to integrate SCM into the course teaching practice.

1. Current teaching situation of undergraduate sensor course

The investigation shows that the current teaching materials of sensor course can not adapt to the new trend of engineering education. The existing sensor teaching content has too much theoretical knowledge and too little practical application content. It pays more attention to the internal working principle of the sensor and ignores the external characteristics and specific application methods. At the same time, the compilation structure of textbooks is generally classified according to the working principle of sensors, which has an impact on the improvement of undergraduate students' practical application ability. In addition, the current sensor experiment teaching also faces some problems, such as the problem of emphasizing theory and neglecting practice; There are many verification experiments, but few comprehensive and design experiments, which are not closely related to engineering practice; The experimental teaching method is single and has little attraction to students; The assessment is superficial, with weak pertinence, and the effect of practice is poor, which cannot guarantee the effect of classroom teaching.

2. The Application of SCM in the Teaching Reform of Undergraduate Sensors

2.1 Reconstruction of course content

Reconstruct the original sensor teaching content, break through the existing theoretical mode, and build the sensor application mode introduced into MCU. Many of the existing sensors have been modularized, which is different from the previous sensors to some extent. Now it is only necessary to understand how to use the application of the modular peripheral circuit, so that students can relieve the pressure of learning and make clear how to correctly use the relevant types of sensors.

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First, the integration of project mode. The integration of SCM into the teaching of sensor courses can effectively integrate the contents of SCM and sensor courses and promote the reform of electronic course system. The introduction of project-based teaching content can enrich the learning of sensor content, no longer be independent of other courses, but also achieve the integration and arrangement of electronic related courses.

Second, content arrangement. The relevant content can be arranged with the help of the relevant model of the SCM course and the project type content. When we talk about the content of temperature sensors, we will introduce various types of sensors, such as thermocouple sensors, which can be converted into projects and then divided into several tasks. The project is named as temperature detection. Different types of sensors can be arranged into several tasks. Relevant theoretical knowledge can be introduced in each task, especially how to control the integrated sensor by using a single chip computer. In this way, the attention of learning can be focused on using a single chip computer to control the sensor and master the relevant characteristics of the sensor. For example, for the study of thermistor sensor, the shape of relevant modules can be presented first, then the principle of the module can be briefly described, and tasks can be arranged. The thermistor sensor can be controlled by a single chip computer, so that students can have a more comprehensive understanding of the external characteristics of the thermistor sensor.

2.2 Reform of teaching methods

In the reform of teaching methods, we should do a good job of conceptual design, comprehensive project guidance, and task driven teaching ideas, integrate engineering cases into the whole teaching process, and attach importance to teaching guidance for students. In the teaching of sensor courses, many teaching methods such as case teaching method and on-site teaching method can be introduced.

First, case teaching method. In terms of sensor principle and structure, you can use question guidance or heuristics to attract students' attention and inspire them to think and explore knowledge. After the principle is explained, the case teaching method can be used to integrate the sensor detection examples based on this, and the principle and structural characteristics can be further explored in the examples to achieve the unity of theory and practice. These cases are visible in life, which can mobilize students' enthusiasm for learning, and also help students understand the relevant principles and improve their learning ability. This paper introduces the application of single chip microcomputer in the strain sensor which is often used in electronic scales. The electronic scale is often seen in life. The strain sensor used in the electronic scale is a parallel double hole beam. There are four strain gauges stuck up and down the double holes through the strain adhesive. The strain sensor comprises a resistance strain gauge and a double control cantilever beam; The minimum system of single chip microcomputer includes crystal oscillator and reset circuit; The data acquisition module includes a weighing sensor, which mainly controls the display of weight, price and other information. Through C language programming, the functions of each software part can be realized. This example is the application of single chip microcomputer in the sensor. The strain gauge is a sensing element, which transforms the strain into a relative change of resistance. The resistance strain sensor mainly detects the force signal, amplifies it through the voltage amplification circuit, and then has the analog-to-digital conversion equipment to realize the digital signal conversion, and finally transmits the signal to the microcontroller. Figure 1 shows the hardware structure of the electronic scale.

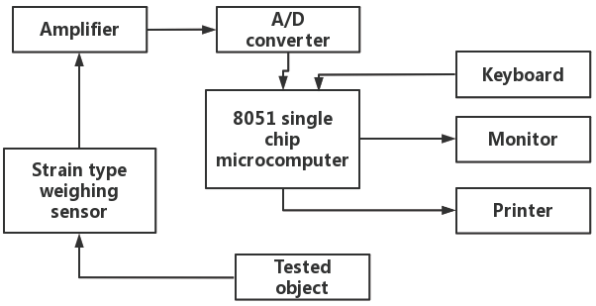

Fig. 1 Hardware Structure of Electronic Scale

Second, on-site teaching method and discussion method. In teaching practice, these two teaching methods are used to move the classroom to the laboratory to realize the synchronous implementation of theoretical and practical teaching. For example, when the teacher talks about the principle of resistance strain gauge, students can observe the sensor in the experimental operation process at the same time, which is more intuitive and can strengthen students' understanding of the sensor. A discussion area can also be set up in the laboratory, where students can discuss the questions raised by teachers in groups. At the same

time, students can also observe and be familiar with the application of sensors, verify their principles, and then design training projects based on single-chip microcomputer to improve students' practical operation ability.

Third, task driven approach. Use the task driven method to arrange the course design tasks for students at the end of each lesson. The sensors required for each task are corresponding to the content of this section. The design scheme should also be set closely around the course content. For example, the measurement results can be analog or digital, and the measurement accuracy and range shall be designed according to specific conditions.

3. Conclusion

The application of SCM in the undergraduate sensor teaching reform is not achieved overnight, which covers all aspects. In the practical reform, students need to be guided by integrating SCM and traditional experimental equipment sensor courses, in stages and steps, to help students grasp relevant theoretical knowledge and be able to effectively apply it in practice. At the same time, we should reconstruct the course content, optimize the teaching means, and update the evaluation system in order to play the role of single-chip microcomputer in the sensor teaching reform.

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