

## **The Application of Virtual Simulation Software Platform in the Course Teaching of Automation Technology and Application**

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*Abstract: This paper discusses the ways of using software teaching platform in the course of automation technology and application. To set up the relevant curriculum task module, to enhance students' learning enthusiasm, in the completion of the task module to cultivate and analyze problems, to solve the problem of the ability.*

*Keywords: Teaching Module, Software Platform, teaching method*

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### **1. INTRODUCTION**

Automation technology and application is a general education course, intended to broaden the eye shot of students, increase the ability to understand and apply the automation technology. This paper discusses the use of auxiliary software platform to complete the task of teaching unit, to deepen students' understanding of the subject, the subject of enhancing students' interest, cultivate students' ability to analyze and solve problems.

### **2. SOFTWARE PLATFORM TEACHING TASK MODULE SETTING**

When designing the software platform, the students' level should be fully considered: Students understand the level of software platform is different; to achieve the task complexity is also different. Therefore, need to set up task difficulty task module ladder arrangement for for different levels of students. The students can generally be divided into three types: (1) The students who don't know the software platform platform. (2) The students who understand the software platform, to be able to do the basic experiment. (3) The students who have studied the software platform systematically .And teacher can easily know the students' level distribution by communicate with students through interaction and in break time in the first few classes. Software platform to build a control system based on Matlab platform, for example, the physical system using Disk drive head control system.



Fig1. Disk drive head control system

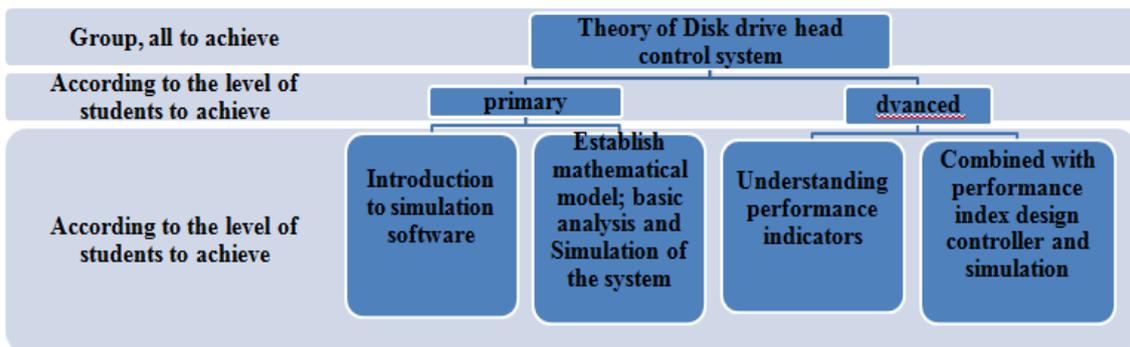


Fig2. Teaching task module of Disk drive head control system

Figure 2 is the teaching task module based on the physical platform. In the beginning of the new curriculum, teachers can investigate the extent of the students to understand the physical platform, Combined with students' willingness and understanding degree, grouping reasonably. For different levels of students, take different progress and content of the teaching activities.

### 2.1 Basic knowledge of software platform

First introduce the basic knowledge of Matlab software application. Through this part of the study, students can understand the basic characteristics of the MATLAB software and

application areas. Let students familiar with the MATLAB language programming and Simulink simulation environment.

### 2.2 "Primary" teaching task module

In this module, the teacher guides the students to analyze the working principle of the actual physical system, how to determine the input quantity, the output quantity, the controlled object, the controlled quantity, the measuring element, the explicit control relations, drawing system diagram. According to the disk drive system to establish the control objectives, control variables, variables of the initial design index.

Drawing the block diagram of closed loop control system. According to a certain control index design and control system, the establishment of the object, the forward path of the mechanism, sensor mathematical model. To investigate the orward path amplifier gain variation of system step response and steady-state error. Adjust the mission target, adjust the amplifier gain, get the fast step response; Restricted overshoot and natural oscillation of response, reduce the influence of magnetic head positioning. And using MATLAB software to achieve simulation. Fig.3 shows the control system for disk drive head reader. Fig.4 shows the disk drive head control system with the typical parameters. And Fig.5 shows the simulation results of disk drive head control system when  $K_a$  changes.

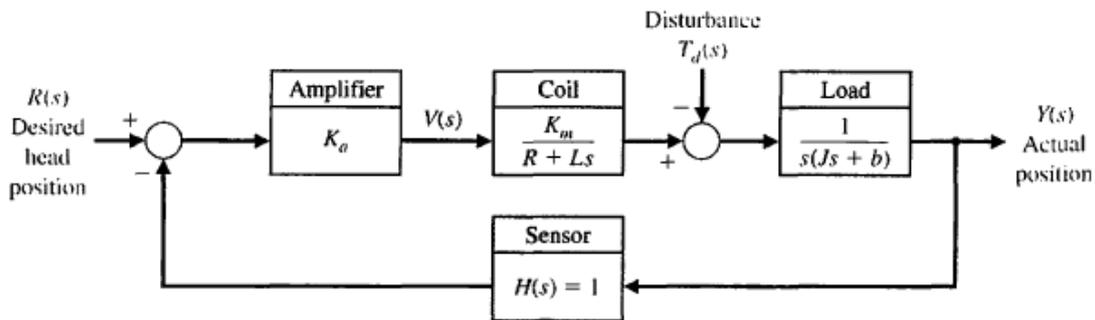


Fig.3 Control system for disk drive head reader

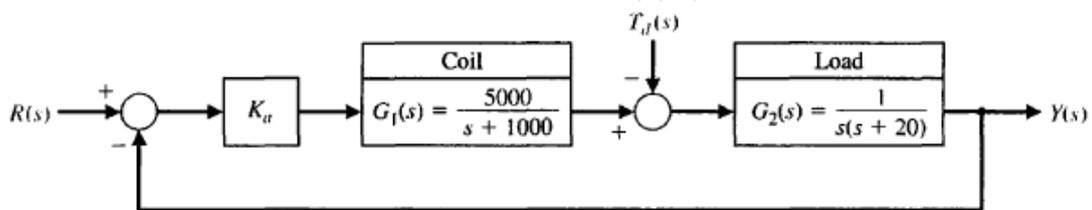


Fig.4 Disk drive head control system with the typical parameters

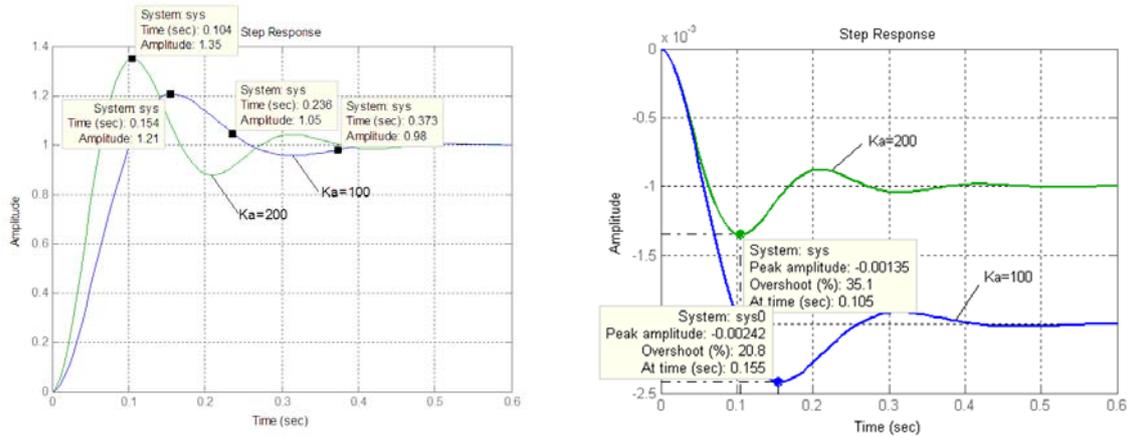


Fig.5 Simulation results of disk drive head control system when Ka changes

### 2.3 "Advanced" teaching task module

This teaching task module is specially designed for better students, On the basis of fully understanding (2), some students can enter the module of learning. This module is mainly to allow students to experience how to design the controller for the actual automatic control system.

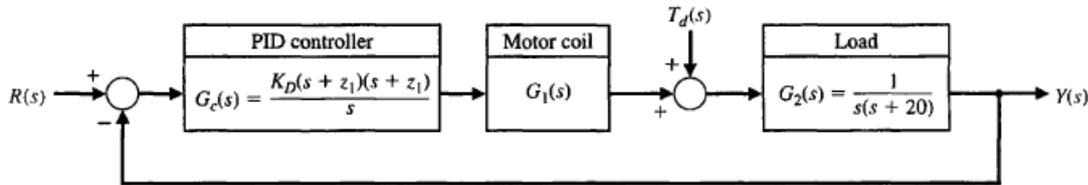


Fig6. Disk drive feedback system with a PID controller

### 3. THE STUDENT PERFORMANCE EVALUATION MODEL BASED ON SOFTWARE SIMULATION PLATFORM

The application of this part of the teaching content can be used as an important part of the course score evaluation of automation technology and application. According to the original student foundation is different, the study of different types of students to study and complete the situation, reasonable to give this part of the results. When set in the teaching module have been fully taken into account the different types of students the demand for knowledge, and each module can give students sufficient space for development, and thus eventually to more scientific and reasonable evaluation results. Specific rating scale reference standard as shown in Fig 7.

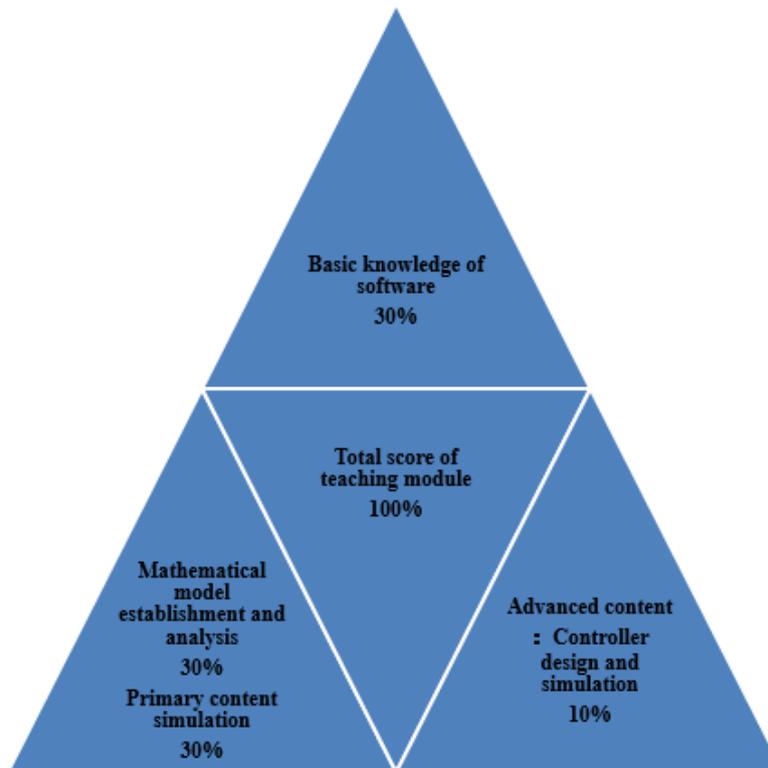


Fig.7 Reference standard of rating scale

#### 4. CONCLUSION

In this paper, we take the disk drive system as an example, set up the teaching module that the students can do the simulation in the course of automation technology. Through the content of the study, students can learn the basic application of simulation software, programming, simulation and other content. In addition, the basis of the better students can study the control system design and simulation, parameter adjustment, and other more complex content. The combination of theory and practice teaching mode can improve the students' learning interest and enhance the teaching effect.

#### REFERENCES

- [1] Wu Yunzhu. The Exploration of Compound Talent Training Pattern in local universities. Education and occupation. 2009
- [2] Roscoe, Rod D., Chi, Michelene T. H. Understanding tutor learning: Knowledge- building and knowledge- telling in peer tutors' explanations and questions [J]. Review of Educational Research.
- [3] Richard C DORF, Robert.H.BISHOP.. Modern Control System. Upper Saddle River, N.J. : Prentice Hall International, 2010
- [4] Haimei, Tian, Yan Zhang. Teaching mode of computer special courses based on driving by

- task [J]; Experimental Technology and Management; 2011-05
- [5] LIU Kun, LI Ai-ju, DU Li-juan (College of Oriental Application & Technology, Beijing Union University, Beijing 102200, China); The Application of Task-based Teaching Method in a Course [J]; Journal of Beijing Union University (Natural Sciences); 2010-03