Application Study of Task Driven Teaching Method in the Teaching of Automatic Control Theory

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Abstract

Automatic Control Theory is a compulsory course for students of automation specialty. The theoretical knowledge of this course is the basis of supporting the knowledge structure of other courses of automation specialty. In this paper, we discuss the application of the task driven approach to the teaching of Automatic Control Theory. In order to help students to build up the concept of system engineering, improve students' ability of applying control theory to design practical control system.

Keywords

Task drinven teaching method; Automation major courses; Automatic Control Theory.

1. Introduction

Task driving teaching thought can be traced back to the Chinese education originator Kong Fuzi in 2000 years ago, the idea of "learn in order to practise"; Its embryonic form is in the last century 50, 60 time in West Germany in the prevalence of "case teaching" model. "Task driven" is a kind of teaching method based on the theory of Constructivism teaching. Usually refers to in the process of study information technology, the students in the teacher's help, closely around a common task activity center, in the strong problem motivation, through the active application of learning resources, to explore and learn with interaction, to complete the task at the same time, guide students to produce a learning practice.

The theory of automatic control studies the integration, analysis and design of control systems. It reveals the general rules of automatic control. Automatic Control Theory is the one of the most important courses for automation specialty.

How to enhance the practicality of this course,stimulate students interest in learning,improve the ability to analyze and solve problems, these are the keys to the course. From this point of view,it is very suitable to use the Task Driven Teaching Mode in the teaching of automatic control theory course

2. Example of Task Driven Teaching Mode for Automatic Control Theory

Fig.1 shows the knowledge structure of Automatic Control Theory. We put the speed of the DC motor drive, disk drive read system, as the task of the scene into the theory of automatic control theory. To try to cover the main contents of the principle of automatic control. This method can also be completed in the course of the total review to allow students to practice. Stimulate students' interest in learning this course with practical examples,enhance the effect of theoretical teaching. Due to limited space, here only take DC motor drive as task situation to explain the application of task driven teaching method in the course teaching of   Automatic Control Theory.

2.1 General Concept of Automation

This part is of the basic knowledge of the teaching materials, we will usually be introduced to the students：basic control method, basic composition of control systems, classification of control systems, requirements on control systems, the content of the course；The characteristics and principle of negative-feedback control system ；Plotting the block diagram using the working principle diagram of system.

It can be combined with the specific task to deepen the understanding of the basic concepts of students. For example, we introduce the DC motor speed control of the task;let students use the theory knowledge analysis the working principle themselves;points out that the controlled object,control device etc and drawing system block diagram.
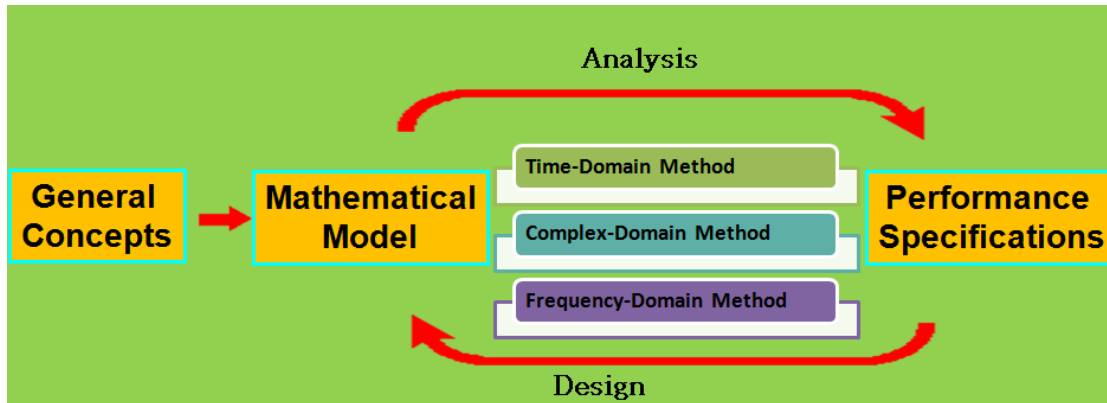
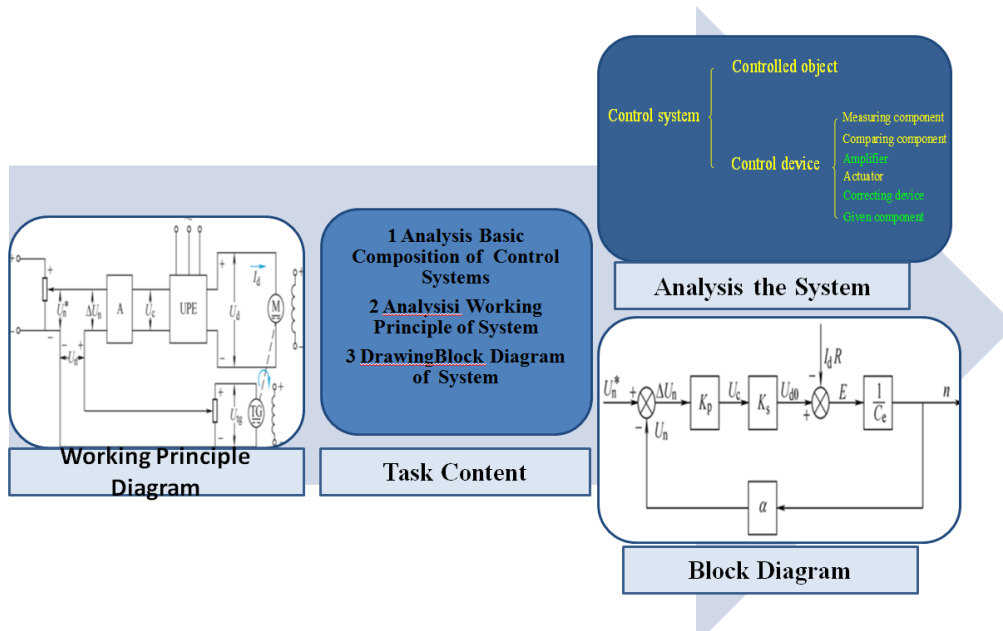

Fig.1 Knowledge Structure of Automatic Control Theory [1]

Fig.2 DC Motor speed regulation system task

2.2 Determination of DC Motor Speed Control System Mathematical Model

The whole process of the mathematical model of the DC speed regulating system is used as one task situation to make the students finish the task independently. The whole process of the mathematical model of the DC speed regulating system is used as a task situation to make the students finish the task independently. The whole task of the implementation of the process as shown in Fig. 3.

2.3 Stability Analysis and Correction of DC Motor Drive System

Setting specific parameters, let the students analysis of the stability of DC motor speed control system after study the stability of the relevant content themselves. Use MATLAB software to verify., after the theoretical derivation. Figure 4 shows the analysis process of DC motor speed control system with proportional control. Firstly, analysis the stability (using the Routh criterion);error clculation (including the steady state error and perturbation error under the given input),crrection process(PI regulator);fnally, the simulation verification process is given under the Simulink environment.
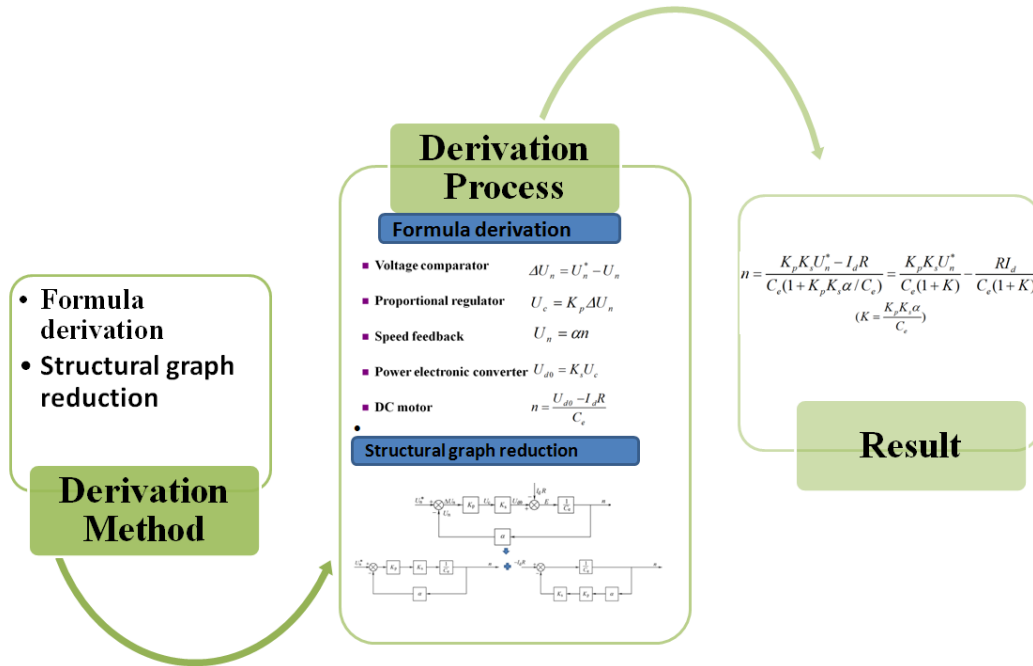
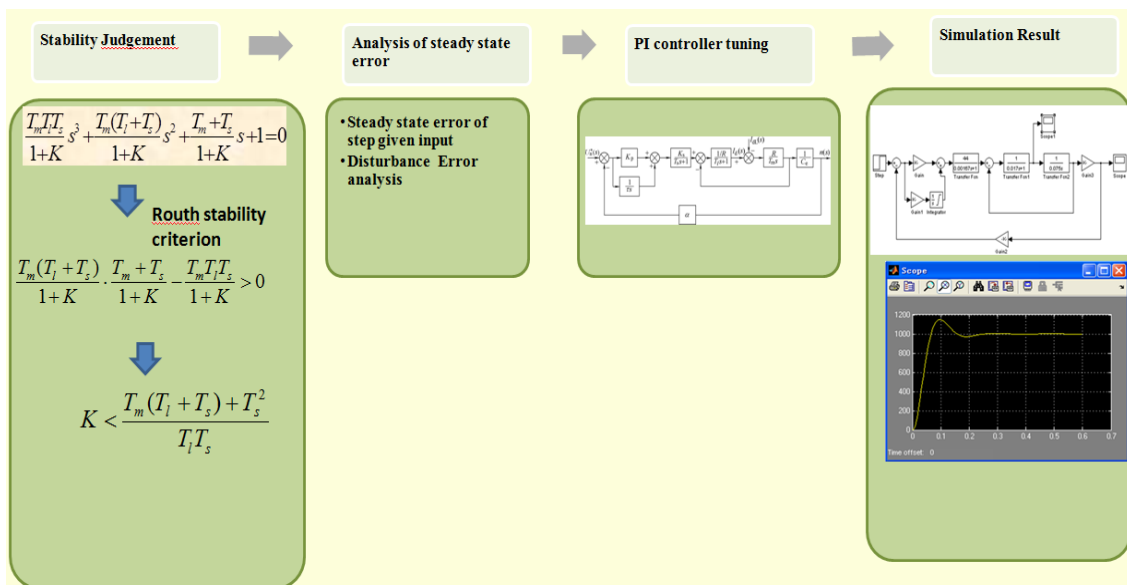Fig.3 Mathematical model of "DC motor speed regulation system"

Fig.3 Stability Analysis and Correction of DC Motor Drive System

3.　Conclutions

Task-driven, need to complete a number of tasks associated with the discipline to learn and develop skills. Task teaching method is very suitable for the specialized course teaching process of Automatic Control Theory. Task based teaching method is beneficial to the students to learn the Automatic Control Theory knowledge system. Facts have proved that the task driven teaching method can get better teaching effect.

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