

Article

Adaptive Internal Model Control Based on Parameter Adaptation

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Abstract: In actual industrial control, many objects have the characteristics of large lag and time-varying parameters, which makes it difficult for traditional PID control to obtain satisfactory control effects. Therefore, engineers need a control algorithm with a better control effect and a simple structure, and thus the internal model control is introduced into industrial process control. Internal model control has received a lot of attention in the control field because of its excellent control effect, and in ideal conditions, it can perfectly suppress external disturbances, and the output strictly tracks the input. On the basis of the internal model control, a two-degrees-of-freedom internal model control was developed. Compared with the conventional feedback control, the internal model control structure mainly embeds an internal model consistent with the control object in the control object, so the deviation between the internal model and the control object determines the quality of the control effect. In this paper, the internal model is changed to an adjustable parameter model, and the model parameters are adjusted in real time using the parameter adaptive algorithm, so that the model output error is as small as possible, or even zero. In order to solve the influence of interference on the system, compensation based on MRAC theory is used. In order to verify the feasibility of the algorithm, it was applied to the landing process control of fixed-wing Unmanned aerial vehicle (UAV) and achieved satisfactory results.

Keywords: internal model control; parameter adaptation; adaptation control; Unmanned aerial vehicle

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1. Introduction

Due to the needs of various technical fields, automation technology has gradually developed. At the beginning, people imitated human operation process, put forward the automatic control system based on the feedback principle, and developed the classic proportional integral derivative (PID) control algorithm. The PID control algorithm has low requirements for the model, and online adjustment is also convenient, so it is favored by engineers. According to the estimation of experts, eighty percent of the control system still uses the PID algorithm. However, for some systems with large inertia and delay, using PID control cannot achieve good control results. In addition, there are also some complex systems (such as nonlinear, time-varying systems, large time-delay systems, and non-minimum phase systems). The effect of PID control is often poor and it is difficult to meet

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Table of Contents Adaptive Internal Model Control

1. Understanding the eBook Adaptive Internal Model Control
 - The Rise of Digital Reading Adaptive Internal Model Control
 - Advantages of eBooks Over Traditional Books
2. Identifying Adaptive Internal Model Control
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Adaptive Internal Model Control
 - User-Friendly Interface
4. Exploring eBook Recommendations from Adaptive Internal Model Control
 - Personalized Recommendations
 - Adaptive Internal Model Control User Reviews and Ratings
 - Adaptive Internal Model Control and Bestseller Lists
5. Accessing Adaptive Internal Model Control Free and Paid eBooks

- Adaptive Internal Model Control Public Domain eBooks
 - Adaptive Internal Model Control eBook Subscription Services
 - Adaptive Internal Model Control Budget-Friendly Options
6. Navigating Adaptive Internal Model Control eBook Formats
 - ePub, PDF, MOBI, and More
 - Adaptive Internal Model Control Compatibility with Devices
 - Adaptive Internal Model Control Enhanced eBook Features
 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Adaptive Internal Model Control
 - Highlighting and Note-Taking Adaptive Internal Model Control
 - Interactive Elements Adaptive Internal Model Control
 8. Staying Engaged with Adaptive Internal Model Control
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Adaptive Internal Model Control
 9. Balancing eBooks and Physical Books Adaptive Internal Model Control
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Adaptive Internal Model Control
 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
 11. Cultivating a Reading Routine Adaptive Internal Model Control
 - Setting Reading Goals Adaptive Internal Model Control
 - Carving Out Dedicated Reading Time
 12. Sourcing Reliable Information of Adaptive Internal Model Control
 - Fact-Checking eBook Content of Adaptive Internal Model Control
 - Distinguishing Credible Sources
 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development

- Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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