

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

Adaptive Internal Model Control

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Adaptive Internal Model Control:

Adaptive Internal Model Control Aniruddha Datta,2012-12-06 Adaptive Internal Model Control is a methodology for the design and analysis of adaptive internal model control schemes with provable guarantees of stability and robustness Written in a self contained tutorial fashion this research monograph successfully brings the latest theoretical advances in the design of robust adaptive systems to the realm of industrial applications It provides a theoretical basis for analytically justifying some of the reported industrial successes of existing adaptive internal model control schemes and enables the reader to synthesise adaptive versions of their own favourite robust internal model control scheme by combining it with a robust adaptive law The net result is that earlier empirical IMC designs can now be systematically robustified or replaced altogether by new designs with assured guarantees of stability and robustness

Handbook of Nanophysics Klaus D. Sattler,2010-09-17 Providing the framework for breakthroughs in nanotechnology this landmark publication is the first comprehensive reference to cover both fundamental and applied physics at the nanoscale After discussing the theoretical principles and measurements of nanoscale systems the organization of the set follows the historical development of nanoscience Each peer reviewed chapter presents a didactic treatment of the physics underlying the nanoscale materials applications and detailed experimental results State of the art scientific content is enriched with fundamental equations and illustrations many in color

Adaptive Internal Model Control with Disturbance Prediction Thomas R. Sim,1990
Advances in Neural Networks - ISNN 2007 Derong Liu,Shumin Fei,Zeng-Guang Hou,Huaguang Zhang,Changyin Sun,2007-07-16 This book is part of a three volume set that constitutes the refereed proceedings of the 4th International Symposium on Neural Networks ISNN 2007 held in Nanjing China in June 2007 Coverage includes neural networks for control applications robotics data mining and feature extraction chaos and synchronization support vector machines fault diagnosis detection image video processing and applications of neural networks

Adaptive Systems in Control and Signal Processing 1989 M.A. Johnson,1990-06-08 The Symposium covered three major areas adaptive control identification and signal processing In all three new developments were discussed covering both theoretical and applications research Within the subject area of adaptive control the discussion centred around the challenges of robust control design to unmodelled dynamics robust parameter estimation and enhanced performance from the estimator while the papers on identification took the theme of it being a bridge between adaptive control and signal processing The final area looked at two aspects of signal processing recursive estimation and adaptive filters

Computer And Network Technology - Proceedings Of The International Conference On Iccnt 2009 Venkatesh Mahadevan,Jianhong Zhou,2009-07-16 ICCNT is the main annual computer and network research conference in Chennai that presents cutting edge research work It will act as a platform for scientists scholars engineers and students from universities all around the world to present ongoing research and hence foster better research relations between universities and the computer and networking industry

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Innovations in Science, Engineering and Technology Swapan Bhattacharyya, Sabyasachi Sen, Meghamala Dutta, Papun Biswas, Himadri Chattopadhyay, 2017-07-20 The book is a collection of peer reviewed scientific papers submitted by active researchers in the International Conference on Industry Interactive Innovation in Science Engineering and Technology I3SET 2016 The conference is a collective initiative of all departments and disciplines of JIS College of Engineering an autonomous institution Kalyani West Bengal India The primary objective of the conference is to strengthen interdisciplinary research and encourage innovation in a demand driven way as desired by the industry for escalating technology for mankind A galaxy of academicians professionals scientists industry people and researchers from different parts of the country and abroad shared and contributed their knowledge The major areas of I3SET 2016 include nonconventional energy and advanced power systems nanotechnology and applications pattern recognition and machine intelligence digital signal and image processing modern instrumentation control robotics and automation civil engineering and structural design real time and embedded systems communication and devices advanced optimization techniques biotechnology biomedical instrumentation and bioinformatics and outcome based education

Mechanical Properties and Structural Materials Y.M. Song, 2012-10-08 Selected peer reviewed papers from the 2012 International Mechanical Properties and Structural Materials Conference IMPSMC 2012 August 17 19 2012 Shenyang Liaoning China

Adaptive Systems in Control and Signal Processing 1995 Csilla Bányász, 1995 Paperback Leading academic and industrial researchers working with adaptive systems and signal processing have been given the opportunity to exchange ideas concepts and solutions at the IFAC Symposia on Adaptive Systems in Control and Signal Processing This postprint volume contains all those papers which were presented at the 5th IFAC Symposium in Budapest in 1995 The technical program was composed of a number of invited and contributed sessions and a special case study session providing a good balance between applications and theory oriented papers

Applied Energy and Power Engineering IV Dan Hong Cheng, Qun Jie Xu, Wei Feng Yao, 2014-12-11 Selected peer reviewed papers from the 4th International Conference on Energy Environment and Sustainable Development EESD 2014 October 25 26 2014 Nanjing China

Adaptive Output Regulation Brian Whitehead, 2009 In this work Model Reference Adaptive Control MRAC and Adaptive Internal Model AIMC techniques are used to address problems of output regulation for uncertain nonlinear systems Under appropriate hypotheses MRAC methods compensate for parametric uncertainties and force the dynamic response of the controlled system to match that of a specified reference model AIMC provides a means to robustly asymptotically achieve prescribed trajectories and or reject disturbances generated by an exosystem even when the exosystem s frequencies of oscillation are not known a priori Combining these two approaches provides useful control architectures two such architectures are explored in this work Additionally some of the described techniques are applied to a quadrotor helicopter and demonstrated in both simulation and laboratory flight

Control Theory and Advanced Technology, 1994

Proceedings of the 1987 American Control Conference, 1987

1995 IEEE International Conference on

Neural Networks ,1995 Proceedings of the ... American Control Conference ,2005 Adaptive Internal Model Control for Multiple-input Multiple-output Systems Lifford Lee Lancaster McLauchlan,2000 **Active Noise and Vibration Control** Waldemar Rączka,Marek Sibiela,2016-03-21 Selected peer reviewed papers from the 12th Conference on Active Noise and Vibration Control Methods MARDiH 2015 June 8 11 2015 Krak w Poland **SIAM Journal on Control and Optimization** Society for Industrial and Applied Mathematics,2007 New Technologies for Computer Control 2001 (NTCC 2001) H. B. Verbruggen,C. W. Chan,2002 Topics covered include parallel and distributed computing software architecture and hardware for distributed computer control real time operating systems real time communication architectures *Proceedings of the 1985 American Control Conference* ,1985

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nonviolent crisis intervention training crisis prevention institute - May 28 2023

nonviolent crisis intervention nci provides your staff with the skills to safely recognize and respond to everyday crisis situations that may involve more challenging behaviors nci training is designed to help you achieve compliance

nonviolent crisis intervention training and the incidence of violent - Sep 19 2022

nonviolent crisis intervention nci training was initiated to reduce the incidence of violence in an acute care hospital ed with

more than 75 000 annual visitors training intended to build skills to defuse potentially violent situations and significantly decrease incidents in the ed requiring emergency security team involvement manifested as

nonviolent crisis intervention training program - Apr 14 2022

nonviolent crisis intervention training program program focusing on the safe management of disruptive and assaultive behavior since 1980 6 million trained standardized to apply to care welfare safety and securitysm of staff in numerous types of work settings principals and techniques have been proven effective in

nonviolent crisis intervention training 3rd edition - Aug 31 2023

the nonviolent crisis intervention 3rd edition course provides staff with an effective framework for preventing de escalating and safely responding to crisis behavior the program introduces how to apply knowledge of brain and behavior to understand distress behavior and the reasons for distress

free nonviolent crisis intervention training manual examples - Apr 26 2023

we ve compiled the best nonviolent crisis intervention training manual examples on the web and turned them into free microlearning courses that you can deploy to your teams with just a press of a button