

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

Aniruddha Datta



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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 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 [Advances in Neural Networks - ISSN 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 ISSN 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 [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 [Industry Interactive 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 *Adaptive Internal Model Control with Disturbance Prediction* Thomas R. Sim, 1990 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 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 **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 Control Theory and Advanced Technology, 1994 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 Proceedings of the 1987 American Control Conference, 1987 SIAM Journal on Control and Optimization Society for Industrial and Applied Mathematics, 2007 **Proceedings of the ... American Control Conference**, 2005 **IJCNN '93 - Nagoya**, 1993 *1995 IEEE International Conference on Neural Networks*, 1995 Dissertation Abstracts International, 2007 *Estimation and Control of Molecular Weight Distributions in Polymethyl Methacrylate Polymerizations* Víctor A. González S., 1987 Automatic Control World Congress, 1987 International Federation of Automatic Control. World Congress, Rolf Isermann, 1988 Contains 60 research and survey papers on power systems analysis modelling simulation control optimization

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