

## 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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