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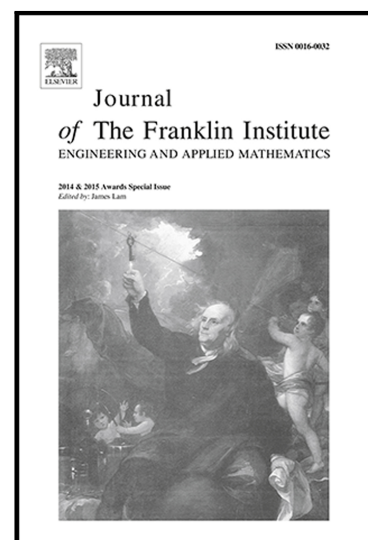
PII: S0016-0032(18)30424-1  
DOI: [10.1016/j.jfranklin.2018.05.063](https://doi.org/10.1016/j.jfranklin.2018.05.063)  
Reference: FI 3516

To appear in: *Journal of the Franklin Institute*

Received date: 21 June 2016  
Revised date: 19 March 2018  
Accepted date: 27 May 2018

Please cite this article as: Shao-Hua Yang, Zong-Yao Sun, Zhuo Wang, Ting Li, A New Approach to Global Stabilization of High-Order Time-Delay Uncertain Nonlinear Systems via Time-Varying Feedback And Homogeneous Domination, *Journal of the Franklin Institute* (2018), doi: [10.1016/j.jfranklin.2018.05.063](https://doi.org/10.1016/j.jfranklin.2018.05.063)

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# A New Approach to Global Stabilization of High-Order Time-Delay Uncertain Nonlinear Systems via Time-Varying Feedback And Homogeneous Domination<sup>†</sup>

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**Abstract** This paper addresses the state-feedback stabilization problem for a class of high-order uncertain nonlinear systems with multiple time-delays. The distinguished feature of the systems to be investigated is the serious coexistence between unknown time-varying parameters and unknown multiple time-delays. Time-varying method combined with adaptive technique is used to capture the possible unknowns and delayed states. The new control strategy is presented based on homogeneous domination idea and the choice of a Lyapunov-Krasovskii functional. Finally, the developed scheme is used to stabilize mass-spring mechanical system with unknown time-delays.

**Key words** High-order uncertain nonlinear system; multiple time-delays; time-varying method; homogeneous domination; mass-spring mechanical system.

## 1 INTRODUCTION

Control design for a class of high-order nonlinear systems has attracted considerable attentions in recent fifteen years, in view of the more general structure and some potential applications in practice. However, it has been recognized as an intricate challenge due to the infeasibility of existing method, such as feedback linearization [1] and backstepping [2]. Delightedly, combining constructive design with stability theorem perfectly, adding a power integrator method promoted the successful solutions to

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<sup>†</sup>Supported by National Natural Science Foundation of China (61773237,61374004,61203013), China Postdoctoral Science Foundation Funded Project under grant 2017M610414, Shandong Province Quality Core Curriculum of Postgraduate Education (SDYKC17079), Zhejiang Provincial Natural Science Foundation under grant LY16E050003.

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