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Adaptive Regulation with Almost Disturbance Decoupling for Power Integrator Triangular Systems with Nonlinear Parametrization

Y. M. Fu*, M. Z. Hou, J. Hu and L. Niu

Center for Control Theory and Guidance Technology, Harbin Institute of Technology, Harbin 150001, P. R. China

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Abstract: The problem of almost disturbance decoupling for a class of nonlinear systems is considered. The controlled systems consist of a chain of power integrators perturbed by a lower-triangular vector field with nonlinear parametrization. By using the tool of adding a power integrator combined with the parameter separation technique, under a set of growth conditions a smooth adaptive controller is explicitly constructed to attenuate the influence of the disturbance on the output with an arbitrary degree of accuracy. The designed adaptive controller is in its minimum-order property, since the order of the dynamic compensator is equal to one. An illustrative example is given to verify the effectiveness of the proposed approach.

Keywords: *almost disturbance decoupling; smooth adaptive controller; adding a power integrator; nonlinear parametrization; parameter separation.*

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1 Introduction

One of the main objectives in control theory is to suppress unknown disturbances. It will be ideal if the influence of disturbances on the output can be eliminated completely, or in other words, the disturbances are decoupled from the output. Unfortunately, in most practical situations it is impossible to achieve the exact disturbance decoupling. In this case, it is reasonable to aim at almost disturbance decoupling (ADD), which means that the influence of the disturbance on the output is attenuated to an arbitrary degree of accuracy via feedback control design. More precisely, the problem of ADD can be stated

* Corresponding author: mailto:fuyanming@hit.edu.cn

