Asymptotic Stability of Some Class of Affine Nonlinear Control Systems through Partial Feedback Linearization

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Abstract: The problem of asymptotic stability for some class of nonlinear control systems, where the relative degree of the system is well defined, with relative degree being 1 and $n-1$, n is the dimension of the system, is addressed in this paper. To solve the problem, we will design an input control. For the design of input controls, the system will be transformed through partial feedback linearization such that the zero dynamic of the system with respect to a new state is asymptotically stable and the new state is a linear combination of state variables.

Keywords: *relative degree of system; partial feedback linearization; zero dynamic; asymptotic stability.*

Mathematics Subject Classification (2010): 93C10, 93D20.

1 Introduction

In the analysis for nonlinear control systems, there is no general method which can be applied to any nonlinear control system in designing the control input for solving the stability problems. Therefore, in general, the researchers describe some particular nonlinear classes only. Recently, stability problems for nonlinear control systems have been intensively investigated. J. Naiborhu and K. Shimizu [1] proposed a dynamic feedback control for the asymptotic stability of a nonlinear class, where its unforced dynamic is asymptotically stable. In 2004, P. Chen et al. [2] and L. Diao et al. [3] introduced the problem of stability through system transformation, where the transformation of the system is made through dynamic feedback. One of popular methods for solving stability

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