

Design Sliding Control for Non-Affine Nonlinear Systems

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In this paper we present result of sliding control for non-affine nonlinear systems. Because nonlinear systems have complex behaviors, their analysis is very difficult and there is no general method for designing nonlinear controllers.

Global linearization control (GLC) is Conventional approach for nonlinear system can not be used for all nonlinear systems such as non-minimum phase system and it is not robust in the presence of parameter uncertainty or unmodeled dynamics. By defining an area of certain surface, many researchers succeed in using this sliding mode method for linear and non-linear systems. Sliding control is robust method. In this paper we used sliding control for two constant volume reactors with exothermic reaction that is non-affine non linear system. The results of sliding control produce a better response of closed loop system than the GLC and PID controllers.

Key words: sliding control, nonlinear system, non- affine systems.

1. Introduction

Many common process control problems exhibit nonlinear behavior, in that the relation between the controlled and manipulated variables depends on the operating conditions. If the process is only mildly nonlinear or remain in the vicinity of a nominal steady state, then the effects of the nonlinearities may not be severe. In these situations conventional feedback control strategies can provide adequate performance. But many important industrial process including high purity distillation columns, highly exothermic chemical reactions, PH neutralizations, and batch systems can exhibit highly nonlinear behavior [1, 2].

There is not a general method that can be used in analyzing and synthesizing nonlinear control system, because nonlinear differentials system is basically difficult to

solve. Only a few and simple nonlinear differential equation can be exactly solved. Other hand, powerful mathematical tools like Laplace and Fourier transform do not apply to nonlinear systems. Thus, there are no systematic tools for predicting the behavior of non-linear systems, nor are there systematic procedures for designing nonlinear control system. Many methods of nonlinear control system analysis have been proposed. These methods depend on the nonlinearity and order of the analysis system. The describing function is an approximated linearization approach can be used in Quasi-linear system with any order. Phase plant analysis is a graphical method of studying second- order nonlinear system [1].

Lyapunov method is used in analyzing nonlinear system with high degree of