

Solada Naksiri 2009: Differential Geometric Controller Design with Stability Constraint for Uncertain Chemical Processes. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Mr. Chanin Panjapornpon, Ph.D. 156 pages.

The control of chemical and biological processes frequently encounters the problem of robustness achievement caused by inaccuracy of kinetic models and unmeasured disturbances. The traditional linear controller such as PI/PID does not perform satisfactorily in the presences of severe uncertainties resulted in the degradation of the controller performance. To overcome such problem, this work presented a control technique for uncertain chemical processes by using input/output (I/O) linearization integrating with Lyapunov stability constraint. The I/O linearization is enhanced the setpoint tracking while Lyapunov stability constraint is ensured asymptotic closed-loop stability. The unmeasured uncertainty estimated through the optimizer and then feed back to the compensator to eliminate the output offset. The domain of stability is investigated with bifurcation analysis to determine the tuning parameters. The performance of the proposed method was illustrated through the examples of chemical/biological reactors with multiple steady states, in which the uncertainties are appeared in the kinetic parameters and the feed. The simulation results showed that the proposed method was successfully handle the process at the desired setpoints whether stable or unstable processes.

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