

Pisit Sukkarnkha 2011: Input/output Linearization Control with Two-degree-of-freedom Structure for Uncertain Nonlinear Processes. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Assistant Professor Chanin Panjapornpon, Ph.D. 117 pages.

In chemical processes, the process uncertainty naturally appears in the process parameters, the process measurements, and the unmeasured disturbance. The uncertainty leads to the deterioration in robustness and control performance that may result in the off-specification of a product quality and unsafe condition during operation.

This work takes advantage of two-degree-of-freedom control for improving robustness of the control system that setpoint tracking and disturbance rejection can be handled independently. Input/output (I/O) linearization technique is selected to provide the setpoint tracking ability. For disturbance rejection, the high-gain technique is used to compensate the effect of the uncertainty. Two types of control structure are proposed for (i) the uncertain processes without time-delay and (ii) the uncertain processes with input time-delay. The control performance of both control methods under servo and regulatory tests are evaluated through numerical simulation with various chemical processes. Furthermore, both proposed control scheme are compared with the existing methods developed by Wu *et al.* (2001) and Hu and Rangaiah (1999) for the processes without and with time-delay, respectively. The results show that the control methods successfully force and maintain the outputs at the desired setpoints and give better performance comparing with other methods.

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