Issarush Kajornrungsilp 2011: Development of an Approximate Input/Output Linearizing Controller Using Taylor Series Technique Applied in FPGA Device. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Assistant Professor Chanin Panjapornpon, Ph.D. 114 pages.

Input/Output (I/O) linearization is a control technique that applies a process model in a controller synthesis. It is an attractive method for many applications in chemical industries. In spite of many advances in control theory, practical implementation of I/O linearization is still sluggishly compared to other model-based techniques. The formulation of I/O controller basically requires the differentiation and inversion of the process model, which becomes cumbersome as the complexity of the model increases.

This work presented a new approach to the formulation of an approximate input/output (I/O) linearizing controller for non-minimum phase processes. The time derivatives of outputs are truncated around the nominal equilibrium point by applying the Taylor series expansion. The open-loop state observer is used to estimate the unmeasured state variables of the process. The compensator is used to estimate a disturbance in the process. The developed controller system is in a sample form, and the control algorithm is more applicable to embed into the control hardware device such as the NI C-RIO. The performance of the embedded model-based controller is illustrated through real-time implementation of the pilot process exhibiting non-minimum phase behavior. The results show that the controller provides good performance for set-point tracking and output disturbance rejection.

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