ABSTRACT

Measurements are used to monitor and ultimately, to control and optimize processes. Difficulties in measuring quality (primary) variables inevitably mean poor or no control at all. On-line sensors may be available but they may suffer from long measurement delays (e.g. gas chromatographs) or may be subject to factors that affect the reliability of the sensor (e.g. drifts and fouling). In this work, a nonlinear process control system (real time) assisted with soft estimator and a fuzzy controller, with an objective to model the relationship between a primary output and secondary outputs and inputs is developed, implemented and tested. The system response is obtained for different types of nonlinearities and for slow and fast motion inputs. The phase-plane portrait is obtained for each case and the system stability is evaluated. The construction of a parameter (or state) estimator can be basically considered as a function approximation problem. To design an estimator, it is first necessary, to obtain the training data set ‘G’ such that, this training data set contains as much information as possible about a system ‘g’. Once trained properly, the estimator will adaptively follow the slope of ‘g’ at all times. In this research, signals are processed in real time and combined with previous monitoring data to estimate, the process variable level in a nonlinear process control plant.

Key words: Nonlinear control, Sensor validation. Fuzzy Estimator, Neural Network, Fuzzy logic controller, Slow motion system, Fast motion system.