Combination of Observer and Statistical Techniques for Robust Fault Detection of Transient State in Nonlinear Systems with Noisy Condition

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Fault detection is a major part of successful management of chemical processes. Detection speed and its accuracy decide the performance of fault detection methods. Model-based methods compare measured data against predicted data obtained from calculation of process model. It is very sensitive to change of process. Problems that are discussed in this study are instant and sensitive to changing inputs and noise. We bring a focus on the transient period of a process response with control theories such as observer and Kalman filter and demonstrate this idea in cases of CSTR and a desalination process. As a result, the detection time is shortened to 80% and the variance from noise is reduced to 4% in contrast to traditional fault detection methods (e.g. observer) for the processes out of steady-state. Using this method, we could expect not only advance of fault detection but also improvement of state feedback control.