Process Monitoring based on Nonlinear Wavelet Packet Principal Component Analysis

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Abstract
For using process operational data to realize process monitoring, kinds of improved Principal Components Analysis (PCA) have been applied to cope with complex industrial processes. In this paper, a novel nonlinear wavelet packet PCA (NLWPPCA) method, which combines input training network with wavelet packet PCA, is proposed. Wavelet packet PCA integrates ability of PCA to de-correlate the variables by extracting a linear relationship with what of wavelet packet analysis to extract auto-correlated measurements. Then methodology of process monitoring based on NLWPPCA is presented. Finally, the proposed approach is successfully applied to two case studies: process monitoring of an eight variables nonlinear process with noise and Tennessee Eastman process.

Keywords: process monitoring, wavelet packet analysis, PCA