

A Data-Driven Monitoring Technique Using Combined Anomaly Detectors

Authors : Fouzi Harrou, Ying Sun, Sofiane Khadraoui

Abstract : Anomaly detection based on Principal Component Analysis (PCA) was studied intensively and largely applied to multivariate processes with highly cross-correlated process variables. Monitoring metrics such as the Hotelling's T2 and the Q statistics are usually used in PCA-based monitoring to elucidate the pattern variations in the principal and residual subspaces, respectively. However, these metrics are ill suited to detect small faults. In this paper, the Exponentially Weighted Moving Average (EWMA) based on the Q and T statistics, T2-EWMA and Q-EWMA, were developed for detecting faults in the process mean. The performance of the proposed methods was compared with that of the conventional PCA-based fault detection method using synthetic data. The results clearly show the benefit and the effectiveness of the proposed methods over the conventional PCA method, especially for detecting small faults in highly correlated multivariate data.

Keywords : data-driven method, process control, anomaly detection, dimensionality reduction