

Batch process monitoring using MPCA based on variable-wise unfolding and time varying score covariance

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Multiway principal component analysis (MPCA) has been widely used to monitor batch processes. However, it has such shortcomings for on-line batch monitoring that the future behavior of the new batch should be inferred somehow and all batch length should be equalized. A new statistical batch monitoring approach is proposed to overcome the drawbacks of MPCA and obtain better monitoring performance. After eliminating the batch trajectory and scaling the variables at each time, the batch data is rearranged to a form of variable-wise matrix. Then, the covariance matrices of scores at each time during a batch are calculated for the extracted scores to incorporate the covariance variations at each time. These procedures don't have to anticipate the future values while the dynamic relations are preserved. The proposed method was applied to monitoring of the simulated fed-batch penicillin fermentation. The simulation results clearly show the power and advantages of the proposed method in comparison to MPCA.