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Sparse abnormality detection based on variable selection for spatially correlated multivariate process

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Monitoring the manufacturing process becomes a challenging task with a huge number of variables in traditional multivariate statistical process control (MSPC) methods. However, the rich information is often loaded with some rare suspicious variables, which should be screened out and monitored. Even though some control charts based on variable selection algorithms were proven effective for dealing with such issues, charting algorithms for the sparse mean shift with some spatially correlated features are scarce. This article proposes an advanced MSPC chart based on fused penalty-based variable selection algorithm. First, a fused penalised likelihood is developed for selecting the suspicious variables. Then, a charting statistic is employed to detect potential shifts among the variables monitored. Simulation experiments demonstrate that the proposed scheme can detect abnormal observation efficiently and provide root causes reasonably. It is shown that the fused penalty can capture the spatial information and improve the robustness of a variables selection algorithm for spatially correlated process.

Keywords

Spatially correlated process; variable selection; penalised likelihood

Special/invited session

Data-Driven Methods for Quality Modeling and Monitoring

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