Abstract

In many manufacturing processes, process data are observed in the form of time-based profiles, which may contain rich information for process monitoring and fault diagnosis. Most approaches currently available in profile monitoring focus on single-stage processes or multistage processes with repeating cyclic profiles. However, a number of manufacturing operations are performed in multiple stages, where non-repeating profiles are generated. For example, in a broaching process, non-repeating cyclic force profiles are generated by the interaction between each cutting tooth and the workpiece. This talk will present a process monitoring method based on Partial Least Squares (PLS) regression models, where PLS regression models are used to characterize the correlation between consecutive stages. Instead of monitoring the non-repeating profiles directly, the residual profiles from the PLS models are monitored. A Group Exponentially Weighted Moving Average (GEWMA) control chart is adopted to detect both global and local shifts. The performance of the proposed method is compared with conventional methods in a simulation study. Finally, a case study of a hexagonal broaching process is used to illustrate the effectiveness of the proposed methodology in process monitoring and fault diagnosis.
About the Speaker

Wenmeng Tian is currently a PhD candidate in the Grado Department of Industrial & Systems Engineering at Virginia Tech. She received her bachelor’s degree in Industrial Engineering and master’s degree in Management Science and Engineering, both from Tianjin University, China. Her research interests focus on process modeling, monitoring, and prognostics based on the integration of high density data and process knowledge. She is a member of IIE and INFORMS.

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All are Welcome!