

Real-time process fault diagnosis based on time delayed mutual information analysis

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Abstract

Causal relations among variables may change significantly due to different control strategies and fault types. Off line-based knowledge is not adequate for fault diagnosis. In this work, a fault diagnosis framework is proposed based on information solely extracted from process data. Variable correlation under normal condition is extracted by mutual information to obtain a threshold for random noises. Once a process deviation is detected, each pair of variables with mutual information beyond this threshold are further investigated by time delayed mutual information (TDMI) analysis, so as to determine the causal logic between them, which is represented as fault propagation paths, can be tracked all the way back to the root cause. The proposed method is applied to a simulated process, Tennessee Eastman process and a practical industrial process. The results show that the fault propagation path can be objectively identified, together with the root cause.

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