Guo, Jinyu; Liu, Yuchao; Li, Yuan
Fault detection of multimodal processes based on local entropy double subspace. (Chinese. English summary) [Zbl 07338608] Control Theory Appl. 37, No. 9, 2020-2028 (2020)

Summary: In order to improve the performance of detection in non-Gaussian industrial process, a fault detection method of multimodal processes based on local entropy double subspace (LEDS) is proposed. The local entropy matrix is constructed by local probability density estimation to eliminate the multimodal characteristics of the data. The normal distribution of variables in local entropy data is tested by Kolmogorov-Smirnov (KS). The fault detection models of PCA-based Gaussian subspace and ICA-based non-Gaussian subspace are established for Gaussian distribution and non-Gaussian distribution data, respectively. The Bayesian decision is used to transform the detection results into the form of fault probability, and the detection results are combined into final statistical information for fault detection. The proposed method is applied to a numerical example and Tennessee-Eastman multimodal process. The simulation results show that the fault detection rate is the highest when the false alarm rate is lower, which is better than PCA, local entropy PCA (LEPCA) and local entropy ICA (LEICA) method.

MSC:
94C12 Fault detection; testing in circuits and networks

Keywords:
multimodal processes; local probability density; local entropy; KS test; Bayesian decision

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