Application of Fault Diagnosis Based on Signed Digraphs and PCA with Linear Fault Boundary

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In this paper, we developed a fault diagnosis model based on signed digraph(SDG), support vector machine(SVM) and improved principal component analysis(PCA) method. In PCA, we set linear fault boundaries. By means of the system decomposition based on SDG, the local models of each measured variable are constructed and more accurate and fast models are using an SVM, which has no loss of information and shows good performance, in order to obtain the estimated value of the variable, which is then compared with the measured value in order to diagnose the fault. And then, in order to make fault boundaries linearized, we select particular variables in the local model and express the data through the PC space. In the last analysis for various fault intensities, we diagnose a number of faulty data effectively. To verify the performance of the proposed model, the Tennessee Eastman(TE) Process was studied and the proposed method was found to demonstrate a good diagnosis capability compared with previous statistical methods.