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Enhanced Dynamic Approach to Improve the Detection of Small-Magnitude Faults

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Abstract

The conventional SPE and Hotelling's T^2 statistics may not work properly in the detection of incipient and small−magnitude faults. In this paper, an enhanced dynamic Multivariate Statistical Process Control approach is proposed, which combined with the dimension reduction techniques KPCA and KICA improved the detection of these types of faults. In the parameters choice task two metaheuristic algorithms were used. The kernel optimization criterion used involves the computation of the False Alarm Rate (FAR) and False Detection Rate (FDR) indicators, unified by the Area Under the ROC Curve (AUC). The proposal was tested with excellent results on the Tennessee Eastman (TE) process.

Keywords: Fault Detection, Kernel methods, Small-magnitude faults, AUC measure, Metaheuristic algorithms, Latency time, TE process

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