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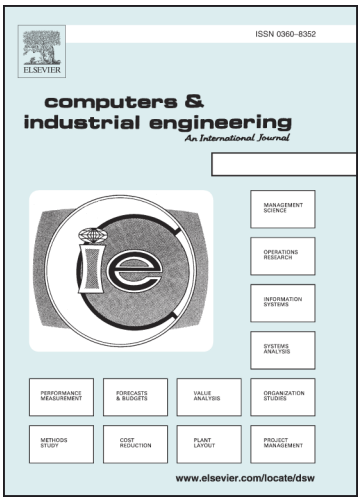

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Nominal Features-based Class Specific Learning Model for Fault Diagnosis in Industrial Applications

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***Abstract*—Fault Detection and Isolation (FDI) is the preliminary stage in the real-time fault diagnosis in industrial applications. The introduction of data-driven techniques to the diagnosis framework provides the mapping of high-dimensional into the low-dimensional on the basis of the preservation of significant information. The detection and classification of faults with the application of machine learning techniques (like Support Vector Machine (SVM)) depends on the number of features involved in it. The increase in a number of faults will increase the size of the features that limit the accuracy. This paper proposes the suitable technique to extract the relevant features and classify the faults accordingly. Initially, the preprocessing removes the unfilled entries in the fault dataset (after the data collected from the sensor). Then, the Minimal Relevant Feature extraction predicts the features that correspond to the six types of fault classes. The minimum and maximum ranges of voltage, current, vibrations and speed due to the above classes regarded as the features. The modified objective function for the class-specific support vector machine (CS-SVM) classifies the fault classes which highly contribute to the early diagnosis. The relevant feature prior to the Classification increases the accuracy effectively. The variations of voltage, current, and motor speed according to the injection of vibration faults from the motor bearings determine the impacts effectively. The comparison between the proposed MRFC (Minimal Relevant Features -based Classification)with the existing SVM regarding the accuracy, precision, recall, sensitivity, specificity and coefficient (Jaccard, Dice and Kappa) confirms the effectiveness of proposed MRFC in earlier fault diagnosis in industrial applications.**

***Index Terms*—Conditional Monitoring, Data Driven techniques, Fault Detection, Fault Classification, Fault Diagnosis.**

I. INTRODUCTION

An analysis of large volume multivariate process data through the troubleshooting operations and the Statistical Processing Models (SPM)[1]prevents the fault operations in the industrial applications. The tasks involved in SPM are fault detection, identification, estimation, reconstruction, and diagnosis. The violation of statistical process control limits, affect the stabilization that generates the alert signal to the operator for immediate remedial actions. The major observation of SPM is that the residual space analysis statistics is the major requirement to detect the fault in a large scale process. The root cause prediction is the immediate stage if the fault is detected that constitutes the investigation of process variables to identify the number of root causes led to the faults. Then, the visualization such as control chart is the major requirement to diagnose the fault during the unassigned root cause scenarios. Thus, the constant monitoring of variables through the control charts is the major role of the operator in real-time process monitoring. Quality assurance under the software complexities is the major challenging issue in production system due to high testing cost. The process of execution of system or component under the specific conditions, recording and the evaluation in some aspects refer testing which is conducted manually in most of the applications. The suitable strategy implementation in correct time and correct place is the background of automated Production System's (aPS)[2]the immediate reaction to the faults under software basis. The time reserved for the testing is around 25-30 % to prove the validity of the system. Hence, the feasible strategy is required to make the fault detection system as automated one. The overall performance of the system is dependent on the performance of each element in the system. The reliable maintenance of the systems is the major requirement and this process is the critical stage in various systems i.e. chemical plant.