Data-driven Fault Diagnosis in Chemical Process based on Transfer Entropy and Graphical Lasso

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Since process faults cause loss of many aspects, process monitoring is essential. Process monitoring can be classified into 'fault detection' to detect process anomalies, 'fault diagnosis' to find out the root-cause of detected faults, and 'process recovery' to recover the identified faults. As well as detecting them through real-time monitoring using various methodologies, fault diagnosis is also important to eliminate the cause of faults immediately. The granger causality analysis method, which is one of the typical methods of fault diagnosis, is based on the linearity assumption and therefore is not suitable for the complex real process. On the other hand, transfer entropy, the recently proposed information theoretic measure, is a model free method and can be used in a general cases. Meanwhile, transfer entropy has a limitation in applying to actual chemical process because it inherently requires massive computational cost and has a problem of 'Curse of dimensionality'. In this study, we propose a effective fault diagnosis methodology by adopting a regularization method called 'Graphical Lasso' to overcome these limitations.