

## Adaptive Kaman Filter for Fault Diagnosis of Linear Parameter-Varying Systems

**Authors :** Rajamani Doraiswami, Lahouari Cheded

**Abstract :** Fault diagnosis of Linear Parameter-Varying (LPV) system using an adaptive Kalman filter is proposed. The LPV model is comprised of scheduling parameters, and the emulator parameters. The scheduling parameters are chosen such that they are capable of tracking variations in the system model as a result of changes in the operating regimes. The emulator parameters, on the other hand, simulate variations in the subsystems during the identification phase and have negligible effect during the operational phase. The nominal model and the influence vectors, which are the gradient of the feature vector respect to the emulator parameters, are identified off-line from a number of emulator parameter perturbed experiments. A Kalman filter is designed using the identified nominal model. As the system varies, the Kalman filter model is adapted using the scheduling variables. The residual is employed for fault diagnosis. The proposed scheme is successfully evaluated on simulated system as well as on a physical process control system.

**Keywords :** identification, linear parameter-varying systems, least-squares estimation, fault diagnosis, Kalman filter, emulators

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