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Sensor Fault-Tolerant Model Predictive Control for Linear Parameter Varying Systems

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Abstract : In this paper, a sensor fault-tolerant control (FTC) scheme using robust model predictive control (RMPC) and set theoretic fault detection and isolation (FDI) is extended to linear parameter varying (LPV) systems. First, a group of set-valued observers are designed for passive fault detection (FD) and the observer gains are obtained through minimizing the size of invariant set of state estimation-error dynamics. Second, an input set for fault isolation (FI) is designed offline through set theory for actively isolating faults after FD. Third, an RMPC controller based on state estimation for LPV systems is designed to control the system in the presence of disturbance and measurement noise and tolerate faults. Besides, an FTC algorithm is proposed to maintain the plant operate in the corresponding mode when the fault occurs. Finally, a numerical example is used to show the effectiveness of the proposed results.

Keywords : fault detection, linear parameter varying, model predictive control, set theory
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