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Fault-Tolerant Predictive Control for Polytopic LPV Systems Subject to Sensor Faults

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Abstract : In this paper, a robust fault-tolerant predictive control (FTPC) strategy is proposed for systems with linear parameter varying (LPV) models and input constraints subject to sensor faults. Generally, virtual observers are used for improving the observation precision and reduce the impacts of sensor faults and uncertainties in the system. However, this type of observer lacks certain system measurements which substantially reduce its accuracy. To deal with this issue, a real observer is then designed based on the virtual observer, and consequently a real observer-based robust predictive control is designed for polytopic LPV systems. Moreover, the proposed observer can entirely assure that all system states and sensor faults are estimated. As a result, and based on both observers, a robust fault-tolerant predictive control is then established via the Lyapunov method where sufficient conditions are proposed, for stability analysis and control purposes, in linear matrix inequalities (LMIs) form. Finally, simulation results are given to show the effectiveness of the proposed approach.

Keywords : linear parameter varying systems, fault-tolerant predictive control, observer-based control, sensor faults, input constraints, linear matrix inequalities
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