Abstract

As commonly known, sensor errors and faulty signals may potentially lead structures in vibration to catastrophic failures. This paper presents a new approach to deal with sensor errors/faults in vibration control of structures by using the Fault detection and isolation (FDI) technique. To demonstrate the effectiveness of the approach, a space truss structure with semi-active devices such as Magneto-Rheological (MR) damper is used as an example. To address the problem, a Linear Matrix Inequality (LMI) based fixed-order H-infinity FDI filter is introduced and designed. Modeling errors are treated as uncertainties in the FDI filter design to verify the robustness of the proposed FDI filter. Furthermore, an innovative Fuzzy Fault Tolerant Controller (FFTC) has been developed for this space truss structure model to preserve the pre-specified performance in the presence of sensor errors or faults. Simulation results have demonstrated that the proposed FDI filter is capable of detecting and isolating sensor errors/faults and actuator faults e.g., accelerometers and MR dampers, and the proposed FFTC can maintain the structural vibration suppression in faulty conditions.

Citation

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