Abstract

Fault detection and isolation (FDI) technology can provide early warning of faulty sensors and actuators in order to prevent events that lead to catastrophic failures. The main objective of this paper is to describe the application of FDI techniques for vibration suppression of a space truss structure. Thus, this paper presents a Linear Matrix Inequality (LMI) based fixed-order FDI filter design theorem and approach. Necessary and sufficient conditions for the existence of a solution to detecting and isolating faults using the H_∞ formulation are provided. Furthermore, a Fuzzy Fault Tolerant Controller (FFTC) for a base isolation structure model based on the FDI filter is developed to preserve the pre-specified performance of the space truss structure in the presence of faults. A numerical example is given as well as FDI and FFTC results which demonstrate that the designed filter can successfully detect and isolate faults including displacement sensor and accelerometer failure, and that the FFTC can maintain excellent performance of vibration suppression in faulty conditions.

Citation

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