Abstract

Sensor fault in aircraft is detected based on two different approaches. The first approach, well documented in literature, is based on algorithmic method dealing with Luenberger observers. The second approach, which is followed in this paper, is based on Knowledge based neural network fault detection (KBNNFD). KBNNFD uses gradient descent back propagation training algorithm of neural network. A C-Star controller of F8 aircraft model, which improves the handling qualities, is used for validation of the KBNNFD. Neural network is trained with certain features of F8 aircraft model and C-Star controller enabling it to detect the faulty sensor. A comparative analysis of both the methods is done for various cases of stuck fault of the sensor for flight control system. Nz (Normal acceleration) sensor failure was considered because of its importance in C-Star controller. Knowledge-based approach of neural network, used in this work, has come out with results indicating that it takes less time to detect the faulty Nz sensor during transition, steady state and also in the presence of random noise. Results show improvement when compared to algorithmic methods with regard to the time taken to detect faults and ability to detect sensor faults especially near steady state. Investigations have been carried out using Matlab and Simulink.
Neural Network based Sensor Fault Detection for Flight Control Systems

References

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