Sensor Fault Detection and Fault Isolation Scheme for Unmanned Aerial Vehicle

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ABSTRACT

Sensor, actuator and control surface faults in flight control systems can cause control of the aircraft to be lost and aircraft accidents to happen. Hence, faults which occur on sensor, actuator and control surface should be detected and isolated. Methods like filters, observers, parameter estimation systems, parity equations and signal models are used in literature for this purpose. First, fault detection must be performed. Then, fault isolation must be performed and finally, problem must be solved. Unmanned aerial vehicle (UAV) is used for a variety of purposes which are photography, commercial, agricultural, search and rescue, surveillance, military and many other areas. However, most UAV systems do not have any fault detection and fault isolation scheme (FDI). During the control of this vehicles, any sensor fault will cause to gather incorrect data first and then will cause an accident and crash. By designing a FDI scheme, these vehicles will be prevented from falling due to any sensor fault and also more accurate control will be achieved. In this study, Artificial Neural Network (ANN) was used to detect and isolate sensor fault occurring randomly on a UAV. UAV flight data were used in the system design. Estimated sensor values were found using ANN. Residual signals were analyzed and results were presented for fault detection and isolation. MATLAB and LabVIEW softwares were used while scheduled operations being performed.

Keywords: aircraft; artificial neural network; estimation; machine learning; quadrotor