World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:11, No:08, 2017

Modeling of a UAV Longitudinal Dynamics through System Identification Technique

Authors : Asadullah I. Qazi, Mansoor Ahsan, Zahir Ashraf, Uzair Ahmad

Abstract : System identification of an Unmanned Aerial Vehicle (UAV), to acquire its mathematical model, is a significant step in the process of aircraft flight automation. The need for reliable mathematical model is an established requirement for autopilot design, flight simulator development, aircraft performance appraisal, analysis of aircraft modifications, preflight testing of prototype aircraft and investigation of fatigue life and stress distribution etc. This research is aimed at system identification of a fixed wing UAV by means of specifically designed flight experiment. The purposely designed flight maneuvers were performed on the UAV and aircraft states were recorded during these flights. Acquired data were preprocessed for noise filtering and bias removal followed by parameter estimation of longitudinal dynamics transfer functions using MATLAB system identification toolbox. Black box identification based transfer function models, in response to elevator and throttle inputs, were estimated using least square error   technique. The identification results show a high confidence level and goodness of fit between the estimated model and actual aircraft response.

Keywords : fixed wing UAV, system identification, black box modeling, longitudinal dynamics, least square error
Conference Title : ICAEIST 2017 : International Conference on Aeronautical Engineering and Innovative Spacecraft Technologies
Conference Location : New York, United States
Conference Dates : August 07-08, 2017