

Application of the Total Least Squares Estimation Method for an Aircraft Aerodynamic Model Identification

Authors : Zaouche Mohamed, Amini Mohamed, Foughali Khaled, Aitkaid Souhila, Bouchiha Nihad Sarah

Abstract : The aerodynamic coefficients are important in the evaluation of an aircraft performance and stability-control characteristics. These coefficients also can be used in the automatic flight control systems and mathematical model of flight simulator. The study of the aerodynamic aspect of flying systems is a reserved domain and inaccessible for the developers. Doing tests in a wind tunnel to extract aerodynamic forces and moments requires a specific and expensive means. Besides, the glaring lack of published documentation in this field of study makes the aerodynamic coefficients determination complicated. This work is devoted to the identification of an aerodynamic model, by using an aircraft in virtual simulated environment. We deal with the identification of the system, we present an environment framework based on Software In the Loop (SIL) methodology and we use MicrosoftTM Flight Simulator (FS-2004) as the environment for plane simulation. We propose The Total Least Squares Estimation technique (TLSE) to identify the aerodynamic parameters, which are unknown, variable, classified and used in the expression of the piloting law. In this paper, we define each aerodynamic coefficient as the mean of its numerical values. All other variations are considered as modeling uncertainties that will be compensated by the robustness of the piloting control.

Keywords : aircraft aerodynamic model, total least squares estimation, piloting the aircraft, robust control, Microsoft Flight Simulator, MQ-1 predator

Conference Title : ICCAR 2016 : International Conference on Control, Automation and Robotics

Conference Location : Copenhagen, Denmark

Conference Dates : June 27-28, 2016