LONGITUDINAL AERODYNAMIC PARAMETER ESTIMATION USING
NEURAL NETWORK AND GAUSS-NEWTON METHOD

N.K. Peyada
Ph.D. Student
Department of Aerospace Engineering
Indian Institute of Technology Kanpur
Kanpur-208 016, India
Email : nkpeyada@gmail.com

A.K. Ghosh
Professor
Department of Aerospace Engineering
Indian Institute of Technology Kanpur
Kanpur-208 016, India
Email : akg@iitk.ac.in

Abstract

A new parameter estimation method based upon Feed Forward Neural Network is proposed. The proposed method utilizes the universal mapping capability of Feed Forward Neural Network to develop flight dynamic model of aircraft. Gauss-Newton method is used to obtain values of aerodynamic parameters by minimizing a chosen error cost function. The method has then been validated using flight data pertaining to longitudinal dynamics of aircraft. Proof of match approach has been followed to verify the estimated model by the proposed method. The results obtained using the proposed method have also been compared with those obtained using wind tunnel tests, and Filter Error method. Unlike, most of the conventional methods, the proposed method does not require a priori description of the model. It also bypasses the requirement of solving the equations of motion. This feature may have special significance in handling flight data of an unstable aircraft.

Keywords: Parameter estimation, Longitudinal aerodynamic, Neural Network, Gauss-Newton method