The Estimation of an Aircraft Motions by using the Bass-Gura Full-Order Observer

Mihai Lungu

University of Craiova, Faculty of Electrical Engineering, Craiova, Romania
Lma1312@yahoo.com, mlungu@elth.ucv.ro

Abstract— This paper deals with the study of a full-order observer for the state estimation of the linear systems. The observer is based on the Bass-Gura formula for the determination of the observer gain matrix. The obtained algorithm will be structured into 4 steps; the Bass-Gura algorithm replaces the well known pole placement method. The only disadvantage of the designed full-order observer is related to the choosing of the observer eigenvalues, the Bass-Gura formula representing a procedure which is similar to the pole placement technique. In this paper, the full-order observer is designed for the longitudinal and lateral motions of a light aircraft. The obtained observer is a simple one, its derivation being direct and easy. It will be shown that the only constraint (existence condition) of the Bass-Gura algorithm is that the original system (observable system) must have only one output; the main advantage of the Bass-Gura observer is its simplicity and ease of software implementation. The effectiveness of the suggested design algorithm is illustrated by two Matlab/Simulink numerical simulations for the longitudinal and lateral motions of a small aircraft. For both examples, it will be shown that the Bass-Gura algorithm is convergent (the components of the estimation error vector tend to zero).