World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:13, No:01, 2019

Controller Design for Highly Maneuverable Aircraft Technology Using Structured Singular Value and Direct Search Method

Authors : Marek Dlapa

Abstract : The algebraic approach is applied to the control of the HiMAT (Highly Maneuverable Aircraft Technology). The objective is to find a robust controller which guarantees robust stability and decoupled control of longitudinal model of a scaled remotely controlled vehicle version of the advanced fighter HiMAT. Control design is performed by decoupling the nominal MIMO (multi-input multi-output) system into two identical SISO (single-input single-output) plants which are approximated by a 4th order transfer function. The algebraic approach is then used for pole placement design, and the nominal closed-loop poles are tuned so that the peak of the μ-function is minimal. As an optimization tool, evolutionary algorithm Differential Migration is used in order to overcome the multimodality of the cost function yielding simple controller with decoupling for nominal plant which is compared with the D-K iteration through simulations of standard longitudinal manoeuvres documenting decoupled control obtained from algebraic approach for nominal plant as well as worst case perturbation.

Keywords : algebraic approach, evolutionary computation, genetic algorithms, HiMAT, robust control, structured singular value
Conference Title : ICUAS 2019 : International Conference on Unmanned Aircraft Systems
Conference Location : Zurich, Switzerland
Conference Dates : January 14-15, 2019