A Multidisciplinary Robust Optimization Framework for UAV Conceptual Design

Nhu Van Nguyen, Jimin Kim, SangHo Kim, and Jae-Woo Lee*

Konkuk University, Seoul, 143-701, South of Korea

This paper describes a multidisciplinary UAV design optimization framework using a robust design process. An in-house configuration designer software system is implemented to generate full sets of configuration data for a well-developed advanced UAV resizing tool. Fully integrating configuration design along with the advanced UAV resizing tool ensures that full sets of configuration data may be provided simultaneously while the UAV configuration changes during optimization calls. A robust design process is integrated after the deterministic optimization process terminates while creating and storing surrogate models of objective and constraints functions respecting to design variables. The minimization of variance helps to enhance the probability that the UAV performance criteria is satisfied, providing a robust optimal UAV configuration. In addition, the fully integrated process and automatic generation of surrogate models reduce the failure probability under uncertainty factors without any noticeable increase in design turnaround time. Maximizing UAV endurance while performing a robust design process yields a more trustworthy prediction of the optimal configuration and is preferable to the traditional deterministic design approach

Keywords: Robust Design, Multidisciplinary Design Optimization (MDO), Unmanned Aerial Vehicle (UAV), Aircraft Design Program

*Corresponding author: jwlee@konkuk.ac.kr