Integrated Design and Control of a Flying Wing Using Nonsmooth Optimization Techniques

In this paper we consider the problem of simultaneously stabilizing a civil flying wing aircraft and optimizing the control surfaces physical parameters, such as control surfaces sizes and actuators bandwidth. This flying wing configuration is characterized by unstable longitudinal modes, badly damped lateral modes, and a lack of control efficiency despite large movables. The question is then to determine the energy penalty associated to the control of these unstable modes, and more precisely to optimize the control surfaces architecture in order to minimize the control associated energy. Our approach uses latest nonsmooth optimization techniques, which allows more possibilities on requirements specifications and controller structure compared to other approaches such as LMI-based optimizations. Results show a consistent behaviour for tuned parameters of the control surfaces.