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Airfoil Roll Control by Bang-Bang Optimal Control Method with Plasma Actuators

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The bang-bang optimal control method was proposed for glow discharge plasma actuators, taking account of practical issues, such as limited actuation states with instantaneously varied aerodynamic control performance. Hence, the main contribution of this Note is to integrate flight control with active flow control in particular for plasma actuators. Flow control effects were examined in wind tunnel experiments, which show that the plasma authority for flow control is limited. Flow control effects are only obvious at pitch angles near stall. However, flight control simulations suggest that even those small plasma-induced roll moments can satisfactorily fulfill the maneuver tasks and meet flight quality specifications. In addition, the disturbance from volatile plasma-induced roll moments can be rejected. Hence, the proposed bang-bang control method is a promising candidate of control design methodology for plasma actuators.

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