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Developing a virtual stiffness-damping system for airfoil aeroelasticity testing

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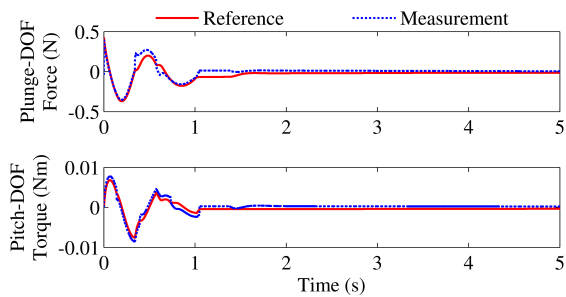


Fig. 10. VSDS force/torque under LQG control in Case 1 tests.

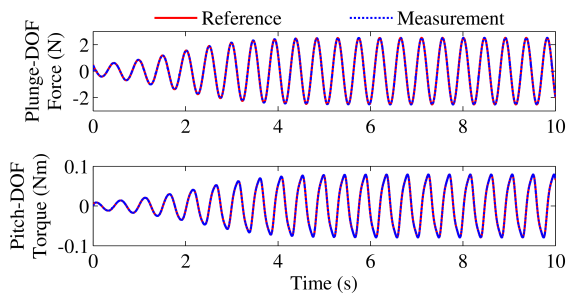


Fig. 11. VSDS force/torque under UIE-LQG control in Case 1 tests.

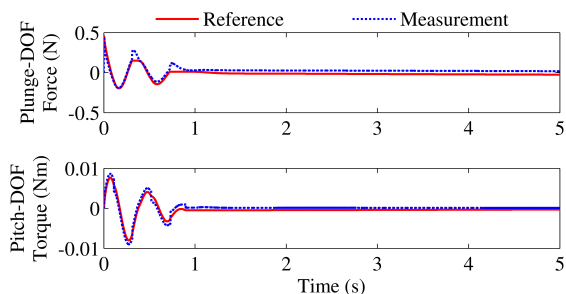


Fig. 12. VSDS force/torque under LQG control in Case 2 tests.



Fig. 13. VSDS force/torque under UIE-LQG control in Case 2 tests.

and significantly reduces system identification and calibration procedures in VSDS development, although with some phase lag introduced. Wind-tunnel experiments confirms that the new 2-DOF VSDS prototype can provide satisfactory simulation of structural stiffness and damping for AAT. Future work will focus on further reduction of the phase lag introduced by the control system.

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operation principle proposed effectively addresses dynamic coupling between each DOF without the need for sophisticated aeroelastic modeling. Resolution loss in velocity measurement is identified as a main problem associated with the first type of non-reduction transmission on a VSDS and is solved by the proposed MESO. The proposed VSDS control system with UIE-LQG control enables robust force/torque tracking