



Avviso di Seminario

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Addressing Limits of Operability of Scramjet Engines in Nonlinear Adaptive Flight Controllers for Hypersonic Vehicles

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Abstract. Among many outstanding problems in flight control system design for Air-breathing HyperSonic Vehicles (HSVs), one of the most challenging is to account at the same time for the constraints on the control inputs and the stringent limits of vehicle operability at hypersonic speed. This talk considers the incorporation of limits of operability of the scramjet engine in a previously developed adaptive guidance and flight control architecture for a 6-DOF model of a generic air-breathing HSV. A dynamic reference management is presented for the adaptive inner-loop module of the flight controller that provides tracking of airspeed reference trajectories. A model-recovery anti-windup strategy is teamed with a reference governor so that feasible input reference trajectories (which depends on parameter estimates) are provided to the adaptive controller, so that convergence to a feasible setpoint for the throttle setting is attained.

Bio. Andrea Serrani received the Laurea degree in Electrical Engineering, summa cum laude, and the Ph.D. degree in Artificial Intelligence Systems from the University of Ancona, Italy, in 1993 and in 1997, respectively. At Washington University in St. Louis, he obtained the M.S. and D.Sc. degrees in Systems Science and Mathematics in 1996 and 2000, respectively. Since 2002, he has been with the Department of Electrical and Computer Engineering, Ohio State University, where he is currently a Professor and Associate Chair. The research activity of Prof. Serrani deals both with nonlinear, adaptive and geometric control theory and with their applications in real systems (aerospace and marine systems, fluidic systems, robotics). His work has been supported by AFRL, NSF, Ford Motor Co. and NASA, among others. Prof. Serrani has authored more than 150 articles in journals, proceedings of international conferences and book chapters, he was a Distinguished Lecturer of the IEEE CSS, and served as the Editor-in-Chief of the IEEE Trans. on Control Systems Technology and as an Associate Editor for the same journal (2010-2016), Automatica (2008- 2014) and the Int. Journal of Robust and Nonlinear Control (2006-2014). He received the IEEE CSS Distinguished Member Award in 2023.

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