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Development of Feedback Control for High-Speed and High-Reynolds Number Jets[1] ANIRUDDHA SINHA, KIHWAN KIM, JIN-HWA KIM, Gas Dynamics & Turbulence Laboratory, OSU, ANDREA SERRANI, Electrical Engineering Department, OSU, MO SAMIMY, Gas Dynamics & Turbulence Laboratory, OSU — Currently an effort is underway at GDTL to develop feedback control for high-speed and high Reynolds number jets. In this abstract we present preliminary experimental results on the feedback control of a Mach 0.9 axisymmetric jet with a Reynolds number based on jet diameter of 7.8×10^5. An azimuthal array of 8 plasma actuators is employed at the nozzle exit; they are driven by pulse-based switching signals. Open-loop forcing is shown to have two distinct effects on the irrotational near field pressure. At low forcing Strouhal numbers (St_{DF}'s) (near the jet column mode instability), a sharp peak in the pressure fluctuations is observed. At higher St_{DF}'s (close to the initial-shear-layer instability), a broad minimum is observed in the pressure fluctuations. An online gradient-based extremum-seeking feedback control scheme is implemented. The cost function can be selected as the RMS of various individual azimuthal pressure modes, or a combination thereof. The controller can be setup to optimize the St_{DF} to seek either a maximum or a minimum of the cost function with negligible reconfiguration.

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Mo Samimy
OSU

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