An Optimal Control Approach to Rayleigh and Fanno Flows in Scramjet Engines

Guest Seminar

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An optimal control approach is employed to determine the best possible cross-sectional profile of 1-D Rayleigh and Fanno flows in scramjet engines. The desired cross-sectional profile is sought after by means of Pontryagin's Minimum Principle. The performance index is the exit Mach number or the exit total pressure.

The solution is analytically shown to be in most cases a non-singular "bang-bang" type; thus, the optimal slope is either zero or maximal, except when the minimum allowable Mach number is reached. Numerical solutions verify the analytical results.

The seminar includes a short review of optimal control theory.

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