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Global eigenfunction based actuation and sensor design for compressible, viscous flows[1] MAHESH NATARAJAN[2], JONATHAN FREUND[3], DANIEL BODONY[4], University of Illinois at Urbana-Champaign — A method is developed to estimate optimal actuator types and locations for controlling compressible, viscous flows using linear feedback. Based on an analysis of the eigensystem of the linearized compressible Navier-Stokes operator for steady baseflow, the forward and adjoint global modes are used to estimate of where the controller should be placed, and what type of controller (mass, momentum, energy, etc.) it should be. The method is demonstrated using direct numerical simulations of a separated boundary layer in a Mach 0.65 diffuser at different Reynolds numbers. The baseflow is taken as the true steady solution or the time-averaged flow. For sufficiently low Reynolds numbers, global stabilization of the flow is achieved; only partial stabilization is achieved at higher Reynolds numbers.

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