

Abstract Submitted
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The Stability Region for Feedback Control of the Wake Behind Twin Oscillating Cylinders¹ JEFF BORGGAARD, SERKAN GUGERCIN, LIZETTE ZIETSMAN, Virginia Tech — Linear feedback control has the ability to stabilize vortex shedding behind twin cylinders where cylinder rotation is the actuation mechanism. Complete elimination of the wake is only possible for certain Reynolds numbers and cylinder spacing. This is related to the presence of asymmetric unstable modes in the linearized system. We investigate this region of parameter space using a number of closed-loop simulations that bound this region. We then consider the practical issue of designing feedback controls based on limited state measurements by building a nonlinear compensator using linear robust control theory with and incorporating the nonlinear terms in the compensator (e.g., using the extended Kalman filter). Interpolatory model reduction methods are applied to the large discretized, linearized Navier-Stokes system and used for computing the control laws and compensators. Preliminary closed-loop simulations of a three-dimensional version of this problem will also be presented.

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Jeff Borggaard
Virginia Tech

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