1105-76-139 **Jeff Borggaard*** (jborggaard@vt.edu), Blacksburg, VA 24061, and **Serkan Gugercin** (gugercin@vt.edu), Blacksburg, VA 24061. *Feedback Control of Vortex Shedding by Cylinder Rotation Using Interpolatory Model Reduction.*

We consider a well-studied flow control problem: Stabilizing the von Kármán vortex shedding behind a circular cylinder by controlling the cylinder rotation. Our approach develops an accurate, high-dimensional linearized model about the (unstable) steady-state solution and seeks an optimal feedback control driving the discrepancy from the steady-state solution to zero over small regions in the cylinder wake. This leads to a linear quadratic regulator problem with a high-dimensional, linear differential algebraic equation (DAE) constraint. An interpolatory model reduction approach is used to develop a low-dimensional model for this DAE constraint equation that accurately captures the input-output behavior of the system. For the problem under consideration, we have one control input (the tangential velocity on the cylinder) and a dozen controlled outputs. The resulting low-dimensional DAE is used to design the linear feedback control design for the wake stabilization problem. To test the effectiveness of this control design method, we apply the feedback control law to the original problem. This involves simulating the Navier-Stokes equations with full-state feedback. (Received September 15, 2014)