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Optimization of Feedback Control of Flow over a Circular Cylinder[1] DONGGUN SON, EUIYOUNG KIM, HAECHEON CHOI, Seoul National University — We perform a feedback gain optimization of the proportional-integral-differential (PID) control for flow over a circular cylinder at $Re = 60$ and 100. We measure the transverse velocity at a centerline location in the wake as a sensing variable and provide blowing and suction at the upper and lower slots on the cylinder surface as an actuation. The cost function to minimize is defined as the mean square of the sensing variable, and the PID control gains are optimized by iterative feedback tuning method which is a typical model free gain optimization method. In this method, the control gains are iteratively updated by the gradient of cost function until the control system satisfies a certain stopping criteria. The PID control with optimal control gains successfully reduces the velocity fluctuations at the sensing location and attenuates (or annihilates) vortex shedding in the wake, resulting in the reduction in the mean drag and lift fluctuations.

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