

Abstract Submitted
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A proportional-integral-differential control of flow over a circular cylinder¹ DONGGUN SON, SEUNG JEON, HAECHEON CHOI, Seoul National University — In the present study, we apply a proportional(P)-integral(I)- differential(D) feedback control to flow over a circular cylinder for suppression of vortex shedding in the wake. The transverse velocity at a centerline location in the wake is measured and used for the feedback control. The sensing location is varied from $1d$ to $4d$ from the center of the cylinder. The actuation (blowing/suction) is provided to the flow at the upper and lower slots on the cylinder surface near the separation point based on the P, PI or PD control. Given each sensing location, the optimal proportional gain in the sense of minimizing the sensing velocity fluctuations is obtained for the P control. The additions of I and D controls to the P control certainly increase the control performance and broaden the effective sensing location. The P, PI and PD controls significantly reduce the velocity fluctuations at sensing locations and attenuate vortex shedding in the wake, resulting in the reductions in the mean drag and lift fluctuations.

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