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Active feedback control of flow over a circular cylinder with wall pressure sensor using machine learning[1] JINHYEOK YUN, JUNGIL LEE, Ajou University — In the present study, we conduct active feedback control of laminar and turbulent flows over a circular cylinder with wall pressure sensor for suppression of vortex shedding in the wake. The blowing and suction actuations are imposed at the wall before the flow separation, and their magnitudes are proportional to the transverse velocity in the the wake. To avoid direct measurement of velocity in the wake, we build an artificial neural network (ANN) between the pressures on the cylinder surface and the transverse velocities. For the learning process to build ANN, instantaneous flow data sets are obtained from numerical simulations of flow over a cylinder at $Re = 60$ and 3900. The performance of ANN is assessed with the locations of wall pressures, structures of neural network, and etc. It is found that the wall pressures on the cylinder surface can accurately predict velocities in the wake with the neural network built. Active feedback control combined with this neural network successfully suppresses the vortex shedding behind the cylinder, leading to reductions of the drag and lift fluctuations of cylinder.

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