Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Extension of suboptimal control theory for flow around a square cylinder YOSUKE FUJITA, KOJI FUKAGATA, Keio University — We extend the suboptimal control theory to control of flow around a square cylinder, which has no point symmetry on the impulse response from the wall in contrast to circular cylinders and spheres previously studied. The cost functions examined are the pressure drag (J_1), the friction drag (J_2), the squared difference between target pressure and wall pressure (J_3) and the time-averaged dissipation (J_4). The control input is assumed to be continuous blowing and suction on the cylinder wall and the feedback sensors are assumued on the entire wall surface. The control law is derived so as to minimize the cost function under the constraint of linearized Navier-Stokes equation, and the impulse response field to be convolved with the instantaneous flow quanties are numerically obtained. The amplitide of control input is fixed so that the maximum blowing/suction velocity is 40% of the freestream velocity. When J_2 is used as the cost function, the friction drag is reduced as expected but the mean drag is found to increase. In constast, when J_1, J_3, and J_4 were used, the mean drag was found to decrease by 21%, 12%, and 22%, respectively; in addition, vortex shedding is suppressed, which leads to reduction of lift fluctuations.

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Date submitted: 12 Jul 2017 Electronic form version 1.4