

Abstract Submitted  
for the DFD05 Meeting of  
The American Physical Society

**Suboptimal feedback control for drag reduction in flow over a sphere**<sup>1</sup> SEUNG JEON, HAECHEON CHOI, Seoul National University — The objective of the present study is to propose a method of controlling the wake behind a sphere for drag reduction using suboptimal control theory. The present numerical method is based on an immersed boundary method in a cylindrical coordinate. The Reynolds numbers considered are 100, 250, 300 and 425, at which the base flows are steady axisymmetric, steady planar-symmetric, unsteady planar-symmetric, and unsteady asymmetric, respectively. Several cost functions to be minimized or maximized from blowing and suction on the sphere surface with zero-net mass flow rate are considered for each Reynolds number. Some of them successfully provide drag reduction. Among them, the most effective cost function is the square of the difference between the target pressure (potential-flow pressure) and real pressure on the sphere surface. With this cost function, the flow becomes steady axisymmetric for all the Reynolds numbers considered, and about 20% drag reduction is obtained at  $Re = 425$ .

<sup>1</sup>Supported by the National Creative Research Initiatives, MOST

Haecheon Choi  
Seoul National University

Date submitted: 02 Aug 2005

Electronic form version 1.4