Riccati-based Feedback Stabilization of an Oscillating Vertical Cylinder using a POD Reduced-Order Model[1] LAURENT CORDIER, GILLES TISSOT, BERND NOACK, Institute PPRIME — The aim of this communication is to demonstrate the use of Reduced-Order Model (ROM) based on Proper Orthogonal Decomposition (POD) to stabilize the flow over a circular cylinder in the laminar regime (Reynolds number equal to 60). The control is introduced by vertical oscillations of the cylinder, the objective being to determine by linear control the vertical velocity of the cylinder that stabilizes the flow. Since in Fluid-Structure Interaction, the POD algorithm cannot be applied directly, the fictitious domain method of Glowinski et al. (JMF 1999) is implemented where the solid domain is treated as a fluid undergoing an additional constraint. The POD-ROM is then classically obtained by projecting the Navier-Stokes equations on the first POD modes. The cylinder movement is enforced in the POD-ROM through the introduction of Lagrange multipliers. Finally, a Linear Quadratic Regulator framework is used to determine the optimal control law such that the flow is stabilized.

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