Coupling Pressure Measurements and Boundary Control for the Stabilization of Fluid Flows

J.-P. Raymond[1]

Abstract: We consider fluid flows governed by the Navier-Stokes equations and we are interested in the stabilization of a flow about an unstable stationary solution in the case of partial information. This means that we have some measurements and that we look for a control expressed in terms of an estimate of the velocity of the flow.

In the case of a control acting in a Dirichlet boundary condition and when the observation is expressed in terms of the stress tensor or of the pressure at the boundary, the observation involves the derivative of the control at the boundary. This happens not only for the continuous system but also for discrete models obtained by finite element methods. This leads to unsual filtering and control problems. We shall present a new appraoch for determining a feedback control law and for estimating the velocity of the flow.

This work is in collaboration with several colleagues and post-docs in Toulouse, J.-M. Buchot, L. Thevenet, M. Fournié, P. A. Nguyen, J. Weller, J. Tiago.

[1] Institut de Mathématiques de Toulouse
Université Paul Sabatier
118 Route de Narbonne, 31062 Toulouse Cedex, France
raymond@math.univ-toulouse.fr