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Amjad Tuffaha*, 3620 S Vermont Ave., KAP 104, Dept. of Mathematics, University of Southern California, Los Angeles, CA 90089, and **Viorel Barbu, Zoran Grujic** and **Irena Lasiecka**.

Well-posedness and Optimal Control of System of Fluid Structure Interaction. Preliminary report.

A 3D fluid-structure interaction model in which an elastic body is fully immersed in a viscous incompressible fluid is studied. The interaction is realized through an interface, i.e., the boundary of the elastic body. We establish existence of global weak solutions to this nonlinear model of fluid structure interaction. We also establish existence of smooth solutions in both two and three dimensions given more regular initial data satisfying natural compatibility conditions on the interface. We also consider a boundary control system for the linearized version of the model. The objective is to show that this boundary control model falls in the class of Singular Estimate Control Systems (SECS) for which a complete description of optimal dynamics and feedback control via a solution to a Riccati equation became recently available. This class of control systems was motivated by many boundary and point control systems of coupled PDE that are not necessarily analytic though containing an analytic component. This is joint work with V. Barbu, I. Lasiecka and Z. Grujic. (Received February 13, 2008)