

Elastohydrodynamics of a crankshaft in a journal bearing

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We describe the motion of an elastic cylinder rotating in a journal bearing under hydrodynamic forces of an oil film and cavitation. We obtain a coupled system of 6 ordinary differential equations for the rigid body motion, a vectorial partial differential equation for elastic waves and a variational inequality for the pressure in the oil film. Semidiscretizing the problem we obtain a nonlinear system of the form

$$M(p)\ddot{p} = f(p, \dot{p})$$

whereupon every timestep requires the solution of a discrete cavitation problem. We discuss various aspects of this system.