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Simulation of high Reynolds fluid flow through an array of moving cylinders

Because of its practical importance in industrial applications, many attempts have been made to understand the instability of flow-induced vibration of a periodic array of elastically mounted cylinders. It has been suggested that the instability depends on parameters such as geometry, mass damping and natural frequency of the array as well as the mean velocity of the cross flow. Unfortunately, the available experimental provide conflicting evidence for the stabilizing or de-stabilizing role of the flow's Reynolds number and turbulence intensity. In order to investigate this problem, we are using a high resolution pseudo-spectral scheme to solve the Navier-Stocks equations and Brinkman volume penalization to impose no-slip boundary conditions on the surfaces of the moving cylinders. Our goal is to vary the turbulence intensity, Reynolds number and mean velocity to better understand the role of turbulence in fluid-elastic instability. In this presentation I will focus on my initial work developing numerical tools to efficiently simulate the flow on large numbers of processors.