PHYSICAL MATHEMATICS SEMINAR

Solving flows around flexible boundaries using simple computational grids

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ABSTRACT:

Many applications in science and engineering involve dynamic interactions between flowfields and flexible boundaries (e.g., the interface between different fluid phases, heart valves, flapping wings). Solving these problems computationally is challenging because (i) the boundaries undergo large deformations, and (ii) flow variables may be discontinuous across the boundaries. We introduce a general framework that produces accurate and robust discretizations of such problems using simple computational grids. This is possible because the computational grids are not required to conform to the geometry of the boundaries. Instead, we estimate smooth extensions of the flowfield across the boundaries, such that standard discretizations can be applied. The novelty of this framework is that these smooth extensions are defined as solutions to Cauchy problems in the vicinity of the boundaries. We complete the framework by introducing a numerical scheme to solve these Cauchy problems that is accurate, efficient, and robust with respect to the arbitrary shapes the boundaries may assume with respect to the underlying computational grid.

TUESDAY, NOVEMBER 28, 2017
2:30 PM
Building 2, Room 142

Reception following in Building 2, Room 290
(Math Dept. Common Room)

http://math.mit.edu/seminars/pms/

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