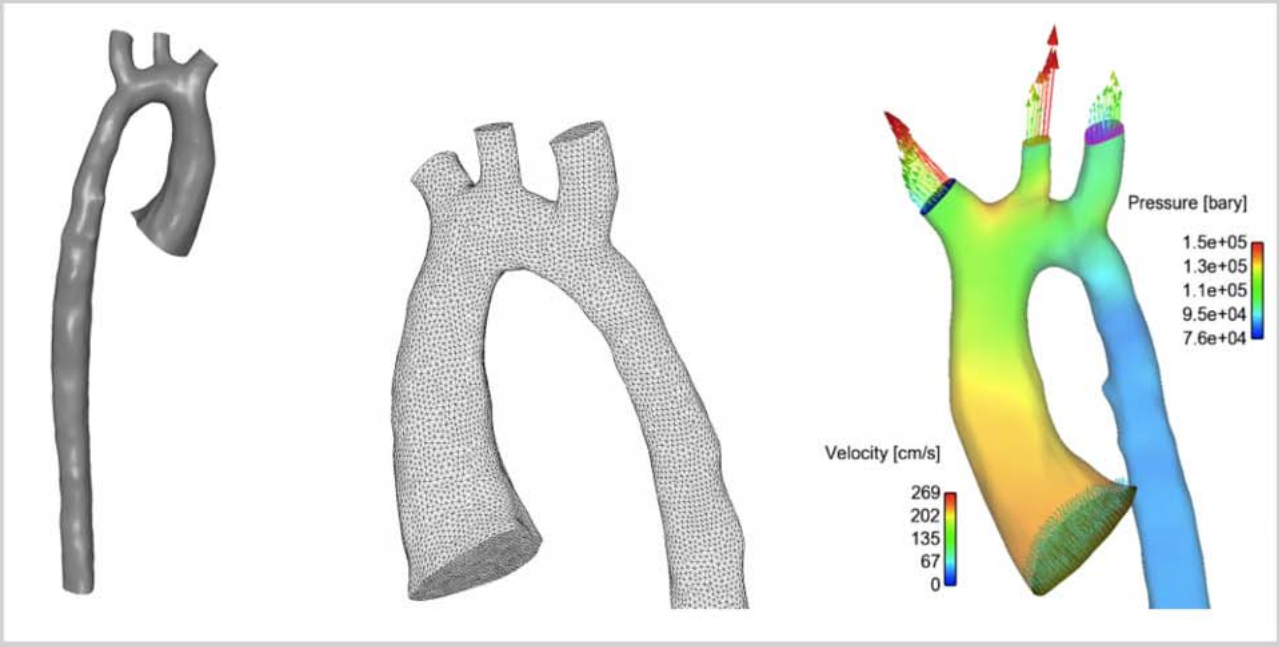
seminario interuniversitario de mecánica y materiales

SEMINARIO INTERUNIVERSITARIO DE MECÁNICA Y MATERIALES
SEMINARIO JOSÉ ANTONIO GARCÍA GARCÍA
MÁSTER DE ESTRUCTURAS

TIME-SPLITTING SCHEMES FOR INCOMPRESSIBLE FLUID-STRUCTURE INTERACTION



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TIME-SPLITTING SCHEMES FOR INCOMPRESSIBLE FLUID-STRUCTURE INTERACTION

Miguel Ángel FERNÁNDEZ

Abstact:

Incompressible fluid-structure interaction problems, i.e., mathematical models that describe the interaction of a deformable structure with an internal or surrounding incompressible fluid flow, are among the most widespread multi-physics problems.

Their numerical simulation is of major interest in practically all the engineering fields, from the aeroelasticity of bridge decks and parachutes, to naval hydrodynamics and the biomechanics of blood and airflow. The separate simulation of either an elastic structure in large displacements or incompressible flow is rather well established. However, making both models interact via efficient partitioned procedures remains a challenge in scientific computing.

In fact, besides the increasing complexity of the models (contacting structures, active mechanics, porous media, etc.), there is also an emerging interest in addressing inverse problems (e.g., to improve clinical diagnosis via personalized vascular models) which definitely calls for efficient partitioned methods.

A key issue in the simulation of these systems is that their numerical approximation is extremely sensitive to the way the interface coupling conditions (kinematic and kinetic continuity) are treated at the discrete level. For instance, it is well known that the energy stability of standard loosely coupled method is dictated by the physics of the system, irrespectively of the discretization parameters. Examples in blood flow simulation are popular.

In this talk we will present an overview of the state-of-the-art on the splitting time-marching alternatives circumventing these infamous difficulties.