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Fluid Structure Interaction simulation of heart prosthesis in patient-specific left-ventricle/aorta anatomies[1] TRUNG LE, IMAN BORAZJANI, FOTIS SOTIROPOULOS, University of Minnesota, SAFL TEAM — In order to test and optimize heart valve prosthesis and enable virtual implantation of other biomedical devices it is essential to develop and validate high-resolution FSI-CFD codes for carrying out simulations in patient-specific geometries. We have developed a powerful numerical methodology for carrying out FSI simulations of cardiovascular flows based on the CURVIB approach (Borazjani, L. Ge, and F. Sotiropoulos, Journal of Computational physics, vol. 227, pp. 7587-7620 2008). We have extended our FSI method to overset grids to handle efficiently more complicated geometries e.g. simulating an MHV implanted in an anatomically realistic aorta and left-ventricle. A compliant, anatomic left-ventricle is modeled using prescribed motion in one domain. The mechanical heart valve is placed inside the second domain i.e. the body-fitted curvilinear mesh of the anatomic aorta. The simulations of an MHV with a left-ventricle model underscore the importance of inflow conditions and ventricular compliance for such simulations and demonstrate the potential of our method as a powerful tool for patient-specific simulations.

[1]Minnesota Supercomputing Institute, National Science Foundation and National Institutes of Health

Trung Le
University of Minnesota

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