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Simulating Prosthetic Heart Valve Hemodynamics: Numerical Model Development[1] LIANG GE, Georgia Institute of Technology, FOTIS SOTIROPOULOS, AJIT YOGANATHAN — Since the first successful implantation of a prosthetic heart valve four decades ago, over 50 different designs have been developed including both mechanical and bio-prosthetic valves. Valve implants, however, are associated with increased risk of blood clotting, a trend which is believed to be linked to the complex hemodynamics induced by the prosthesis. To understand prosthetic valve hemodynamics under physiological conditions, we develop a numerical method capable of simulating flows in realistic prosthetic heart valves in anatomical geometries. The method employs a newly developed hybrid numerical technique that integrates the chimera overset grid approach with a Cartesian, sharp-interface immersed boundary methodology. The capabilities of the method are demonstrated by applying it to simulate pulsatile flow in both bileaflet and tri-leaflet valves moving with prescribed leaflet kinematics.

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