

Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Hybrid immersed boundary method for general purpose CFD simulation KAMAU KINGORA, HAMID SADAT, University of North Texas — We propose a novel direct forcing immersed boundary method, hybrid immersed boundary (HIB), that closely mimics conformal grid formulation. HIB is a hybrid of ghost-cell and cut-cell methods; boundary cells are split along immersed boundary (IB) in similar fashion to cut-cell method and a virtual ghost cell is created in which virtual force act to enforce desired boundary condition at the exact location of IB. HIB is interpolation free and is capable of simulating flow with complex geometries, massless IBs and high aspect ratio. It is especially attractive in flow with multiple IBs and internal flow. Benchmark results obtained from simulation of flow over massless flat plate normal to flow direction, flow over isolated cylinder and flow over a sphere are in close agreement (within 2% margin) with established experimental results. HIB's prowess in handling flow with multiple immersed boundaries is tested by simulating an array of 284 cylinders evenly distributed in circular area. Capability of HIB to simulate turbulent flow with heat transfer has also been demonstrated.

Hamid Sadat
University of North Texas

Date submitted: 10 Aug 2020

Electronic form version 1.4