

Meshfree Vorticity Boundary Condition for Stream-Vorticity Formulation in 2D Incompressible Navier-Stokes Flows

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ABSTRACT

Stream-Vorticity formulation for two-dimensional incompressible Navier-Stokes flows has led to the most popular schemes to solve numerical solutions of the flows. In case of primitive variable approaches, the pressure is tightly bounded with the incompressibility, so that it causes difficulties in solving the numerical solution. Instead, in the stream-vorticity formulation in 2D, the difficulties for pressure moves to the boundary condition of vorticity, which is not given a priori. The only boundary conditions given in this formula are both the stream function values and its normal derivatives on the wall boundaries. Based on these boundary conditions, we have to derive a compatible vorticity boundary conditions on it. In this talk, we propose a effective formula generating the vorticity on the no-slip walls using the meshfree point collocation method that we have developed[1]. We will show the accuracy and convergence of the method through several numerical examples and an interesting phenomenon for highly oscillatory wall.

REFERENCES

1. Y. Kim, D. W. Kim, S. Jun and J. H. Lee, "Meshfree Point collocation Method for the Stream-Vorticity Formulation of 2D Incompressible Navier-Stokes Equations", *Computer Methods in Applied Mechanics and Engineering*, Vol. 196, 3095-3109 (2007)