Natural Boundary Element Method for Stokes Problem of Exterior Circular Domain

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Abstract

As the basis of N-S equations of viscous incompressible fluid, Stokes problems[1] have been the research hotspot for years. However, there have been few exact analytical solutions for the Stokes flow so far. Yu[2] utilized natural boundary element method to calculate the Stokes problem of an exterior circular region, but the equations can but calculate the case that the velocity magnitude of the boundary is zero[3]. Aiming at this limitation, with Fourier series expanded technique of natural boundary element method, the boundary integral formulae can be reduced to resolve arbitrary velocity boundary conditions of exterior circular region. Finally, the concrete example is calculated by the pressure boundary integral formula obtained in this paper and computed by the liquid software, the result of pressure distributions can be shown as Figure It indicates that the boundary integral formula obtained with natural boundary element method in this paper is accurate and intuitionistic.

Figure: Isolines of pressure

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