An average source meshless method for solving the potential problems

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Abstract

A new boundary-type meshless method, to be called the average source meshless method (ASMM), is presented in this paper that is easy to implement and has no requirement of the uniform distribution of boundary nodes. The method is based on an average source technique (AST) and the regularized boundary integral equations (RBIEs). By using the RBIEs to avoid the singularity of the kernel functions, the main difficulty of the coincidence of the source and collocation points disappears and therefore, unlike the traditional MFS, the source points can be located on the physical boundary. By using the AST the distributed source on a segment can be reduced to the concentrated point source and so the boundary integrals are generally not necessary. On the other hand, as we all known, the treatment of the boundary layer effect is a very difficult problem in any meshless method. Herein, we thoroughly solve the problem by AST. Furthermore, the proposed method can effectively compute any boundary fluxes $\partial u/\partial x_i$ ($i=1,2$), but are only not limited to normal flux $\partial u/\partial n$. The accuracy, stability, efficiency and widely practical applicability are verified in numerical experiments of the Dirichlet, and mix-type boundary conditions of interior and exterior problem with simple and complicated boundaries. Good agreements with exact solutions are shown.

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