An Improved Mesh Deformation Method Based on Radial Basis Function

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Abstract : Mesh deformation using radial basis function interpolation method has been demonstrated to produce quality meshes with relatively little computational cost using a concise algorithm. However, it still suffers from the limited deformation ability, especially in large deformation. In this paper, a pre-displacement improvement is proposed to improve the problem that illegal meshes always appear near the moving inner boundaries owing to the large relative displacement of the nodes near inner boundaries. In this improvement, nodes near the inner boundaries are first associated to the near boundary nodes, and a pre-displacement based on the displacements of associated boundary nodes is added to the nodes near boundaries in order to make the displacement closer to the boundary deformation and improve the deformation capability. Several 2D and 3D numerical simulation cases have shown that the pre-displacement improvement for radial basis function (RBF) method significantly improves the mesh quality near inner boundaries and deformation capability, with little computational burden increasement.