EFFICIENT MESH GENERATION USING AN BODY CENTERED CUBIC MESH

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ABSTRACT

To generate a mesh in a physical domain, we construct an initial mesh of a polygonal domain that approximates the physical domain. The initial mesh is formed by using a Body Centered Cubic (BCC) method that can give a more efficient node ordering for matrix vector multiplication. We consider an optimization problem for the displacement on the initial mesh points, which maintains a good quality of triangles while fitting the initial mesh to the boundary of the physical domain. In the optimization problem, we employ the mesh quality function introduced in [1]. To find the optimal solution, we calculate the Fréchet derivative of the objective function, and we then obtain a nonlinear algebraic system. We solve the nonlinear algebraic system by using the Picard iteration method or the Newton’s method. To resolve the complexity in the physical domain, a very fine initial mesh is often required but the solution time for the nonlinear algebraic system becomes problematic. To overcome this limitation, we apply a BDDC domain decomposition preconditioner [2–4] for solving the algebraic system of the Picard iteration method or the Newton’s method. Numerical results for various test models will be presented.

REFERENCES

1. Klingner, B. M., Improving Tetrahedral Meshes, ECS Department, University of California, Berkeley. UCB/EECS-2008-145, 2008