

An Adaptive Mesh Refinement Based on the Movement of Nodes in FEM

Kopysov S.P., Michailova G.V., Novikov A.K.

Institute of Applied Mechanics UB RAS

426000, Gorky st., 222 , Izhevsk city, Russia

E-mail: kopysov@udman.ru

If the finite element solution is refined by the movement of the mesh nodes (r -version of FEM) then the system matrix order and portrait is not changed. This feature is attractive for computations. For example, when r -version of FEM is used dynamic load balancing is not required for parallel solving of the equations. This research is aimed to estimation of the computational costs of adaptive algorithm with refinement by r -version. The refinement procedures are considered on the plane problems of linear elasticity. To support the triangular mesh compatibility when the boundary nodes get over the angle points of the domain, the algorithm and the data structures are suggested. The movement effect of all kinds of nodes on the error is analyzed (the movement of inner nodes, the movement of boundary nodes and their combination). The results and computational costs are compared for r -version with different mesh steps (h , $h/2$, $h/4$, $h/8$) and h -version of FEM. The h -step mesh is sufficiently coarse.