AN ADAPTIVE PROCEDURE FOR MESHLESS METHODS

Cell Energy Error Estimate: The error estimate is based on background cells for meshless methods. In contrast to conventional pointwise error estimates, the proposed estimate evaluates error based on cell instead of point, with the cell energy error being the basic measure. The cell energy error is constructed based on the difference between a computed value and a reference value by using two different Gauss integration schemes. The computed value refers to the cell energy based on the Gauss integration scheme that has been used for the domain integration of the governing equations; the reference value however is formulated based on a different Gauss integration scheme where the values at gauss points are evaluated from the original solution. It has shown that the cell energy error is sensitive to the order of the approximation function and is effective in reflecting the gradient change of the approximation field. The approach holds value for its simplicity, effectiveness and efficiency in numerical implementations.

Refinement Approach: In the process of domain discretisation, each node is assigned a scaling factor which is used to control local nodal density. Local modification of nodal distribution is accomplished simply by adjusting the scaling factor at a node.

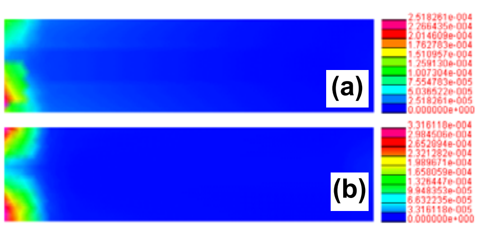

Fig. 1 Error distribution within a cantilever beam. (a) estimated error; and (b) analytical error.

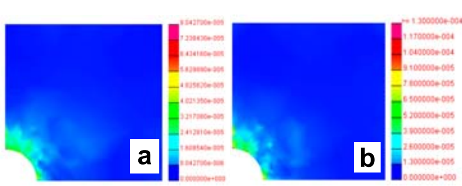

Fig. 2 Error distribution within a square plate with a hole at the centre. (a) estimated error; and (b) analytical error.

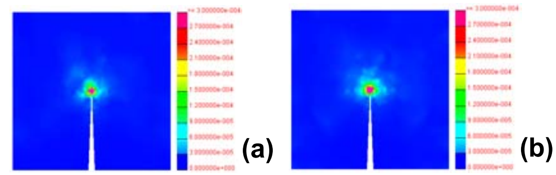

Fig. 3 Error distribution within a square plate containing a single crack. (a) estimated error; and (b) analytical error.

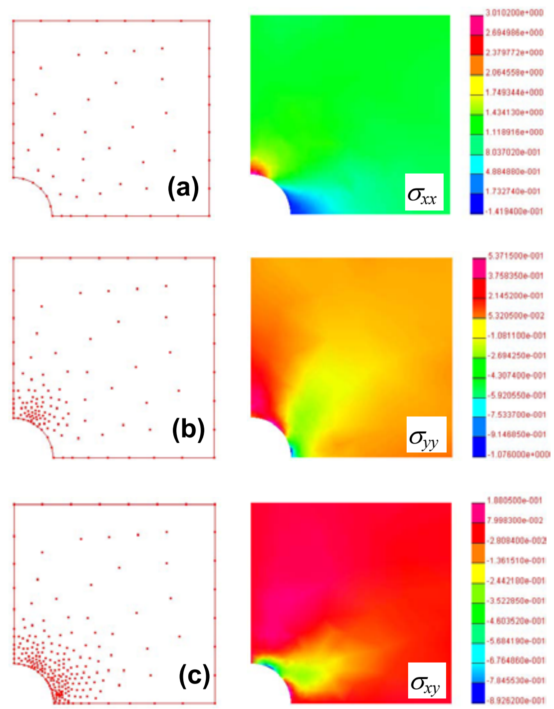

Fig. 4 A square plate with a hole. The refinement process and the final stress distributions.

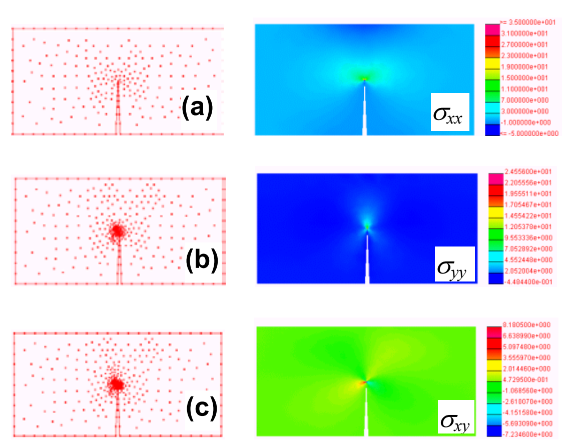

Fig. 5 A rectangular plate with a single crack. The refinement process and the final stress distributions.