An Adaptive Analysis with Content-Adaptive Meshfree Method

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Summary

In order to evaluate the integrity of steel structure, estimation of fatigue life length through numerical analysis of fatigue crack propagation is necessary. In this study we propose an adaptive nodal generation technique algorithm for meshfree analysis based on a content-adaptive modeling technique [1] with Floyd-Steinberg algorithm. The content-adaptive technique is an image representation method based on nonuniform sampling, in which the samples (mesh nodes) are placed automatically so that their spatial density varies in relation to the degree of local image detail.

We adopt this technique for adaptive meshfree analysis of fatigue crack propagation. Nodes can be replaced, added or deleted in accordance not only with the propagation of crack but also with distribution of solution error which is estimated by Double Projection technique in meshfree method [2]. The algorithm consists of following three steps: (1) estimate error through Double Projection method; (2) apply a content-adaptive modeling technique based on the Floyd-Steinberg algorithm to generate the nodes; (3) use Delaunay triangulation to construct background mesh for integration in meshfree method. Through the numerical experiments, the performance of proposed technique is shown.

References

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