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Shape Design Sensitivity Analysis of Dynamic Crack Propagation using Peridynamics

Jae-Hyun Kim[1], Hyun-Seok Kim[2] and Seonho Cho[3]

[1] Seoul national university , 151-019 Gwanak-Gu Seoul, Republic of Korea , priuss1@snu.ac.kr
[2] Seoul national university , 151-019 Gwanak-Gu Seoul, Republic of Korea , roiter85@snu.ac.kr
[3] Seoul national university , 151-019 Gwanak-Gu Seoul, Republic of Korea , secho@snu.ac.kr

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The shape design sensitivity analysis based on meshfree method for the bond-based peridynamics theory is developed for dynamic crack propagation problems. The methods may serve for following two purposes. First, the shortcomings of Finite Difference Methods that involves. Specifically, FDM is very sensitive to design perturbation amounts. Second, to found the basis to proceed shape design optimization. To solve large scale problem, and to improve numerical efficiency, the binary decomposition method is employed for parallel computation. An shape design sensitivity analysis method is developed by using the direct differentiation method(DDM) and adjoint variable method(AVM). shape design sensitivity is developed using Lagrangian approach since geometry and finite grids perturb together during the shape variation. C^1 continuous volume fraction that arise from numerical discretization is needed for accurate analytical shape design sensitivity. The accuracy of analytical design sensitivity is verified by comparing it with the Finite Difference Method.

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