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Meshless Local Petrov-Galerkin Micromechanical Analysis of Periodic Composites Including Shear Loadings

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Summary

In this paper the meshless local Petrov-Galerkin (MLPG) method is used in the micromechanical analysis of a unidirectional fiber composite. The methods have been extended to include shear loadings, thus permitting a more complete micromechanical analysis of the composite subjected to combined loading states. The MLPG formulation is presented for the analysis of the representative volume element RVE of the periodic composite containing material discontinuities. Periodic boundary conditions are imposed between opposite faces of the RVE. The treatment of periodic boundary conditions in the MLPG method is handled by using the multipoint constraint technique. Examples are presented to illustrate the effectiveness of the current model, and it is validated by comparing the results with available analytical and numerical results. The current method shows a great potential in applications to composite material analysis, especially in micromechanics of composites, wherein the complexities meshing can be avoided.