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Formulation and development of two cell-based smoothed plate elements using triangular elements

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Abstract

The paper presents the formulation and development of two cell-based smoothed plate elements using triangular elements proposed recently: the cell-based smoothed discrete shear gap method (CS-DSG3) and the cell-based smoothed three-node Mindlin plate element (CS-MIN3). In the CS-DSG3 and CS-MIN3, each triangular element will be divided into three sub-triangles, and in each sub-triangle, the original plate elements (DSG3 or MIN3) are used to compute the strains and to avoid the transverse shear locking. Then the strain smoothing technique on whole the triangular element is used to smooth the strains on these three sub-triangles. The CS-DSG3 and CS-MIN3 have been now developed for many different analyses such as: (1) analyses of flat shells; (2) response of plates on foundation subjected to moving sprung vehicle; (3) analyses of FGM plates using C0-type higher-order shear deformation theory; (4) analyses of composite plates integrated with piezoelectric sensors and actuators; etc.

Keywords: Reissner-Mindlin plate, smoothed finite element method (S-FEM), cell-based smoothed finite element method (CS-FEM), cell-based smoothed discrete shear gap method (CS-DSG3), cell-based smoothed three-node Mindlin plate element (CS-MIN3), strain smoothing technique.