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Upper bound limit analysis of plates using the isogeometric approach

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In this paper, we propose an alternative numerical procedure based on a rotation-free isogeometric approach for the assessment of collapse limit loads of plastic thin plates. The formulation relies on the kinematic (or upper bound) theorem and namely B-splines or non-uniform rational B-splines (NURBS), resulting in both exactly geometric representation and high order approximations. Only one deflection variable (without rotational degrees of freedom) is used for each control point. This enables us to design the resulting optimization problem with a minimum size that is very useful to solve largescale plate problems. The optimization formulation of limit analysis is transformed into the form of a second-order cone programming problem so that it can be solved using highly efficient interior-point solvers. Several numerical examples are illustrated to demonstrate the performance of the present method in comparison with other published methods.

Keywords: Plate bending, Limit analysis, Rigid-perfect plasticity, Isogeometric analysis, Second order cone programming

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