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## A Kinematically Enhanced Constitutive Model for Elastic and Inelastic Analysis of Unidirectional Fibre Reinforced Composite Materials

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### Abstract:

A constitutive model with an enhanced strain field is developed in this study for predicting the behaviour of unidirectional fibre reinforced composite materials. The different deformation modes introduced in the enhanced strain field take into account of both the variation of strains and internal equilibrium conditions across the fibre-matrix interfaces in unidirectional composites. This opens rooms to accommodate the difference in the responses of fibre and matrix and allows both fibre and matrix to be represented separately by their own constitutive responses. The enriching deformation modes and internal equilibrium conditions lead to a combination of both upper and lower bound solutions on different components of the stress/strain tensors, resulting a homogenised macro response that compares well with experimental data and sophisticated homogenisation approaches in the literature. In addition, the key feature of the proposed approach is that the macro

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