

MODELING UNCERTAINTY PROPAGATION IN LARGE DEFORMATIONS

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A total Lagrangian formulation for quantifying uncertainty propagation in finite deformation problems is presented. The formulation is based on the spectral stochastic expansion of the deformation gradient which results from a spectral stochastic expansion of the current configuration of the body. The spectral expansion is carried out using a polynomial chaos basis. Various other fields that arise in a finite deformation problem (strain and stress measures, consistent moduli etc.) are then computed from the deformation gradient using a toolbox for elementary operations on spectral quantities based on Galerkin projections. Applications to model problems involving uncertainties arising from material heterogeneities, boundary conditions and initial configurations will be presented. It is observed that the developed approach can estimate the probability density function and response statistics of the field variables with satisfactory accuracy in a single simulation. Extensions to solution of problems involving ductile damage with random distribution of voids using a newly developed support space method will also be discussed.

References

[1] S. Acharjee and N. Zabarar, "Uncertainty propagation in finite deformations -- A spectral stochastic Lagrangian approach," *Computer Methods in Applied Mechanics and Engineering*, submitted.