

## ASSESSING DISCRETIZATION UNCERTAINTY IN V&V

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Discretization Uncertainty estimators (or Error Bars) for computational mechanics problems are calculated from error estimators but are distinct from them. For example, the Grid Convergence Index (GCI) is obtained from the Richardson Extrapolation error estimate  $E1$  through multiplication by a factor of safety  $F_s$ .  $E1$  is an ordered approximation based only on asymptotic theory, whereas the GCI is not an ordered approximation to the Uncertainty  $U_{95}$  but an empirical correlation calibrated by  $F_s$  based on computational experiments. The presentation addresses five issues involved in assessing the adequacy of any Discretization Uncertainty estimator (not limited to the GCI). (1) The issue of a probabilistic concept of Uncertainty in regard to a deterministic calculation. (2) The definition of Uncertainty to be used. (3) Achieving statistically significant sampling. (4) Corruption of results for fine grid assessments caused by lack of exact solutions. (5) Outline of a research program for assessing Discretization Uncertainty estimators using the Method of Manufactured Solutions (MMS) to generate realistic exact solutions.