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CREDIBILITY OF COMPUTATIONAL SOLID MECHANICS MODELS

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ABSTRACT

The credibility of computational models has been discussed since the advent of modelling. Credibility can be defined as the willingness of someone to base decisions on the output from the model. The strength of evidence required to provide credibility is dependent on the consequences of making an incorrect decision, which in engineering structures could be very high in both human and financial terms, particularly in areas such as aerospace, civil and nuclear engineering. Traditionally, strain gauges have been fixed on prototypes at locations of high stress identified using the computational model and the results from experiments used to validate the model. This approach leaves open the possibility that high stresses could occur somewhere else in the structure that might cause an unexpected failure, especially if material is removed in an optimisation exercise. Recent advances in optical techniques for measuring strains over the entire surface of engineering components offer the potential for more comprehensive validation and thus, higher credibility for solid mechanics models. Challenges remain in making and interpreting quantitative comparisons of data-rich strain fields obtained from the experiments and models. The session will include illustrations of the potential of modern techniques of strain measurement, validation methodologies incorporating quantitative comparisons of large data sets and approaches to design and operational decision-making based on enhanced model credibility.

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