COMPUTATIONAL EXPLORATIONS OF JOINT MECHANICS

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The nonlinear mechanics of interfaces in bolted (or otherwise built- up) structures are responsible for much of the nonlinearity and most of the damping in those structures. Predictive structural dynamics requires tractable methods to incorporate those physics into the otherwise linear analysis of large structures. The work reported here involves using experiment and high-resolution finite element analysis to develop macroscopic constitutive equations for use in large-scale structural dynamics models.

These mathematical models of joints are then used to capture the appropriate nonlinear and dissipative processes where they actually occur structures. Finite element simulations of structures containing multiple joints have been performed using these tools and the results compared with laboratory measurements. Intriguing contrasts are made between frequency- and time-domain comparisons of simulation and experiment.