

Preface

With the increases in computational power and numerical methods, computer-aided design has allowed engineers to study very-large-scale problems, including built-up structures. Inherent in these problems are nonlinearities, such as frictional interfaces found in joints. Despite advances in computational ability, these nonlinearities are often neglected or linearized in analyses due to the significant computational cost and lack of numerical stability associated with modeling them in high fidelity. One of the principle roadblocks to high-fidelity modeling of interfaces is our lack of understanding of the physics of how energy is dissipated in and transmitted through the joints. In order to advance our understanding from the macroscopic, heuristic models of Coulomb and Amontons to a higher-fidelity model that is accurate at multiple length scales, the joints community has defined a series of research challenges. These challenges involve many branches of mechanical engineering: mechanics, dynamics, tribology, statistical modeling, experimentation, and numerical methods. This book highlights the current challenges as defined by the ASME Research Committee on Mechanics of Jointed Structures and the state-of-the-art methods for modeling jointed structures, including sample code, and offers perspectives on paths forward for modeling jointed structures.

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