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COMPUTATIONAL STRUCTURAL STABILITY

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ABSTRACT

Diagnosis of loss of stability of structures and of their postbuckling behavior is a challenging topic of both fundamental and applied research as well as of engineering practice. The complexity of many stability problems in engineering very often requires the use of advanced mathematical theories of stability and of sophisticated methods of computational mechanics. The rapid progress of computer efficiency has made it possible to tackle problems which previously were considered to be intractable. Detailed studies have to be based on consistent nonlinear formulations as well as on reliable and robust solution procedures. They are directed for instance to the determination of the load-carrying capacity of thin structures being influenced by initial imperfections, material behavior, geometry, and loading. Another field is the design sensitivity analysis of the initial postbuckling behavior of elastic structures, and related to this, the convertibility of such structures from imperfection sensitivity into insensitivity. These are just two examples of a very wide field including the loss of stability in the plastic material domain, dynamic instability, loss of stability of different types of structural members such as beams, panels, shells, etc. A very recent topic of pertinent research are conditions for extreme values of the stiffness of proportionally loaded structures. They may, but need not, be followed by loss of stability.