

Nonlinear Structural Analysis Using Software Design Patterns

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Abstract

The software framework OpenSees makes extensive use of object-oriented techniques, namely software design patterns, to create flexible and interchangeable modules to form and solve the equations that govern a nonlinear structural analysis. Separate interfaces for linear equation solving, root finding algorithms, constraint handlers, and time integration methods are developed in order to give an analyst full control over a structural simulation. The software design also allows a developer to incorporate numerical modules from outside the structural engineering community. Example simulations demonstrate the modeling flexibility afforded by the framework.