On The Nonlinear Dynamics Of Network Structures Under Stochastic Excitation

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ABSTRACT

We present a new approach to the nonlinear dynamic analysis of network cable structures under stochastic excitation.

The basic algorithm is the Central Difference Method for numerical integration of the mathematical model of second order differential equations of motion. As large displacements are considered, geometric nonlinearities are to be expected. At each integration step, the network geometry is updated and the axial forces in the cable elements are computed. Material linearity is preserved. Masses and damping are lumped at the network nodes.

As an example of stochastic excitation, the effect of wind on the structure is modeled via the so called "synthetic wind method", a Monte Carlo type scheme. A wind velocity PSD is adopted and a harmonic components superposition loading is constructed with randomly set phase angles.

Finally a complete example of a cable roof structure is presented and the results compared to available literature.

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