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Nonlinear Dynamics of Cable-Beam Structures

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Summary

This paper considers the nonlinear dynamics of cable-beam structures which are frequently encountered in practical engineering. Unlike the previous studies, most of which are concerned with a single cable connected to a clamped beam, here we consider the case of a beam rigidly connected to two identical cables at the two ends with the other ends of cables fixed to a spatial point, as shown in Fig. 1. The geometrically nonlinear characteristic of the cables is taken into consideration, and the behavior of beam is described by linear Euler-Bernoulli beam theory. Using the generalized Hamiltonian principle, the governing equations, which incorporate several assumptions for the simplicity of analysis, are derived. The linearized homogeneous equations are solved and the exact eigen-solutions are presented. Then the mode expansion method is employed to derive the nonlinear governing equations of the generalized coordinates. A new solution method, i.e. the homotopy Analysis Method is employed for the solution of the resulting equations. Numerical examples are presented and discussed.

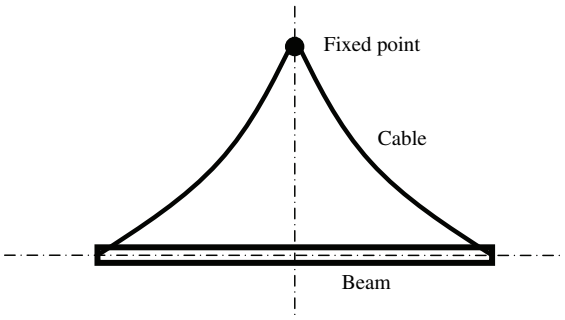

Figure 1: The cable-beam structure

References

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