ملخص البحث رقم (8)

العنوان باللغة الإنجليزية:

Numerical Modeling for Collapse Analysis of Cable-Stayed Bridges using the Improved Applied Element Method

الملخص باللغة الإنجليزية:

This work presents a novel numerical simulation of the collapse process of cable-stayed bridges based on the improved applied element method, which was originally developed as an effective numerical tool for large-scale framed structures under severe loading circumstances. For that, a straight spring element type is utilized for modeling the stay-cable with an equivalent modulus of elasticity that combines the effects of material and geometric deformation of the bridge cables. Moreover, the advantage of the multi-layered element type, which allows for the modeling of various rectangular or non-rectangular RC and composite sections without any complications, is utilized for modeling the pylon and the deck. The pretension forces in the cables are applied by adding an initial loading procedure in which the stay-cable is exposed to an initial strain to consider the effect of prestressing. The mass matrix is modified to include the stay-cable mass, which is lumped at the centroid of the elements connected by the stay-cable. The proposed modeling approach takes material and geometric nonlinearities into account for both the multi-layered element and the stay-cable. Verification examples are provided to examine the capability of the model. The comparison between the results of the proposed modeling technique and the finite element results has shown good agreement, highlighting the reliability of the proposed modeling technique. In addition, the developed tool is used to carry out collapse analysis of a cable-stayed bridge under a cable-loss scenario to examine the capability of the proposed technique.

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