



## 空间索形自锚式悬索桥初始平衡状态分析

### Initial Equilibrium State Analysis of Self-anchored Suspension Bridge with Spatial Cables

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#### 中文摘要

通过缆索系统与塔梁系统的整体分析,对空间索形自锚式悬索桥的初始平衡状态展开研究。主要研究空间缆索系统的吊索——主缆耦合特性,以及自锚式的自平衡特性。先建立空间缆索竖平面为抛物线、水平面为节段线的简化模型,结合最小势能原理推导了解析简化公式。后采用Steffens-Newton法求解耦合的缆索真实模型,结合有限元给出全桥平衡态的数值迭代方法,并编制了程序SASB-IESA。两种算法分别求解算例,对比了二者精度,指出其各自适用性。

#### 英文摘要

The initial equilibrium state analysis is proposed for the self-anchored suspension bridge with spatial cables, through integral analysis of cable-hanger system and tower-beam system. The main study focuses on the coupling characteristic of spatial cable-hanger system and self-equilibrium characteristic of self-anchored system. A simplified model is established in which spatial cable-hanger is simplified as parabola in vertical plane and segmental lines in horizontal plane, and simplified analytical formulas are deduced by the minimum potential energy principle. Steffens-Newton algorithm is employed to solve actual cable-hanger coupling model, and FEA method is incorporated to establish numerical iterative method for entire equilibrium state. The program SASB-IESA is written. A numerical example is solved with the two proposed methods respectively, and their applicability is pointed out based on the comparison of their result accuracy.

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