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自錨式吊拉組合橋車道荷載影響線之探討
Investigation on the Lane Load Influence Line of Self-Anchored Combined Cable-stayed Suspension Bridge

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摘要

自錨式吊拉組合橋具有主纜也有斜拉索，兼備了自錨式懸索橋和斜張橋的許多優點，形成了一種全新結構體系。相較於自錨式懸索橋，它具有較高的抗風穩定性；相較於斜張橋，它具有較低的橋塔高度，且不需要龐大的錨碇基座，因而它更能適應複雜軟弱的地質條件，所以在大跨度橋梁中具有很大的發展空間。在橋梁結構分析時，一般需藉由影響線來確定活載重的臨界位置，進而得出斷面最大應力值，以作為斷面設計之依據，因此如何針對非線性與高靜不定度的吊拉組合橋進行影響線分析，便成為一項值得探討的研究課題。本文即針對此項課題進行模擬分析，並分析比較幾何形式及纜索材料改變對自錨式吊拉組合橋影響線之影響。由分析結果顯示，在活載重作用下幾何形狀及纜索勁度改變對主梁的彎矩和垂直變位均有一定程度的影響。
關鍵詞：吊拉組合橋，自錨式，影響線

Abstract

A self-anchored, combined cable-stayed suspension bridge, which includes stayed cables and possesses, combines merits of both a self-anchored suspension bridge and a cable-stayed suspension bridge, which forms a totally renewed structure mechanism. When compared to a self-anchored suspension bridge, this type of bridge gives better wind-resisting stabilities; and when compared to a cable-stayed suspension bridge, this type of bridge requires a lower tower height and does not require huge anchor bases. Hence, it is more adaptable to complex and weak geological conditions, and is therefore expected to have a more extensive developing room in the category of large-span bridges. When analyzing bridge structures, an influence line analysis is generally required to determine the critical position of the live load, so that the maximum stress of a section can be attained and be used as the basis for section design. Hence, how to perform an influence line analysis of a nonlinear combined cable-stayed suspension bridge of high-indeterminacy becomes a subject that is worthy of study. This paper intends to perform numerical analysis on this subject and to investigate the influence of the variation of geometric parameter and cables parameter on the influence line behavior of cable-stayed suspension bridge. The analysis result shows that, under actions of live loads, both the change of geometric parameter and cables parameter provide influences to a certain extent on the bending moment and vertical displacement of the bridge girder.
Keywords: combined cable-stayed suspension bridge, self-anchored, influence line

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