输电塔塔身交叉斜材拓扑优化方法研究

Synthesis method for topology optimization of intersecting bracing members on the body of transmission tower

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中文摘要

输电塔塔身交叉斜材的拓扑形式是决定塔体重量的关键。本文提出将其优化问题分成三个步骤来完成：首先，针对塔重随节点数目变化具有单谷性的特点，提出利用斐波那契搜索确定最优的基节点数目，构建了原始的基结构模型；其次，提出了一种递归方法得到所有满足工程习惯的杆系拓扑形式，在此基础上结合蚁群算法寻找出最优的设计方案；最后，使用序列二级算法对塔身节点坐标进行调整。使用本方法对三个不同算例的塔身段斜材的拓扑和所有塔身节点坐标进行了优化，得到了新的杆系拓扑形式，相对原设计节省了一定钢材，并满足了工程实用性的要求。

英文摘要

Topology of intersection bracing members on the body of transmission tower is the key to determining structure’s total weight. In this paper, the problem of its optimization was solved in three steps: First, the ground structure’s nodes were got by Fibonacci search according to the characteristics ,that there was only one minimum when the total weight varieties with the number of nodes , so the ground structure was built; Second, a recursion procedure was proposed to find all the feasible topology schemes, and ant colony algorithm was employed to find the optimal one; third, node’s coordinates were optimized by sequence two-stage algorithm. Applications for three samples were presented, the topology of the intersection diagonal members and all the node’s coordinates were optimized, Key results include a new topology design and a certain mass reduction, and the result is practical in project.

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