عنوان مقاله:

Structural Stiffness Matching Modeling and Active Design Approach for Multiple Stepped Cantilever Beam

محل انتشار:

ماهنامه بین المللی مهندسی, دوره 35, شماره 7 (سال: 1401)

تعداد صفحات اصل مقاله: 10

نویسندگان:

Manhui Zhang - *Northwest Institute of Mechanical and Electrical Engineering, Xianyang, China*

Zhongchen Cao - *Northwest Institute of Mechanical and Electrical Engineering, Xianyang, China*

Fangchao Xia - *Northwest Institute of Mechanical and Electrical Engineering, Xianyang, China*

Zhong Yao - *Northwest Institute of Mechanical and Electrical Engineering, Xianyang, China*

خلاصه مقاله:

Aiming at the problem that it is difficult to realize the optimal design due to the fuzzy mapping relationship for the structural stiffness of multiple stepped cantilever beam, a stiffness matching modeling and active stiffness design approach was proposed. Firstly, by deriving out the continuous coordination conditions and the load extrapolation expressions of the cantilever joint, the stiffness analytical model and the recursive model were established for multiple cantilever beam segments, and the stiffness influence coefficient of those composition parameters were obtained by the sensitivity analysis. Then, the active stiffness optimization design process was constructed according to the stiffness design level of the stepped cantilever beam, and those implementation procedures were figured out clearly. Finally, the comparison and verification of the stiffness design of the stepped cantilever beam was carried out through numerical simulations, finite element analysis and bench test. The obtained results showed that the established models and the active stiffness design method are reasonable and effective, the stiffness match parameters are easy to meet the stiffness index requirements, and the safety factor is greater than ۱; when the number of steps is not more than ۵, the relative error between the match stiffness and the test stiffness is less than ۱۵%, which can be reduced to less than ۵% by adding redundancy coefficient [۱.۰۵, ۱.۱۵].

کلمات کلیدی:

cantilever beam, Stiffness match, Active design, Stiffness index, optimization

لینک ثابت مقاله در پایگاه سیویلیکا: