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Finite element method for optimum design selection of carport structures under multiple load cases

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ABSTRACT

In the field of structural modelling, it is obvious that the number of applicable designs for a particular structural necessity is limitless. Along with the integration of various kinds of available structural materials into this complexity, it gets harder to be able to determine the best design before the production stage. In recent years, with the improvement of computational and structural technology, there have been many studies on the optimal design selection. This study focuses on carport structures and pursuing their best producible shape. For this aim, a performance index formulation was developed to assist the decision of material efficiency as well as structural rigidity. Thereafter, five conceptual models were numerically modelled and finite element analyses (FEA) for multiple load cases were carried out. Reviewing the FEA results, the most appropriate model was determined by the application of this performance qualification method. Results of the analyses show that optimum design of structures under multiple load cases can be determined using finite element method.

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Izvirni znanstveni članek

Metoda končnih elementov za optimalno zasnovo konstrukcije avtomobilskih nadstreškov pri različnih obremenitvah

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POVZETEK

Pri zasnovi konstrukcij je strukturnih rešitev ne glede na potrebe praktično neomejeno. Ko v zasnovo konstrukcije vključimo različne razpoložljive materiale, pa je najboljšo strukturo še težje določiti. V preteklem obdobju je bilo na to temo opravljenih dosti študij. Ta prispevek se ukvarja s določitvijo oblike konstrukcije za avtomobilske nadstreške z ozirom na prednosti pri proizvodnji. Vpeljan je indeks uspešnosti, ki pomaga pri izbiri materiala in strukturne togosti. Pripravljenih je bilo pet numeričnih modelov za preračun z metodo končnih elementov (MKE) pri različnih obremenitvah. Iz rezultatov MKE in z uporabo uspešnostne kvalifikacijske metode je nato izbran najprimernejši koncept. Rezultati kažejo, da je s pomočjo MKE mogoče določiti najboljšo strukturno zasnovo konstrukcije pri različnih obremenitvah.

PODATKI O ČLANKU

Ključne besede:
Izvedljivost strukture
Izbira po uspešnosti
Obremenitveni testi
Proizvodnja
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