Evolution methods for discrete minimal weight design of space trusses with stability constraints

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This paper provides a comparative study of evolution methods for minimal weight design of space trusses. Recently used genetic algorithms (GA), simulated annealing (SA) and tabu search (TS) methods are observed for metal structures where the truss member profiles are selected from available catalogue values. In this paper, global and local stability problems are considered using a path-following method for non-linear stability investigation. The results of the comparative study are presented for the commonly known numerical test problems. A twenty-four-member shallow dome structure was presented where structural instability constraints and member buckling are considered as well as using linear elastic material property. The effect of the nonlinear material law is compared in optimal design of the ten-bar truss structure and the twenty-five-bar transmission tower using an inverse Ramberg-Osgood material law.