Global optimization of discrete truss topology design problems using a parallel cut-and-branch method

The subject of this article is solving discrete truss topology optimization problems with local stress and displacement constraints to global optimum. We consider a formulation based on the Simultaneous ANalysis and Design (SAND) approach. This intrinsically non-convex problem is reformulated to a mixed-integer linear program, which is solved with a parallel implementation of branch-and-bound. Additional valid inequalities and cuts are introduced to give a stronger representation of the problem, which improves convergence and speed up of the parallel method. The valid inequalities represent the physics, and the cuts (Combinatorial Benders’ and projected Chvátal–Gomory) come from an understanding of the particular mathematical structure of the reformulation. The impact of a stronger representation is investigated on several truss topology optimization problems in two and three dimensions.

General information
State: Published
Organisations: Applied functional analysis, Department of Mathematics
Contributors: Rasmussen, M. H., Stolpe, M.
Pages: 1527-1538
Publication date: 2008
Peer-reviewed: Yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.365 SNIP 2.465
Web of Science (2010): Impact factor 1.722
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.299 SNIP 1.841
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.416 SNIP 1.91
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.221 SNIP 1.673
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.804 SNIP 1.568
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.966 SNIP 1.345
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.03 SNIP 1.571
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.302 SNIP 1.213
Scopus rating (2002): SJR 1.201 SNIP 1.102
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.674 SNIP 0.962
Scopus rating (2000): SJR 1.064 SNIP 0.882
Scopus rating (1999): SJR 0.818 SNIP 0.707

Original language: English
Keywords: Parallel computing, Discrete bar areas, Stress constraints, Cut-and-branch, Truss topology optimization, Global optimization
DOI:
10.1016/j.compstruc.2007.05.019
Source: orbit
Source-ID: 220907
Research output: Research - peer-review › Journal article – Annual report year: 2008