Automatic penalty continuation in structural topology optimization - DTU Orbit (08/11/2017)

Automatic penalty continuation in structural topology optimization

Structural topology optimization problems are often modelled using material interpolation schemes to produce almost solid-and-void designs. The problems become non convex due to the use of these techniques. Several articles introduce continuation approaches in the material penalization parameter to reduce the risks of ending in local minima. However, the numerical performance of continuation methods has not been studied in detail. The first purpose of this article is to benchmark existing continuation methods and the classical formulation with fixed penalty parameter in structural topology optimization. This is done using performance profiles on 225 minimum compliance and 150 compliant mechanism design problems. The results show that continuation methods generally find better designs. On the other hand, they typically require a larger number of iterations. In the second part of the article this issue is addressed. We propose an automatic continuation method, where the material penalization parameter is included as a new variable in the problem and a constraint guarantees that the requested penalty is eventually reached. The numerical results suggest that this approach is an appealing alternative to continuation methods. Automatic continuation also generally obtains better designs than the classical formulation using a reduced number of iterations.

General information

State: Published
Organisations: Department of Wind Energy, Wind Turbines
Authors: Rojas Labanda, S. (Intern), Stolpe, M. (Intern)
Number of pages: 17
Pages: 1205-1221
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information

Journal: Structural and Multidisciplinary Optimization
Volume: 52
Issue number: 6
ISSN (Print): 1615-147X
Ratings:
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.14
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.42
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.77
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.86
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.08
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 1.85
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Web of Science (2008): Indexed yes

Web of Science (2007): Indexed yes

Web of Science (2006): Indexed yes

Web of Science (2005): Indexed yes

Web of Science (2004): Indexed yes

Web of Science (2003): Indexed yes

Web of Science (2002): Indexed yes

Web of Science (2001): Indexed yes

Web of Science (2000): Indexed yes

Original language: English

Software, Computer Graphics and Computer-Aided Design, Computer Science Applications, Control and Systems Engineering, Control and Optimization, Benchmarking, Continuation methods, Mechanism design, Minimum compliance, Topology optimization, Compliant mechanisms, Design, Machine design, Mechanisms, Numerical methods, Optimization, Shape optimization, Topology, Continuation method, Interpolation schemes, Number of iterations, Numerical performance , Performance profile, Structural topology optimization, Structural optimization

DOIs:

10.1007/s00158-015-1277-1

Relations

Activities:

Linear Algebra and Optimization Seminar 2014

Source: FindIt

Source-ID: 2279892924

Publication: Research - peer-review › Journal article – Annual report year: 2015