A compact cyclic plasticity model with parameter evolution

The paper presents a compact model for cyclic plasticity based on energy in terms of external and internal variables, and plastic yielding described by kinematic hardening and a flow potential with an additive term controlling the nonlinear cyclic hardening. The model is basically described by five parameters: external and internal stiffness, a yield stress and a limiting ultimate stress, and finally a parameter controlling the gradual development of plastic deformation. Calibration against numerous experimental results indicates that typically larger plastic strains develop than predicted by the Armstrong–Frederick model, contained as a special case of the present model for a particular choice of the shape parameter. In contrast to previous work, where shaping the stress-strain loops is derived from multiple internal stress states, this effect is here represented by a single parameter, and it is demonstrated that this simple formulation enables very accurate representation of experimental results. An extension of the theory to account for model parameter evolution effects, e.g. in the form of changing yield level, is included in the form of extended evolution equations for the model parameters. Finally, it is demonstrated that the model in combination with a simple parameter interpolation scheme enables representation of ratcheting effects.

General information
State: Published
Organisations: Department of Mechanical Engineering, Solid Mechanics, Technical University of Denmark
Contributors: Krenk, S., Tidemann, L.
Pages: 57-68
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: Mechanics of Materials
Volume: 113
ISSN (Print): 0167-6636
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 2.91 SJR 1.248 SNIP 1.659
Web of Science (2017): Impact factor 2.697
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.76 SJR 1.253 SNIP 1.593
Web of Science (2016): Impact factor 2.651
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.66 SJR 1.21 SNIP 1.796
Web of Science (2015): Impact factor 2.636
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.56 SJR 1.376 SNIP 1.83
Web of Science (2014): Impact factor 2.329
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.58 SJR 1.188 SNIP 1.721
Web of Science (2013): Impact factor 2.225
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.2 SJR 1.288 SNIP 1.882
Web of Science (2012): Impact factor 1.936
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2.22 SJR 1.448 SNIP 1.924
Web of Science (2011): Impact factor 1.769
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.374 SNIP 1.827
Web of Science (2010): Impact factor 1.911
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.878 SNIP 2.066
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.839 SNIP 2.121
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.856 SNIP 2.12
Scopus rating (2006): SJR 1.776 SNIP 2.146
Scopus rating (2005): SJR 1.599 SNIP 1.844
Scopus rating (2004): SJR 1.494 SNIP 1.639
Scopus rating (2003): SJR 1.677 SNIP 1.623
Scopus rating (2002): SJR 1.246 SNIP 1.36
Scopus rating (2001): SJR 1.136 SNIP 1.034
Scopus rating (2000): SJR 0.816 SNIP 1.249
Scopus rating (1999): SJR 0.778 SNIP 0.861
Original language: English
Keywords: Cyclic plasticity, Kinematic hardening, Material degradation, Model parameter evolution
DOIs: 10.1016/j.mechmat.2017.07.012
Source: Scopus
Source-ID: 85026376494
Research output: Research - peer-review Journal article – Annual report year: 2017