Assessing and updating the reliability of concrete bridges subjected to spatial deterioration - principles and software implementation

Inspection and maintenance of concrete bridges is a major cost factor in transportation infrastructure, and there is significant potential for using information gained during inspection to update predictive models of the performance and reliability of such structures. In this context, this paper presents an approach for assessing and updating the reliability of prestressed concrete bridges subjected to chloride-induced reinforcement corrosion. The system deterioration state is determined based on a Dynamic Bayesian Network (DBN) model that considers the spatial variability of the corrosion process. The overall system reliability is computed by means of a probabilistic structural model coupled with the deterioration model. Inspection data are included in the system reliability calculation through Bayesian updating on the basis of the DBN model. As proof of concept, a software prototype is developed to implement the method presented here. The software prototype is applied to a typical highway bridge and the influence of inspection information on the system deterioration state and the structural reliability is quantified taking into account the spatial correlation of the corrosion process. This work is a step towards developing a software tool that can be used by engineering practitioners to perform reliability assessments of ageing concrete bridges and update their reliability with inspection and monitoring data.

General information
State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Federal Institute for Materials Research and Testing, Technische Universität München
Contributors: Schneider, R., Fischer, J., Bügler, M., Nowak, M., Thöns, S., Borrmann, A., Straub, D.
Number of pages: 10
Pages: 356-365
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Structural Concrete
Volume: 16
Issue number: 3
ISSN (Print): 1464-4177
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 1.56 SJR 1.031 SNIP 1.513
Web of Science (2017): Impact factor 1.384
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.74 SJR 0.99 SNIP 1.684
Web of Science (2016): Impact factor 1.424
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.1 SJR 0.836 SNIP 1.111
Web of Science (2015): Impact factor 1.023
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 1.17 SJR 1.153 SNIP 1.636
Web of Science (2014): Impact factor 1.492
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 0.82 SJR 0.772 SNIP 1.418
Web of Science (2013): Impact factor 0.857
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 0.36 SJR 0.313 SNIP 0.771
Web of Science (2012): Impact factor 0.289
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 0.37 SJR 0.547 SNIP 1.152
Web of Science (2011): Impact factor 0.27
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.451 SNIP 0.709
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.385 SNIP 1.038
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.246 SNIP 0.813
Scopus rating (2007): SJR 0.23 SNIP 0.384
Scopus rating (2006): SJR 0.153 SNIP 0.664
Scopus rating (2005): SJR 0.13 SNIP 0.634
Scopus rating (2004): SJR 0.387 SNIP 0
Scopus rating (2003): SJR 0.188 SNIP 0
Scopus rating (2002): SJR 0.101
Original language: English
DOIs:
10.1002/suco.201500014
Source: FindIt
Source-ID: 2279470123
Research output: Research - peer-review › Journal article – Annual report year: 2015