Probabilistic runoff volume forecasting in risk-based optimization for RTC of urban drainage systems - DTU Orbit (01/02/2019)

Probabilistic runoff volume forecasting in risk-based optimization for RTC of urban drainage systems
This article demonstrates the incorporation of stochastic grey-box models for urban runoff forecasting into a full-scale, system-wide control setup where setpoints are dynamically optimized considering forecast uncertainty and sensitivity of overflow locations in order to reduce combined sewer overflow risk. The stochastic control framework and the performance of the runoff forecasting models are tested in a case study in Copenhagen (76 km² with 6 sub-catchments and 7 control points) using 2-h radar rainfall forecasts and inlet flows to control points computed from a variety of noisy/oscillating in-sewer measurements. Radar rainfall forecasts as model inputs yield considerably lower runoff forecast skills than “perfect” gauge-based rainfall observations (ex-post hindcasting). Nevertheless, the stochastic grey-box models clearly outperform benchmark forecast models based on exponential smoothing. Simulations demonstrate notable improvements of the control efficiency when considering forecast information and additionally when considering forecast uncertainty, compared with optimization based on current basin fillings only.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Urban Water Systems, Department of Environmental Engineering, Dynamical Systems, Krüger A/S
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Pages: 143-158
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Environmental Modelling & Software
Volume: 80
ISSN (Print): 1364-8152
Ratings:
BFI (2019): BFI-level 2
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 4.77 SJR 1.963 SNIP 1.957
Web of Science (2017): Impact factor 4.177
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.8 SJR 1.986 SNIP 2.105
Web of Science (2016): Impact factor 4.404
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 4.67 SJR 2.078 SNIP 2.144
Web of Science (2015): Impact factor 4.207
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 5.04 SJR 2.077 SNIP 2.466
Web of Science (2014): Impact factor 4.42
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 4.8 SJR 2.035 SNIP 2.428
Web of Science (2013): Impact factor 4.538
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 3.69 SJR 1.833 SNIP 2.009
Web of Science (2012): Impact factor 3.476
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes