Simplification of one-dimensional hydraulic networks by automated processes evaluated on 1D/2D deterministic flood models - DTU Orbit (21/12/2018)

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Evaluation of pluvial flood risk is often based on computations using 1D/2D urban flood models. However, guidelines on choice of model complexity are missing, especially for one-dimensional (1D) network models. This study presents a new automatic approach for simplification of 1D hydraulic networks (SAHM) using trimming and merging techniques, with performance evaluated in a 1D/2D case study. Decreasing the number of elements in the 1D model by 66% yielded a 35% decrease in computation time of the coupled 1D/2D simulation. The simplifications increased flow in some downstream branches and removing nodes eliminated connection to some areas. This promoted errors in two-dimensional (2D) flood results with changes in spatial location of flooding in the reduced 1D/2D models. Applying delayed rain inputs to compensate for changes in travel time and preserving network volume by expanding node diameters did not improve overall results. Investigations on the expected annual damages (EAD) showed that differences in EAD are smaller than deviations in the simulated flooded areas, suggesting that spatial changes are limited to local displacements. Probably, minor improvements of the simplification procedure will further improve results of the reduced models.

General information
State: Published
Organisations: Department of Environmental Engineering, Urban Water Systems
Contributors: Davidsen, S., Löwe, R., Thrysøe, C., Arnbjerg-Nielsen, K.
Number of pages: 15
Pages: 686-700
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: Journal of Hydroinformatics
Volume: 19
Issue number: 5
ISSN (Print): 1464-7141
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 1.69 SJR 0.727 SNIP 1.131
Web of Science (2017): Impact factor 1.797
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.73 SJR 0.73 SNIP 1.003
Web of Science (2016): Impact factor 1.634
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.47 SJR 0.697 SNIP 0.97
Web of Science (2015): Impact factor 1.18
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 1.74 SJR 0.795 SNIP 1.379
Web of Science (2014): Impact factor 1.388
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 1.55 SJR 0.768 SNIP 1.011
Web of Science (2013): Impact factor 1.336
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 1.34 SJR 0.623 SNIP 0.911
Web of Science (2012): Impact factor 1.153
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 1.38 SJR 0.466 SNIP 1.153
Web of Science (2011): Impact factor 1.048