Hydrology and Earth System Sciences Discussions

Interactive comment on "Multi-objective optimization using evolutionary algorithms for qualitative and quantitative control of urban runoff" *by* S. Oraei Zare et al.

S. Oraei Zare et al.

sadegh.oraei@gmail.com

Received and published: 23 May 2012

Dear Dr. Fabrizio Fenicia,

The authors wish to thank the reviewers for their accurate and constructive comments on the manuscript entitled "Multi-objective optimization using evolutionary algorithms for qualitative and quantitative control of urban runoff ".

Most of the revisions in the article have been performed in the following sections:

I: Abstract and Introduction sections were modified and innovations were highlighted.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

II: The language of the text has been revised and many parts were rewritten.

III: Formulations and the methodology of the paper was rewritten for sake of more clarity.

IV: In the Results and Discussion section, more interpretations were added such as on k-means method for classification, how to reduce pareto for selection of appropriate scenarios (for planners and policy makers in urban management), introducing an indicator for convergence evaluation. Moreover, the results were explained with more clarity.

V: Tables and figures were upgraded according to referees' comments

VI: More references relevant to some of the employed methods were added.

VII: The response to each referees' comments were carefully prepared as attached. The revised paper is also attached for further consideration.

We look forward to hearing from you soon.

Sincerely Yours,

Sadegh Oraei Zare

Department of Technical and Engineering,

Science and Research Branch, Islamic Azad University, Tehran, Iran

Email: sadegh.oraei@gmail.com

....

Response to Referee 1:

1) The quality of English is not good enough. I suggest the authors to revise the paper completely regarding English language. I try to help as much as possible, however some phrases should be changed completely in my point of view.

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

Answer: The paper was fully revised. We hope that the revisions meet the standards of the journal.

2) The topic seems interesting and fascinating however the choice of Multi-Objective Evolutionary Optimization Algorithms seem to be arbitrary, it would be nice if the authors justified the use of these two methods rather than more efficient algorithm like MOSCEM-UA (Vrugt et al., 2003).

Answer: MOPSO and NSGAII optimization algorithms that were used in this paper enjoy a wide range of applications and a long history in water resources management. Nevertheless, we understand that there are more choices, some newer and more efficient ones as well, that we will be part of our future research in this interesting subject.

3) I would suggest instead of comparing mean and standard deviation, the authors should show whether the distribution and frequency of Pareto-optimal parameter sets are different or not.

Answer: The distribution and frequency of Pareto-optimal parameters were studied. The results showed that the distribution functions were different for the two optimization algorithms. Furthermore, the results showed that although MOPSO variation range was wider, the NSGAII data scatter was more than MOPSO.

4) Although the paper is not about modeling, it would be nice to justify the model structure used in this study.

Answer: The modeling structure used in this study is presented in sections 3.1, 3.2 and 3.3. also Figure 7 that it was revised also shows the model structure used in this study.

5) I strongly suggest the authors to improve "result and discussion" section by further elaboration of graphs and tables.

Answer: The results and discussion section was further completed. Please see the revised text.

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

6) Try not to use identical sentence and phrases, tell the story with new sentences even if they seem to be obvious and general.

Answer: Thank you. We did our best in the revised form.

7) Make figures and graphs more illustrative and try not to copy them from different sources, instead, try to make coherent version of figures with the same line weight and color, text font and size. Include units everywhere in figures and tables.

Answer: Appropriate corrections were made to the figures.

8) What is the conclusion of the paper? I suggest making it clear for readers. What is the aim of this paper, finding the best management practice or finding which optimization proactive works better?

Answer: The conclusions were revised based on the reviewer comment. Generally, the aim of this paper was to find the best flood/quality management scenarios that could be obtained based on optimal trade-off curve.

9) The efficiency of each optimization algorithm may change significantly by changing its parameters; did the authors take this into account?

Answer: The comment is entirely appropriate. Since the selection of parameters has a significant impact on the acceptability of the optimal solution, we first considered the recommendations about the selection of relevant parameters based on available literature (as below). Then, the effects of the parameters' variation on the solution were assessed and suitable parameters were selected.

Eberhart, R.C., and Kennedy, J.: Particle swarm optimization, Proceedings of IEEE International Conference on Neural Networks, Piscataway, NJ, pp. 1942-1948, 1995.

Parsopoulos, K.E. and Vrahatis, M.N.: Particle Swarm Optimization Method in Multi-objective Problems, Proceedings of the ACM 2002 Symposium on Applied Computing (SAC'2002), pp. 603-607, 2002.

Carlisle, A. and Dozier, G.: An off-the-shelf PSO, paper presented at the Particle Swarm Optimization Workshop, Purdue Sch. of Eng. And Technol., Indianapolis, Indiana, 2001.

Deb, K., Pratap, A., Agarwal, S., and Meyarivan, T.: A Fast and Elitist Multi-Objective Genetic Algorithm-NSGA-II, IEEE Transactions on Evolutionary Computation 6 (2): 182–197, doi:10.1109/4235.996017, 2002.

specific comments:

Answer: All specific comments were incorporated into the revised paper.

Response to Referee2:

1) English must be seriously revised to reconsider the paper publication. There are too much syntax and grammar mistakes. Since Referee #1 has reported a very detailed list of items to be corrected, I will not go through it again.

Answer: Yes, the whole text of the paper was revised.

2) Objectives and novel contributions of the paper are not clear at all in the abstract, introduction and conclusions sections.

Answer: In abstract, introduction and conclusions, contributions and distinct goals of the research were described.

3) Hydrological and hydraulic modeling. Hydrological, hydraulic and water quality parameters have been calibrated and validated in the study area? Could these parameters strongly affect the optimization results?

Answer: The models were not calibrated in this study since no observed systematically-collected data on quantity/quality was available. However, by using the recommendations in the literature as well as the sparse local studies conducted in the study area, parameters of the models were estimated.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

4) Definition of decision variables and objective functions. Section 3.4 is unclear. Too many ideas and formulations are supposed to be obvious, so that, it's quite difficult for readers to go through the paper easily.

Answer: The description of the objective function and decision variables as well as the constraints associated with the optimization algorithm were revised and presented in Section 3.4.

5) Results and discussion. In my opinion, this section is very poor and should be enlarged and improved since new ideas and contributions of the paper must be highlighted and justified here. Conclusions must be clear, sound and backed up by results.

Answer: The results and conclusions sections were revised to accommodate for contributions of the paper.

Specific Comments

1) P778 L10. " :aimed at finding optimal solution: : :" What is the aim of this optimal solution? What are the objectives that justify the optimization the authors performed?

Answer: The optimal solution represents the optimal flood/quality management scenarios. Details were added to the "objective function" section.

2) P782 L3-4. Why the authors use the kinematic wave approximation of full Saint-Venant equations?

Answer: Since the main goal of this paper was to study a multi objective optimization problem, we used similar experiences for modeling hydraulic and hydrologic aspects of urban drainage networks. It is suggested in the literature that where no appropriate data for calibration of routing models is available, the KW approximation may be sufficient for flow routing in urban stormwater predictions. Some of the papers on this issue are as follows:

Cheng, J.Y.C.: Modification of Kinematic Wave cascading model for low impact water-

shed development, Ph.D., University of Colorado at Denver, 242 pp.,2011.

Guo, J.C.Y. and Urbonas, B.: Conversion of Natural Watershed to Kinematic Wave Cascading Plane, Journal of Hydrologic Engineering, 14(8), 839-846, 2009.

3) P782 L22. "Mass is expressed:" Do the authors really think that these kinds of clarifications are necessary?

Answer: The specified units are based on SWMM users guide, suggested for two different systems.

4) P783 L23. An initial screening of BMPs alternatives seems to have been done since optimization only deals with rain barrels, porous pavements and bio-retention. What criteria have been used to do that?

Answer: Relevant descriptions in Section 3.3 (Selection of BMPs) were added. In this section authors explain restrictions in choosing the appropriate BMPs

5) P785 and P786. Equations 5 to 10. Some variable units are not properly defined.

Answer: The variables in Equations 5 to 10 were defined in Sections 3.4.

6) P788. Equations 11 to 14. Some variables are undefined.

Answer: The definition of variables in Equations 11 to 14 was added.

7) P790 L12-15. This conclusion is obvious. In my opinion, there is no need of a multi-objective optimization to conclude that using solutions that promote infiltration will reduce runoff production.

Answer: This statement (In Section 4.1) was revised.

8) P790 L24. " since the build-up and wash-off parameters depend on land use". Again an obvious statement:

Answer: This statement was revised completely (Section 4.2).

9) P792 L7-9. "The MOPSO and NSGAII are . . . management" What do the authors refer to? This sentence is confusing.

Answer: The statement was revised.

10) Tables 3, 4, 5 and 6 are not referred in the text.

Answer: All tables are now cited in the text.

11) Tables 7 and 8. The SI symbol for liter is "l". The SI symbol for kilogram is "kg". Please correct "Lit" and "Kg". Also add units for standard deviation.

Answer: The units were corrected.

12) Figure 3, 5, 6 and 11. These figures are not cited in the text.

Answer: These figures are now cited in the text.

13) Figure 4. This figure is not cited in the text. Moreover this figure is copied from SWMM manual and in my opinion is not necessary.

Answer: This figure was removed.

14) Figure 7. In my opinion this figure is not necessary.

Answer: This figure was removed.

15) Figures 8, 9, 11 and 13. The SI symbol for liter is "l". The SI symbol for kilogram is "kg". Please correct "Lit" and "Kg".

Answer: These units were corrected.

16) Figure 11. I suppose "LID" refers to Low Impact Developments. Please explain or clarify.

Answer: The LID was first referred to in the Introduction.

17) Figures 14 and 15. What do these figures add? Are they relevant to conclude?

Answer: These figures were removed.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/9/C1711/2012/hessd-9-C1711-2012-
supplement.zip

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 777, 2012.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper