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Natural Hazards and Earth System Sciences Discussions

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NHESSD

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Interactive Comment

Interactive comment on "Efficient GIS-based model-driven method for flood risk management and its application in central China" *by* Y. Liu et al.

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The authors are indebted to the anonymous reviewer for raising numerous important issues which will improve our final manuscript. The following revisions will be made in response to those comments:

Comment 1: This paper present an interesting approach for a DSS (Decision support System) for flood management. The subject of the work is worth publishing, and the introduction of the paper well states the issues and the situation this new approach tries to solve. However some major issues are limiting the understanding of the paper. First of all, I suggest the authors to review the English of the manuscript: the paper is highly descriptive and the form it has makes it hard to follow it.

Response 1: Thank you very much for the comments on the paper. This is a very good suggestion. We've got expert advice on improving our manuscript from an American team.

Comment 2: A second major issue I see is the lack of descriptions for procedures and algorithms. There are few information about these two points, that makes the procedure hard to understand.

Response 2: Thank you, this is a very good suggestion for our paper. The main contribution of this manuscript includes the following three aspects:

(1) We present a new methodological framework for decision support system (see Fig. 1 and Section 3 in the revised manuscripts). The major issue is the implementation process did not describe clearly. In the revised manuscripts, The Systems Life Cycle is a double-loop iteration optimization structure (see Fig. 2), which contains behavioral-loop and technical-loop (see Section 3 in the revised manuscripts).

(2) We illustrate a loose-coupling technical prototype for integrating heterogeneous elements, such as multi-source data, multidisciplinary models, GIS tools and existing systems (see Section 4 in the revised manuscripts). The descriptions are sufficient.

(3) We describe how the optimization models and algorithms combined in this framework by a case study (see Section 5 in the revised manuscripts). The procedures and algorithms of a single part, such as the hydrological or hydrodynamic model (see Appendix A and Appendix B), are not the basic problem. If you're interested in these models, you can check out our published papers, as follows:

[1] Liu, Y., Zhou, J.Z., Song, L.X., Zou, Q., Liao, L., Wang, Y.R., Numerical modelling of free-surface shallow flows over irregular topography with complex geometry [J]. Applied Mathematical Modelling, doi:10.1016/j.apm.2013.05.001, 2013.

[2] Song, L.X., Zhou, J.Z., Guo, J., Zou, Q., Liu, Y., A robust well-balanced finite volume model for shallow water flows with wetting and drying over irregular terrain [J].

Advances in Water Resources. 2011, 34(7): 915-932.

[3] Zou, Q., Zhou, J.Z., Zhou, C., Song, L.X., Guo, J., Liu, Y., The practical research on flood risk analysis based on IIOSM and fuzzy α-cut technique [J]. Applied Mathematical Modelling, 36: 3271-3282, 2012.

[4] Guo, J., Zhou, J.Z., Zou, Q., Liu, Y., Song, L.X., A Novel Multi-objective Shuffled Complex Differential Evolution Algorithm with Application to Hydrological Model Parameter Optimization [J]. Water Resources Management, 27(8): 2923-2946, 2013.

[5] Song, L.X., Zhou, J.Z., Zou, Q., Guo, J., Liu, Y., Two-dimensional dam-break flood simulation on unstructured meshes. The 11th International Conference on Parallel and Distributed Computing [C]. Applications and Technologies, Wuhan China. 465-469, 2010.

Comment 3: The authors claims that the main innovation is the application of model-driven concepts, however throughout the paper it doesn't seem well established what are these model-driven concepts.

Response 3: Thank you, this is a very good suggestion for our paper. In the revised manuscripts, Model-driven method research can be distributed in two aspects. The first is as DSS foundations research, which is described in Section 3. The other is as software engineering research, which is described in Section 4.

Comment 4: The authors are presenting an example, which shows that their system works successfully for their study case, however no comparison is provided with other available studies to prove the effectiveness of such model if compared to the ones already in use or the ones already available. They provide a full subchapter describing the novelties of their work compared to other systems, however they do not provide a practical example of how this proposed approach is better than the available ones.

Response 4: Thank you, we compare the MDSS model with others on a set of criteria (see Section 6 in the revised manuscripts). We choose the following methodological framework (Zeng et al., 2007; Chen et al., 2011; Qi and Altinakar, 2011), because they are representative method for risk management in some facets. Table 1 shows the comparison.

Comment 5: I overall suggest the authors to shorten the descriptive part of the paper, trying to simplify it by focusing on the novelties of their work and on a more clear description of the procedures, thus providing the readers an easier understanding of their work.

Response 5: Thanks for the meticulous review work. This is a very good suggestion. We revised some descriptions.

References

Chen, H., Wood, M. D., Linstead, C., and Maltby, E.: Uncertainty analysis in a GIS-based multicriteria analysis tool for river catchment management, Environ. Modell. Softw., 26, 395–405, doi:10.1016/j.envsoft.2010.09.005, 2011. Qi, H. and Altinakar, M. S.: A GIS-based decision support system for integrated flood management under uncertainty with two dimensional numerical simulations. , Environ. Modell. Softw., 26(6): 817-821, doi:10.1016/j.envsoft.2010.11.006, 2011. Zeng, H., Talkkari, A., Peltola, H., and KellomÂÍ aki, S.: A GIS-based decision support system for risk assessment of wind damage in forest management, Environ. Modell. Softw., 22, 1240-1249, doi:10.1016/j.envsoft.2006.07.002, 2007.

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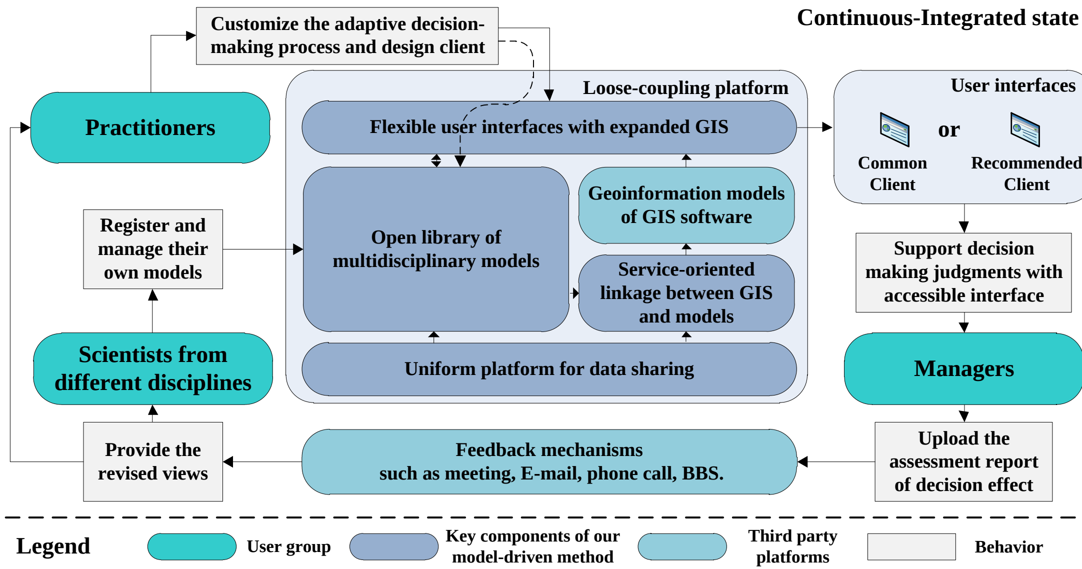

Fig. 1. Behavioral aspects of the model-driven method for flood risk management

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Interactive Discussion

Discussion Paper

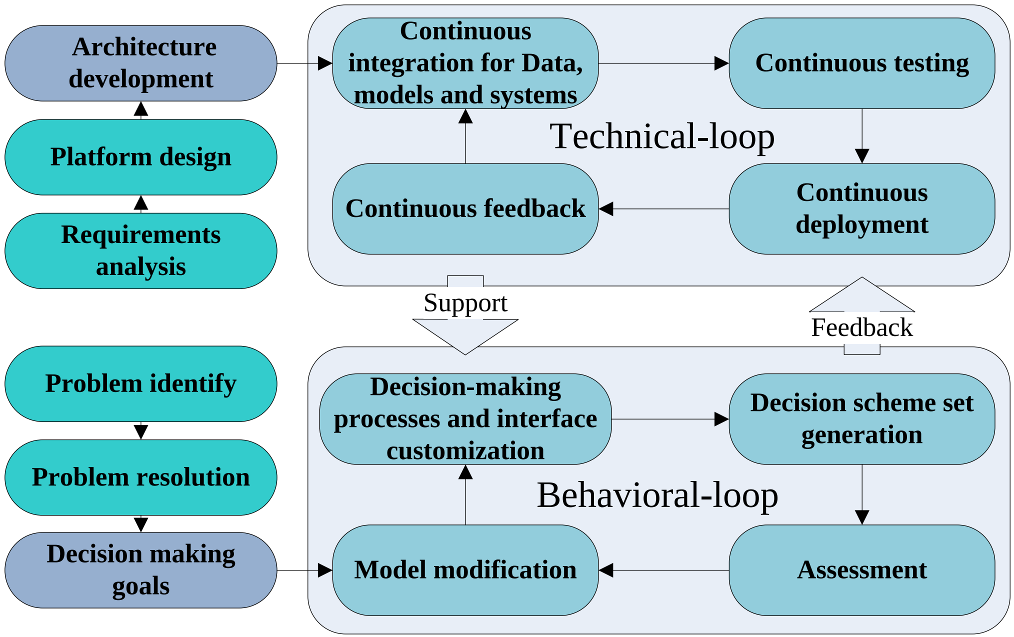

Fig. 2. Systems Life Cycle for Model-driven methodological framework

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Table 1. Comparison between traditional tight-coupling systems and MDSS.

	Traditional tight-coupling systems	MDSS
Development efficiency	Complex development process: including Requirements, Design, Construction, Integration, Testing and debugging, Installation and Maintenance;	Two-stage development process: 1) Deploy the universal Loose-coupling technical prototype; 2) Iteration optimization with technical-loop and behavioral-loop;
Distributed integration	They solve the problems of scalability by harmonization, the maintenance cost becomes incredibly expensive;	It provides flexible integration methods with open library based on SOA;
Emergency needs	They cannot be provided within the prescribed time;	It publishes deployable software at any time by Loose-coupling technical prototype;
Deployment flexibility	They provide only one type or a few similar types of clients;	It provides flexible user interfaces with expanded GIS by WPF and Interface Service;
Model creditability	It is difficult to verify or maintain a single model in the tightly-coupling architecture;	According with the review from practitioners and managers, models will be modified to increase the adaptability; New client will be deployed to verify the model creditability; Automatically loop;

Fig. 3. Comparison between traditional tight-coupling systems and MDSS