Development of Data Base Integrated Hydrological- and Hydraulic Modeling for River Flood- and Urban Inundation Forecast

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Coastal cities are vulnerable to river flood, urban inundation, and storm surges. Numerical simulation of such a complex hydraulic behavior would require seamless integration of corresponding models. Also forecasting water hazards on a real-time basis would require effective framework to exchange data input/output among models. Objectives of the present study is to propose state of the art early warning system against water-related hazards via data archive and model integrated frame work. Yokohama area is selected as a target site for this study.

Background and Objectives

Seamlessly Integrated Model:
- 1D river flood model
- Sewerage network model
- Inundation model
With boundary condition from upstream rivers and the river outlets

Data Integration and Analysis System (DIAS) www.diasjp.net
- Japanese national project for delivering information for solving earth environment related issues by integration of massive observational and model data
- 25PB storage & 120 nodes (16 cores each) computing clusters for storing and analyzing IPCC CMIP3/CMIP5, satellite data, numerical weather prediction, ground radar rainfall, etc.

R Application in this study

- Numerical models employed in the system are written mostly in FORTRAN
- R scripts are applied mainly for geospatial data conversion of misc. data, e.g. radar rainfall, numerical weather prediction, etc.
- Pre-processing of data and post-processing of model output for visualization (see below)
- Numerical models and R-based scripts are wrapped by LINUX scripts and processes are automated

Summary

- Ongoing development of the early warning system by embedding the seamlessly integrated model to the massive data archive
- Intended to support the city managers’ decision making - from expert judgement to quantitative information backed up judgement
- Introducing machine learning to the system, e.g. water level prediction, may increase accuracy of the model prediction leading to effective flood countermeasures

References

Y. Shibuo et al., Implementation of real-time flood prediction and its application to dam operations by data integration analysis system, J. Disaster Research (2016).

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