RELIABILITY ANALYSIS OF HYDROLOGICAL TIME SERIES USING NEURAL NETWORKS MODEL 2. UNCERTAINTY ANALYSIS OF INPUT DATA INFORMATION

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Uncertainty in engineering can be mainly attributed to ambiguity and vagueness in defining the architecture, parameters, and governing forecasting models for the systems. Other sources of uncertainty can include conflict in information, and human and organizational errors (Johnson and Ayyub, 1996). Many theories and methods, including probabilistic, fuzzy-set, gray-set, and interval arithmetic theories, are available for handling uncertainty in engineering system(Moore, 1979; Ayyub and Gupta, 1997; Pedrycz and Gomide, 1998). Forecasting or modeling process with ANNs-based model has been also connected with uncertainty(Kim, 2004; Abebe and Price, 2004). Furthermore, uncertainty in ANNs-based modeling depends on the limited data, which is used in the model training, as well as the modeling process. Sensitivity Analysis, which analyzes the response of a model to parameter uncertainty by perturbing the value of each parameter for each simulation, is the traditional method for dealing with parameter uncertainty within a deterministic model framework(Zou et al., 2002). In this study, Uncertainty analysis is performed to determine the sensitivity level, which is calculated by the change of output node according as each input node changes. Input nodes, which have a little sensitivity as compared with the other nodes, have to be eliminated and the size of EDRNNM is reduced. Therefore, it enables the engineers or hydrologists to prevent the unnecessary data collection and operate flood stage forecasting system with economic benefits such as lower costs in this study.

REFERENCES

Abebe, A.J., and Price, R.K., 2004. Information theory and neural networks for managing uncertainty in flood routing. *J. Comp. in Civ. Engr.,* ASCE, Vol.18, No. 4, pp. 373-380.

Ayyub, B.M., and Gupta, M.M., 1997. *Uncertainty analysis in engineering and sciences : Fuzzy logic, statistics and neural networks approach.* Kluwer Academic, Boston, MA.

Johnson, P.A., and Ayyub, B.M., 1996. Modeling uncertainty in prediction of pipe scour. *J. Hydrau. Engr.*, ASCE, Vol. 122, No. 2, pp. 66-72.

Kim, S., 2004. Neural networks model for analysis of input information uncertainty in the small catchment. *Proc. World Water and Environmental Resources Congress 2004,* ASCE/EWRI, Salt Lake City, UT.

Moore, R.E., 1979. *Method and applications of interval analysis.* SIAM, PA.

Pedrycz, W., and Gomide, F., 1998. *An introduction to fuzzy sets : Analysis and design.* Cambridge, MA.

Zou, R., Lung, W.S., and Guo, H., 2002. Neural network embedded monte carlo approach for water quality modeling under input information uncertainty. *J. Comp. in Civ. Engr.*, ASCE, Vol. 16, No. 2, pp. 135-142.