RELIABILITY ANALYSIS OF HYDROLOGICAL TIME SERIES USING NEURAL NETWORKS MODEL 1. MODEL DEVELOPMENT AND APPLCATION

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Flood stage forecasting generally constitutes important input information in water resources planning and management. Such forecasting would be helpful in two ways. First, it would provide a warning system of the impending flood during flood time series; second, it would assist in regulating reservoir outflows during the low flows(Kim and Lee, 2000). Artificial neural networks(ANNs) have proven to be an efficient alternative to traditional method for modeling qualitative and quantitative water resources variables. Recently, numerous ANNs-based rainfall-runoff models have been proposed to forecast streamflow, drought analysis, and reservoir streamflow(Liong, et al., 2000; Shin and Park, 1999; Coulibaly et al., 2000a, b).

In this paper, Elman Discrete Recurrent Neural Networks Model(EDRNNM) is developed to forecast flood stage at Musung station of Wi-stream , one of IHP representative basins in South Korea. In general, most of popular ANNs-based model for flood stage forecasting have been consisted of precipitation and flood stage term on their input nodes. However, EDRNMM, which had the different lead hour at 5 different stage stations in the upper Wi-stream, was developed for flood stage forecasting. The training data were composed of 135 different training patterns, which involve data length, lead hour, standardization method, and hidden nodes, to minimize the structural uncertainty during training performance. A cross-validation method was applied to reduce the overfitting problem and select the best one of the 6 training patterns during validation performance. The optimal EDRNNM for flood stage forecasting was developed and applied during training and validation performance and the reliability of flood stage forecasting was proved to be highly accurate in this study.

REFERENCES

Coulibaly, P., Anctil, F., and Bobēe, B., 2000a. Daily reservoir inflow forecasting using artificial neural networks with stopped training approach. *J. Hydro.,* Vol. 230, pp. 244-257.

Coulibaly, P., Anctil, F., and Bobēe, B., 2000b. Neural network-based long-term hydropower forecasting system. *J. Comp. Aided Civ. And Infrastruct. Engr.,* ASCE, Vol. 15, No. 5, pp. 355-364.

Kim, S., and Lee, S., 2000. Forecasting of flood stage using neural networks in the Nakdong River, South Korea. *Proc., Watershed Management & Operations Management 2000*, ASCE/EWRI, Fort Collins, CO.

Liong, S.Y., Lim, W.H., and Paudyal, G.N., 2000. River stage forecasting in Bangladesh : Neural network approach. *J. Comp., in Civ. Engr.,* ASCE, Vol. 14, No. 1, pp. 1-8.

Shin, H.S., and Park, M.J., 1999. Spatial-temporal drought analysis of South Korea based on neural networks. *J. Korea Water Resour. Assoc.,* Vol. 32, No. 1, pp. 15-29.