A River Flood Warning System Using a Neural Probabilistic Forecasting Model

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Abstract In the problems associated with various hydrological operational forecasting such as river flood warning system, reservoir operation, and drought forecasting the hydrologist have met generally the following three question in the stage of decision-making process: (1) How we can predict the expected value as well as the uncertainty of the estimate such as variance of estimate ? *(probabilistic prediction)*; (2) What is the probability that a hydrological variable at a given time belongs to various classes representing the severity of the problem of interest (*probability-of-occurrence question*); and (2) What are the optimal decision-making among the suggested and predefined classes (*optimal-classification and decision-making problem*). The suggested prediction or forecasting model, called Neural Probabilistic Forecasting Model have been developed to meet those questions based on nonlinear and nonparametric statistical approaches. Moreover the suggested model provides several probabilistic information such as the expectation estimator, variance estimator, class probability estimator as well as Basian optimal classifier The operation and control scheme of this model have been described in the manner of Neural Network Algorithm. The proposed model has been implemented to developing the flood forecasting and warning system for Soyang River Basin in South Korea. The forecasting performance has been verified with several statistical measures and indicated the acceptable accuracy until over 12 lead times. The variance estimates suggested the estimation error scheme and indicated the proper achievement of its performance. In this application, the model was developed with two flood warning criteria (or class thresholds) resulted in producing three class probabilities for each class defined and Optimal Baysian classification. Overall, this model suggested the significant possibility of probabilistic forecasting model to be used in various hydrological operational concerns in future.

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