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خلاصه مقاله:

Sampling Stochastic Dynamic Programming (SSDP) method uses streamflow scenarios, either historical or synthetic, to capture the complex temporal and spatial nature of streamflows in the optimization of reservoir system operation. SSDP is also capable of incorporating streamflow forecasts in order to improve model performance. The use of historical streamflow scenarios and indeed, their corresponding streamflow forecasts in SSDP reduces dimensionality in multi-reservoir systems optimization and avoids complex correlation computations, as the hydrological state variable can be eliminated. In this study, DEZ Basin in southwest Iran is used to illustrate the application of the SSDP method on a two-reservoir system. A forecasting model, which uses a multivariate regression based on Snow Water Equivalent (SWE) values, has been developed for the system according to earlier studies on spring and summer monthly streamflows. A monthly SSDP optimization model has been developed for these months, as the inflow forecasts are available; whereas a SDP model is employed for the optimization of the remaining months. Kelman et al. (1990) and Faber and Stedinger (2001) described a method of computing this probability using empirical streamflow and forecast data with the Bayes Theorem. This approach considers the probability of having the remaining volume of scenario J given the volume forecast associated with period t of scenario I. Tejada-Guibert et al. (1993) introduced a method of re-optimization in which a new optimal decision is chosen with a one-stage SDP optimization, and employing the future value function from the current stage of the optimization step. In this way, greater accuracy and increased system performance have resulted. Finally, a re-optimization method has been applied during the simulation stage, which resembles real-time operation of the system. The results were compared to the usual approach results prior to the re-optimization. The results of the proposed SSDP model have been analysed and compared to a traditional SDP. Hence, a model is developed that employs streamflow scenarios which represent the empirical distribution rather than discrete levels. In this model, scenarios are streamflow hydrographs that are historically observed.

کلمات کلیدی:

Dynamic Programming; Stochastic Modelling; Streamflow Forecasts; Multi-reservoir Systems