Auto Calibration and Optimization of Large-Scale Water Resources Systems

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Abstract : Water resource systems modelling have constantly been a challenge through history for human being. As the innovative methodological development is evolving alongside computer sciences on one hand, researches are likely to confront more complex and larger water resources systems due to new challenges regarding increased water demands, climate change and human interventions, socio-economic concerns, and environment protection and sustainability. In this research, an automatic calibration scheme has been applied on the Gilan's large-scale water resource model using mathematical programming. The water resource model's calibration is developed in order to attune unknown water return flows from demand sites in the complex Sefidroud irrigation network and other related areas. The calibration procedure is validated by comparing several gauged river outflows from the system in the past with model results. The calibration results are pleasantly reasonable presenting a rational insight of the system. Subsequently, the unknown optimized parameters were used in a basin-scale linear optimization model with the ability to evaluate the system's performance against a reduced inflow scenario in future. Results showed an acceptable match between predicted and observed outflows from the system at selected hydrometric stations. Moreover, an efficient operating policy was determined for Sefidroud dam leading to a minimum water shortage in the reduced inflow scenario.