Bat algorithm for dam–reservoir operation

Abstract

Optimizing reservoir operation rule is considered as a complex engineering problem which requires an efficient algorithm to solve. During the past decade, several optimization algorithms have been applied to solve complex engineering problems, which water resource decision-makers can employ to optimize reservoir operation. This study investigates one of the new optimization algorithms, namely, Bat Algorithm (BA). The BA is incorporated with different rule curves, including first-, second-, and third-order rule curves. Two case studies, Aydoughmoush dam and Karoun 4 dam in Iran, are considered to evaluate the performance of the algorithm. The main purpose of the Aydoughmoush dam is to supply water for irrigation. Hence, the objective function for the optimization model is to minimize irrigation deficit. On the other hand, Karoun 4 dam is designed for hydropower generation. Three different evaluation indices, namely, reliability, resilience, and vulnerability were considered to examine the performance of the algorithm. Results showed that the bat algorithm with third-order rule curve converged to the minimum objective function for both case studies and achieved the highest values of reliability index and resiliency index and the lowest value of the vulnerability index. Hence, the bat algorithm with third-order rule curve can be considered as an appropriate optimization model for reservoir operation.

Keywords