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Differential Evolution Algorithm with Application to Optimal Operation of Multipurpose Reservoir

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ABSTRACT

This paper includes an application of Differential Evolution (DE) for the optimal operation of multipurpose reservoir. The objective of the study is to maximize the hydropower production. The constraints for the optimization problem are reservoir capacity, turbine release capacity constraints, irrigation supply demand constraints and storage continuity. For initializing population, the upper and lower bounds of decision variables are fixed. The fitness of each vector is evaluated. The mutation and recombination is performed. The control parameters, i.e., population size, crossover constant and the weight are fixed according to their fitness value. This procedure is performed for the ten different strategies of DE. Sensitivity analysis performed for ten strategies of DE suggested that, De/best/1/bin is the best strategy which gives optimal solution. The DE algorithm application is presented through Jayakwadi project stage-I, Maharashtra State, India. Genetic algorithm is utilized as a comparative approach to assess the ability of DE. The results of GA and ten DE strategies for the given parameters indicated that both the results are comparable. The model is run for dependable inflows. Monthly maximized hydropower production and irrigation releases are presented. These values will be the basis for decision maker to take decisions regarding operation policy of the reservoir. Results of application of DE model indicate that the maximized hydropower production is 30.885 × 106 kwh and the cor-responding irrigation release is 928.44 Mm3.

KEYWORDS

Optimization, Hydropower Production, Differential Evolution, Reservoir Operation

Cite this paper

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