

Improvement of reservoir operation by hybrid optimization algorithm: case study of Huong Dien Reservoir, Vietnam

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Abstract An Improved Incremental Dynamic Programming (IDP) algorithm is developed in this study by combining IDP and Harmony Search (HS) to form HS-IDP for the initial procedure of generating decision variables. The developed hybrid algorithm (HS-IDP) and HS algorithm are simultaneously proposed for optimizing the reservoir operation to effectively solve a linear reservoir water balance equation and an objective function of benefit of Hydroelectrical Power (HP) to find optimal decision variables, taking into account water release or storage volume rates. The optimal reservoir operation (ORO) model is firstly applied for HuongDien (HD) hydroelectric dam of Hue Basin, Vietnam, downstream as it reaches Bo River where many critical problems have occurred such as water shortages and flooding inundations. This paper outlines how to reduce the impact of droughts and floods and to maximize the economic benefit through effective HD reservoir operation. The results indicated that the hybrid algorithm found the optimal decision variables having the highest HP benefit, while satisfying the specified constraints for reservoir and downstream safety.

Key words Optimization Reservoir Operation; Incremental Dynamic Programming (IDP); Harmony Search (HS); Huong Dien Reservoir; Hue-Vietnam