The Hyperbolic Smoothing Approach for Automatic Calibration of Rainfall-Runoff Models

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Abstract : This paper addresses the issue of automatic parameter estimation in conceptual rainfall-runoff (CRR) models. Due to threshold structures commonly occurring in CRR models, the associated mathematical optimization problems have the significant characteristic of being strongly non-differentiable. In order to face this enormous task, the resolution method proposed adopts a smoothing strategy using a special C∞ differentiable class function. The final estimation solution is obtained by solving a sequence of differentiable subproblems which gradually approach the original conceptual problem. The use of this technique, called Hyperbolic Smoothing Method (HSM), makes possible the application of the most powerful minimization algorithms, and also allows for the main difficulties presented by the original CRR problem to be overcome. A set of computational experiments is presented for the purpose of illustrating both the reliability and the efficiency of the proposed approach.

Keywords : rainfall-runoff models, automatic calibration, hyperbolic smoothing method
Conference Title : ICWRHEE 2021 : International Conference on Water Resources, Hydrology, Ecology and Environment
Conference Location : Toronto, Canada
Conference Dates : June 15-16, 2021