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Automatic differentiation for the optimal calibration of a MASCARET model

Felix Demangeon¹, Cedric Goeury², Nicole Goutal^{1,2}, Fabrice Zaoui²

¹Saint-Venant Laboratory for Hydraulics (joint research unit between EDF R&D, CEREMA and Ecole des Ponts)
Chatou, France

²EDF R&D, Laboratoire National d'Hydraulique et Environnement (LNHE), Chatou, France
cedric.goeury@edf.fr

Abstract:

Numerical models are nowadays commonly used in river hydraulics as flood prevention tools. Computed results have to be compared to field data in order to ascertain their reliability in operational conditions. This process, referred to as operational validation, includes the model calibration task. Calibration aims at simulating reference events as accurately as possible by adjusting some physically based parameters. Any project using a model should include a calibration phase. For a 1D hydrodynamic model based on the Saint-Venant's equations, one may adjust the roughness coefficients. This step requires time during the hydraulic modeling study.

With the help of Automatic Differentiation providing derivatives of hydraulic state in regard of roughness coefficient, a minimisation approach has been adopted to calibrate automatically the 1D hydraulic model MASCARET. The algorithm combines mathematical information contained in hydraulic model and the physical information from observations of known events in order to find the values of roughness coefficients which are the best to calibrate the model. The methodology used to develop the automatic calibration tool will be presented and discussed at the TELEMAC User Club.