Optimization of Fish Passage Structures by a Multilayer Model

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Abstract

In this work we are interested in the design of a vertical slot fishway. This design reasonably handles the seasonal water surface elevation changes. The shape optimization problem is addressed using a multilayer Saint-Venant model as a state system, and the objective function is defined in order to allow fish crossing the obstacle in a convenient conditions. The multilayer Saint-Venant system is a set of coupled modified shallow water systems which allows to consider nonconstant vertical velocities and obtain an accurate description of the vertical profile of the horizontal velocity. A Roe finite volume method combined to a derivative-free algorithm are used to approximate the mathematical state system and the related optimization problem. Numerical simulations are given to show the robustness and the computational efficiency of the technique.

Mots clés. Shape optimization, multilayer system, Roe finite volume method

References


