1. Introduction

Dam break shock-wave is the flow emanating from the sudden release of an initially stationary water body. When a dam is broken, the impounded water flees through the opening into the downstream river. In these circumstances, the probability of loss of lives and properties is much intensive, since the warning time necessary to reach the people living in the downstream region is too short. The existence of more than 800,000 dams and kilometers of dykes in the world makes it more interesting for engineers to address the issue. Accordingly, the need to have a real-time flood zoning prediction and warning system is critical to make logical decisions necessary to evacuate areas prone to inundations. On the other hand, from the mathematical point of view, in numerical simulation of the shock waves and rarefaction waves induced by dam break flows, shock fronts have been characterized as sudden discontinuities with rapid variations of flow velocity and water depth. These two issues are the main difficulties in the numerical simulation of these flows.

Concerning the complex dynamics of dam break flows, the numerical simulation of the respective flows requires advanced mathematics. The importance of the topic primarily comes from its application in mathematical modeling of the shock dominated problems (Boulahia et al., 2014; Brouwer et al., 2015; Inage et al., 2013). The need for such models has prompted and maintained the development of the finite-difference method (FDM) (Luo and Gao, 2015; Ouyang et al., 2014), finite-volume method (FVM) (Aureli et al., 2008; Stecca et al., 2015; Zhang et al., 2014), and the finite-element method (FEM) (Isakson et al., 2015; Ortiz, 2014; Seyedashraf and Akhtari, 2017; Triki, 2013) to solve the relevant governing equation systems. These developments include the so-called shock-capturing techniques, i.e. the Total-variation-diminishing and Flux-corrected-transport schemes (Boulahia et al., 2014; Kuzmin et al., 2005; Ortiz, 2014; Toro, 2001) to improve the accuracy of the models. However, considering the simultaneous solution of the continuity, momentum and energy equations, and the number of iterations required to achieve convergence, numerical methods are computationally expensive (Malekmohamadi et al., 2008).

Taking inspiration from the application of artificial neural networks (ANNs) in various areas of hydraulics and ocean engineering (Emiroglu et al., 2011; Hoosharyipor et al., 2014; Kisi, 2008; Makarynskyy, 2004; Malekmohamadi et al., 2011; Sun et al., 2014), and the analytical solution of the dam break problems in verifying numerical models (Chanson, 2008, 2009; Hunt, 1983; Jain, 2001; Mangeney et al., 2000; Martins et al., 2016; Ritter, 1892; Stoker, 1992), the aim of this study is to develop a new concept for dam break flow predictions. The procedure is a regular ANN model trained by a significant number of input data obtained from Stoker’s analytical solution. As a validation of...
Table 1
The considered H0-H1 water levels for the ANN data train-testing.

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