عنوان مقاله:

NEW OPTIMIZED EQUATIONS WITH INTELLIGENT MODELS FOR PREDICTING HYDRAULIC JUMP CHARACTERISTICS OVER ARTIFICIAL AND NATURAL ROUGH BEDS

محل انتشار:

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خلاصه مقاله:

The available studies for estimating the characteristics of hydraulic jump are only for artificial or natural beds, and very limited researches have simultaneously considered artificial and natural beds. The aim of this study is to present comprehensive equations and models for predicting the characteristics of hydraulic jump in artificial and natural rough beds with various dimensions, arrangement and roughness forms. The experimental data of different researches on two artificial and natural rough beds (containing ۵۵۹ data series) were collected. After randomization, the data were used in combination of ۷۵-۲۵ for training and testing the two intelligent models of K-nearest neighbors (KNN) and M۵ model tree with various scenarios and their performance were evaluated in estimation of hydraulic jump characteristics (including sequent depth, energy loss and shear force coefficient). Then, the existing empirical equations examined and calibrated and new optimized equations were derived using Solver command in Excel software. The results of the best intelligent models were analyzed and compared with the best calibrated and new optimized equations. Both the intelligent models had the same performance. In the M۵ model tree, the best scenario of all the three parameters of sequent depth (R۲=۰.۹۰), energy loss (R۲=۰.۹۴), and shear force coefficient (R۲=۰.۸۱) obtained by using Froude number as input parameter. The best empirical equations were Abbaspour et al.'s (R۲=۰.۹۰), Abbaspour and Farsadizadeh's (R۲=۰.۹۰), and Akib et al.'s (R۲=۰.۸۳) for the sequent depth, the energy loss and the shear force coefficient, respectively. The calibrated and new optimized equations had a similar precision as the intelligent models, but their errors were less than that of the best empirical equations.

کلمات کلیدی:

energy loss, M۵ model tree, optimized equations, sequent depth, shear force coefficient.