TOTAL LOAD TRANSPORT PREDICTION USING SOFT-COMPUTING METHODS

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Due to its significance in the morphodynamic processes of natural streams and associated impacts on riverine aquatic habitats, sediment transport has been studied extensively for decades. Hydraulic researchers have endeavored to describe the above phenomenon using physical reasoning, dimensional analysis, empirical or pra ctical approaches. As a result a plethora of mathematical formulas have been proposed and validated using flume and/or field data from limited sources.
However attempts to generalize these models typically fail as they are usually limited by the assumptions or the range of parameters for which they were validated. Since the developed formulas lack in universality, a new soft-computing method for total load transport prediction is employed. In this paper, a novel Adaptive Neuro Fuzzy Inference system (ANFIS) is used which combines the efficient learning of artificial neural networks (ANN) with the transparency, which the rules of fuzzy inference systems (FIS) provide. Compared to other existing soft-computing methods which can be used efficiently as universal function approximators, such as widely employed ANN models, ANFIS has in many cases provided better results.
Architectures of different complexity utilizing several input-output pairs are developed. The input and output vectors describe parameters related to the controlling factors of the phenomenon and total load description respectively. Training and validation of the data driven ANFIS models, employs extensive data sets, covering a wide range of river and flume data from previous research, so that an exact representation of the problem domain is provided. The domain knowledge represented by the given input-output data pairs can be extracted by close inspection of the fuzzy rules, for models of low complexity. The efficiency of ANFIS models is assessed using several performance indicators and error indices such as correlation coefficient (CC) a nd root mean square error (RMSE). Comparison of the technique with widely used total load predictors proves its effectiveness in terms of accuracy and universality.