Monotonicity preserving SIRMs-connected fuzzy inference system for predicting HPC compressive strength

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Abstract: A harmony search-based single input rule modules (SIRMs)-connected FIS with monotonicity preserving property in predicting compressive strength for high-performance fly-ash concrete is proposed. The use of FIS with monotonicity preserving property in the prediction for concrete compressive strength is novel. The model considers the monotonic relationship between the input, i.e., water-binder ratio, and the output, i.e., compressive strength. Monotonicity index (MI) is then used to measure the fulfillment of monotonicity property of the model. The proposed model is evaluated using experimental data. Results show that the proposed model with MI gives better predictions for both training and testing data sets, compared with the model without MI. This indicates that the proposed method with MI is more suitable to be used in predicting compressive strength of high-performance fly-ash concrete. When compared to results from neural networks fitting tool, results from the proposed model for testing data set were found to be slightly better in terms of RMSE. The contributions of this paper are two-folds: (1) a new harmony search-based SIRMs-connected FIS with monotonicity preserving property in predicting high performance concrete (HPC) compressive strength is proposed; and (2) the suitability of monotonicity preserving property in predicting HPC compressive strength is investigated.

Keywords: Compressive strength, fly-ash concrete, fuzzy inference system, high-performance concrete, monotonicity index

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