ANN based investigations of reliabilities of the models for concrete under triaxial compression

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Abstract

Purpose
A lot of triaxial compressive models for different concrete types and different concrete strength classes were proposed to be used in structural analyses. The existence of so many models creates conflicts and confusions during the selection of the models. In this study, reliability analyses were carried out to prevent such conflicts and confusions and to determine the most reliable model for normal- and high-strength concrete (NSC and HSC) under combined triaxial compressions. The paper aims to discuss these issues.

Design/methodology/approach
An analytical model was proposed to estimate the strength of NSC and HSC under different triaxial loadings. After verifying the validity of the model by making comparisons with the models in the literature, reliabilities of all models were investigated. The Monte Carlo simulation method was used in the reliability studies. Artificial experimental data required for the Monte Carlo simulation method were generated by using artificial neural networks.

Findings
The validity of the proposed model was verified. Reliability indexes of triaxial compressive models were obtained for the limit states, different concrete strengths and different lateral compressions. Finally, the reliability indexes were tabulated to be able to choose the best model for NSC and HSC under different triaxial compressions.

Research limitations/implications
Concrete compressive strength and lateral compression were taken as variables in the model.

Practical implications

The reliability indexes were tabulated to be able to choose the best model for NSC and HSC under different triaxial compressions.

Originality/value
A new analytical model was proposed to estimate the strength of NSC and HSC under different triaxial loadings. Reliability indexes of triaxial compressive models were obtained for the limit states, different concrete strengths and different lateral compressions. Artificial experimental data were obtained by using artificial neural networks. Four different artificial neural networks were developed to generate artificial experimental data. They can also be used in the estimations of the strength of NSC and HSC under different triaxial loadings.

Keywords

- Reliability
- Monte Carlo simulation
- Artificial neural network
- Concrete compressive strength
- Triaxial compression

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