

Estimating Strength of Concrete Using a Grammatical Evolution

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Abstract

The main purpose of this paper is to propose an incorporating a grammatical evolution (GE) into the genetic algorithm (GA), called GEGA, and apply it to estimate the compressive strength of high-performance concrete (HPC). The GE, an evolutionary programming type system, automatically discovers complex relationships between significant factors and the strength of HPC in a more transparent way to enhance our understanding of the mechanisms. A GA was used afterward with GE to optimize the appropriate function type and associated coefficients using over 1,000 examples for which experimental data were available. The results show that this novel model, GEGA, can obtain a highly nonlinear mathematical equation which outperforms than the traditional multiple regression analysis (RA) with lower estimating errors for predicting the compressive strength of HPC.

Keyword : grammatical evolution; genetic algorithm; high-performance concrete; regression analysis