University of Macau

Abstract

AXIAL BEARING CAPACITY PREDICTION OF DRIVEN PILES USING ARTIFICIAL NEURAL NETWORK

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Abstract

Driven piles are the common foundation systems for high-rise buildings and crucial infrastructures in Macau. Prediction of axial pile capacity is the most important task in the execution control of pile foundation. There are many methods for determination of pile bearing capacity using static and dynamic load tests. Results from dynamic load tests can be analyzed using conventional methods such as pile driving formulas, wave equation methods, and signal matching with pile driving records.

This study focuses on the application of artificial neural networks to analyze dynamic pile tests and to predict of axial capacity of piles driven. Artificial neural networks are computer models, the objective of which is to mimic the knowledge acquisition skills of human brain. A well-trained neural network can be treated as an automated analysis system whose operation is not like the traditional signal matching technique that depends on trained personnel, and it will enable an instantaneous feedback of the pile capacity. This provide an alternative to predict the bearing capacity of driven piles, which is reliable but less dependent on experienced personnel than the pile driving analyzers.

The ANN models using entire measured stress-wave data is first established. Finally, a training set for establishment of ANN model using specified measured stress wave data, pile head displacement and the properties of pile as the input data, is selected

from the database of 81 PHC driven piles available from more than 50 construction projects in Macau. The target values are TNOWAVE predicted bearing capacity. The study showed that the neural network model predicted total bearing capacity, shaft resistance reasonably well in comparison with TNOWAVE solution. However, the ANN predicted toe resistance is not as good as total resistance and shaft resistance.

The study also shows that the neural network models generally predict pile bearing capacity more favorably if both stress wave data and the properties of the driven pile are considered as the input parameters. Nevertheless, better selection of input parameters rather than the increase number of input parameters will improve the accuracy of the prediction.