The Forward and Inversion Analysis of High Rock-fill Dams in Construction Period using the Node-Based Smoothed Point Interpolation Method

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Abstract

The meshfree node-based smoothed point interpolation method (NS-PIM) is extended to the forward and inversion analysis of a high gravelly soil core rock-fill dam in construction period. As one of the meshfree methods, the NS-PIM has the advantages of 'softer' stiffness and adaptability to large deformations which is quite indispensable for the stability analysis of the rock-fill dams. In this work, the present method contains a reconstruction procedure to deal with the existence or non-existence of the construction layers and a procedure to form the constitutive matrix of nodes at the interface of different materials. After verifying the validity of the NS-PIM method for rock-fill dams in construction period, the method is used to calculate the Duncan-Chang parameters of the high gravelly soil core rock-fill dam foundation based on the back-propagation neural network method. The results show that: 1) the computation efficiency can be significantly improved by the reconstruct the constitutive matrix based on nodes different from that of the finite element method (FEM); 3) it is promising to apply the NS-PIM to the forward and inversion analysis of high rock-fill dams in construction period.

Keywords: Numerical methods; Smoothed meshfree methods; Duncan-Chang; High Rock-fill Dam; Inversion Analysis