

Inverse analysis/data assimilation in civil engineering

Inverse analysis/data assimilation is a methodology to assimilate observation data into numerical simulation models for realistic predictions and parameter identifications. We have developed inverse analysis methods and demonstrated the effectiveness by applying the methods to numerical experiments, model tests, and actual construction projects. Figure 1 shows conceptual illustration of cross-hole tomography which is typical inverse analysis method and is designed to visualize subsurface in a non-destructive way. Figure 2 shows a comparison between the true image of the ground and the reconstructed image by the cross-hole tomography.

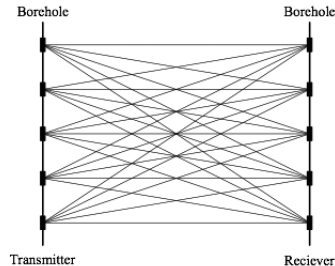
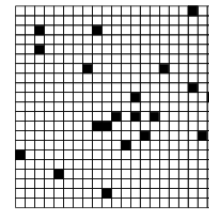
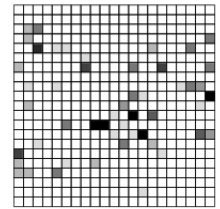


Figure 1 Cross-hole tomography



True image



Reconstructed image

Figure 2 Comparison between true image and reconstructed image

Numerical Simulations using particle-based methods

We have developed simulation codes of the moving particle semi-implicit (MPS) method to predict large deformation and failure behavior in geomaterials such as clay, sand, gravel and their mixtures. Figure 3 shows a breach process of an earthen embankment due to overflow simulated by the developed MPS method.



Figure 3 Embankment breach process simulated by MPS method

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