Yanhui Han ITASCA

Geotechnical & Software Engineer

Expertise	Geomechanics, Microscopic Fluid-Solid Interaction (LBM-DEM Coupling), Poro-Mechanics, Dynamic Simulation, Soil-Structure Interaction, Software Development, User-Interface Design, Numerical Modeling, Programming in FORTRAN, C/C++ and Java
Education	Ph.D. Candidate (Civil Engineering), University of Minnesota
	M.S. (Computer Science), 2003 M.S. (Civil Engineering), 2002 University of Oklahoma (Norman)
	M.S. (Geotechnical Engineering), 1998 China University of Mining & Technology (Beijing)
	B.S. (Civil Engineering), 1995 Anhui University of Science & Technology (Anhui, China)
Registration	Licensed Professional Engineer (License No. 45947), State of Minnesota
Professional Affiliations	Member, American Society of Civil Engineers

Professional Experience

2003 – Present	*Itasca Consulting Group, Inc., Minneapolis, Minnesota* *Geotechnical and Software Engineer*
1998 – 2003	*University of Oklahoma, Norman, Research Assistant*
1996 – 1998	*China University of Mining & Technology, Beijing* *Research Assistant*

Project Experience

Geomechanical Research: Laboratory simulation studies of soil-nail retaining wall construction for a deep foundation pit. Study of coupled time-dependent phenomena of stress, strain and pore pressure variations within borehole wall; derivation and coding of a poro-elastic solution for hollow cylindrical geometry subjected to a triaxial state of stress and pore pressure. Embedment of a nonlinear hysteretic damping model into elastic and elasto-plastic constitutive models; validation of the nonlinear hysteretic damping model with equivalent linear model. Involvement in formulating and implementing a cap-yield elasto-plastic constitutive model for frictional soils. Involvement in developing and verifying an automatic remeshing logic curing element distortion in large strain continuum simulations. Investigation, implementation and validation of the Lattice Boltzmann method to couple with distinct solid particles.

Geotechnical Projects: Construction of a soil-nail wall for a foundation pit in Beijing. Supervision of the installation of soil nailing with grouting concrete for the 13-m-high, 4560-m^2 retaining wall with shotcrete facing reinforced by welded wire mesh. Estimation of subsidence resulting from dewatering of bedrock and overburdens at the proposed Victor Mine via loose coupling analysis.

Investigation of the stability of an underground cavity beneath a circular surface tank and the effect of the cavity on settlements at the ground surface. Determination of the effects of different constitutive models (Mohr-Coulomb vs. Hoek-Brown) and sensitivity analyses on cavity radius and tank construction loading. Development of a model template for studying the response of a helical pier drilled in a peat layer subjected to loads and moment at its top end. Analysis of blasting induced velocities around Washout caverns at Mosaic Potasch Esterhazy Mine. Development of a model template for studying the seismic responses of two reservoir dams (MIAD and Boca) in California.

Dynamic modeling of near-surface waste disposal: In the near-surface disposal of category A waste (i.e., the short-lived low and intermediate level waste), the lifetime of the concrete structure must be guaranteed for at least 300 years. The concrete is protected by a multi layer cover (tumulus). Prediction of the deformation of the tumulus due to the seismic loading, the resulting geometry of each layer of the model and the state of stress in the infiltration barrier (clay – layer 3) under potentially very large strains. Designing and testing FISH functions to rezone the local region near the surface when bad geometry occurs in *FLAC* model.

Modeling of the Overburden Stress/Strain Response Over the Ekofisk field: Modeled the overburden stress/strain response to understand and quantify the contribution of the overburden strain on the seismic time lapse response observed in the field. In the developed *FLAC3D* template model, the available compaction data of chalks in the reservoir was applied as the boundary conditions of the overburden volume. Both displacement control and stress control approaches were implemented. In displacement control scheme, the reservoir compaction data were enforced at the reservoir top as rigid boundary conditions. In stress control scheme, the histories of volumetric strain were imposed in the elements representing reservoir layer.

Seismic Analysis of Reservoir Earth Dam: Conducted both static and dynamic analysis approaches to investigate the effects of a seismic event on the reservoir-soil-pore water system at reservoir dams. Set-up a 2D numerical model in the template format providing good flexibility for making adjustments on model extensions, zoning density, material properties, etc. In the static analysis, the stability and displacement of the dam was evaluated using the residual strength at the post-seismic stage. The dynamic analysis comprehensively integrated the hysteretic constitutive behavior of the soils, the pore pressure generation induced by the cyclic shear loading (liquefaction), the installation of the phreatic line, the interaction between reservoir and dam boundary, the deconvolution of recorded rock outcrop motion to a certain depth, quiet boundary, spectrum analysis and filtering of input motions, etc. The drawback of bad geometry (element distortion), a difficulty commonly encountered in large strain simulations using continuum codes, was cured using the automatic remeshing technique for both static and dynamic analysis.

Blasting-induced Velocities around Washout Caverns: Developed a 3D conceptual model and conducted a set of dynamic analyses sequentially to analyze the influence of blast motion induced by different raise mining scenarios on the peak particle velocity (PPV) distribution, primarily within the formations above the washout.

Flood Protection Levee Design: Development of *FLAC* to evaluate and reconstruct flood protection in New Orleans, comparing alternatives for stabilizing or minimizing movement of existing flood protection measures at various locations.

Nuclear Waste Disposal: Analysis of one-dimensional wave propagation for the Yucca Mountain Project design process, investigating the equivalent linear and nonlinear elastic/elasto-plastic seismic responses of the rock profile subjected to PSHA (probabilistic seismic hazard analysis) generated earthquake motions at certain depth.

Software Development: Maintain and develop *FLAC* and its Graphical User Interface. Coordinate development, testing and documentation of new features for *FLAC* Versions 5.0 and 6.0. Conduct *FLAC* development on a daily basis, including fixing user-reported bugs and adding user-requested functionalities.

Technical Support: Coordinate *FLAC* technical support to assist engineers and researchers around the world apply *FLAC* to challenging practical problems in many geomechanical areas, including fluid-mechanical interaction, seismic analysis, soil-structure interaction and constitutive model implementation and application.

Software Training: Instruct and assist in training courses on Itasca codes (mainly, *FLAC*) in North America and China.