Numerical Simulations and Random Set Theory in Tunnelling – Applications and Limitations

by

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Abstract

Random set theory is attractive in the context of geotechnical analysis, because information tends to be sparse and may only be available in the form of ranges or vague declaration of experts. When information is available from several sources their combination can be thought of as a random set. Published values of geotechnical parameters as well as specifications from experts conventionally appear as intervals, with no information about the probability distribution across the interval. In practical geotechnical engineering subjective assumptions about probability density function of parameters are often made because in many cases the results of geotechnical investigations are set valued rather than being precise and point valued. In this presentation a short introduction of the basic concepts of Random-Set-Theory (RST) and the Random-Set-Finite-Element-Method (RS-FEM) is given. Emphasis is however put on applications in geotechnical practice, and two case studies (both in tunnelling) have been chosen. The comparison between calculation and field measurements clearly demonstrates the applicability of the RS-FEM in general but also points out some limitations.

The speaker

Professor H.F. Schweiger is the head of the Computational Geotechnics Group in the Institute for Soil Mechanics and Foundation Engineering, Graz University of Technology in Austria. He obtained his first degree in Graz University of Technology in 1981, M.Sc. and Ph.D. degrees from the University of Wales, Swansea in 1984 and 1989, respectively. His main research interests include the validation of numerical models (benchmarking), application of random set theory to finite element analysis, numerical modelling and EC7, assessment of the influence of the constitutive model for solving practical problems, in particular deep excavations, tunnels and deep foundations, numerical modelling of special techniques in geotechnical engineering such as compensation grouting and soil improvement techniques. His research work is reflected in more than 100 publications in International Journals and Conference Proceedings.

Professor H.F. Schweiger is in the editorial board of journals including Computers and Geotechnics, International Journal of Geomechanics, Georisk and Geomechanics and Tunnelling; He was a member of the Advisory Panel for Géotechnique (2004-2007), is a core-member of ISSMGE-ERTC7 and chairman of WG A on "Design and Numerical Methods" of Technical Committee TC17 of the ISSMGE. He is on the board member of the International Association for Computer Methods and Advances in Geomechanics; co-organizer of Int. Symposium on Numerical Models in Geomechanics in 1999. He was the chairman of 6th European Conference on Numerical Methods in Engineering in 2006.

Professor H.F. Schweiger was a member of the international expert panel for investigation of the MRT-Circle Line collapse at Nicoll Highway for the Ministry of Manpower, Singapore.

He received the Excellent Contributions Award from the International Association for Computer Methods and Advances in Geomechanics in 2005 and Best Paper Award from the Japanese Geotechnical Society in 2005.

Admission is free

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