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THE UNIVERSITY OF SHEFFIELD

4 PM – SIR FREDERICK MAPPIN BUILDING
LECTURE THEATRE 9

"New Tools for Geotechnical Deformation and Stability Analysis"

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The use of the finite element method for engineering analysis goes back to the 1950s. Since then, the method has undergone tremendous developments and is today a standard tool in many fields of engineering including structural, mechanical, and aerospace engineering. In geotechnical engineering, the method is used routinely for both stability and deformation analysis. That is, to assess limit loads (or factors of safety) and to determine deformations under working loads.

As an alternative to conventional finite element analysis, computational limit analysis (or finite element limit analysis), has long been recognized as a powerful means of assessing stability. Computational limit analysis has been developed in parallel to, and quite separately from, the finite element method and was originally viewed as having little or nothing to do with conventional finite elements. Indeed, it was always recognized that the scope of computational limit analysis – the assessment of stability – was much narrower than that of the finite element method.

However, in the past decade or so, it has been realized that the scope of the methods that underpin computational limit analysis is much broader than originally expected. In particular, it turns out that it is possible to extend the basic computational limit analysis framework to cover also deformation analysis. The result is a framework that embodies the best of both worlds: the flexibility and generality of conventional finite elements and the robustness and efficiency of computational limit analysis.

The presentation will cover the theoretical basis of the new framework and demonstrate its advantages in typical 2D and 3D geotechnical deformation and stability analyses. These include slope stability, deep excavations, embankment construction, and tunnelling.

SPEAKER BIO

Kristian Krabbenhoft received his MSc and PhD from the Technical University of Denmark in 2000 and 2003 respectively. He then joined the University of Newcastle, NSW before moving to the University of Liverpool, where he is currently the Chair of Geomechanics. In 2013, he co-founded Optum Computational Engineering to develop advanced and user-friendly software for geotechnical engineering practice. He is currently a consultant with the company. He has held visiting positions at a number of universities including Ecole Polytechnique and ENS (France), DTU (Denmark), Caltech (USA), and Tsinghua University (China). His research interests include theoretical and computational geomechanics, off-shore geotechnics, constitutive modelling, stochastic mechanics, and risk and reliability analysis.