3D Nonlinear Strength Criterion for Rock and its Applications

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First, Hoek-Brown (HB) strength criterion is introduced and a generalized 3D HB strength criterion is presented, which is also called as Generalized Zhang-Zhu(GZZ) strength criterion by international researchers. The GZZ strength criterion is an ISRM suggested method(2012). Furthermore, the yield surface of the GZZ strength criterion is modified by using three different Lode dependences with characteristics of both smoothness and convexity to replace its Lode dependence. The modified criteria are applied to the verification on the yield surface of non-smoothness and non-convexity and strength prediction accuracy of strength; **Second**, the real parameters of GZZ criterion are obtained from field measuring by using binocular 3-D reconstruction technique based on single camera; **Third**, the constitutive model based on the GZZ criterion is implemented and validated using Tongji-Shuguang 3D numerical software platform (GeoFBA3D); **Finally,** a case study with the GZZ criterion is demonstrated.

Curriculum vitae

Prof. Hehua Zhu is now the Distinguished Professor in Geotechnical Engineering of Tongji University, Changjiang Scholar Chair Professor of China, director of Engineering Research Center of Information Technology in Civil Engineering of the Ministry of Education of China. He received his Bachelor's and Master's Degrees in Mining Engineering from Chongqing University, in 1983 and 1986 respectively, and his PhD was awarded in Structural Engineering (Civil Engineering), Tongji University in 1989. He did his postdoctoral research in Geo-Research Institute of Osaka and Kyoto University, Japan from 1993 to 1995, and was a visiting professor and part-time faculty member at Virginia Tech, USA from 2011 to 2012.

He is now the International Advisory Group member (2011-2020), Center for Smart Infrastructure Construction(CSIC), University of Cambridge, UK and the research advisor of Geo-research Institute of Osaka, Japan; He is also the Chair of JTC2 (FedIGS), the vice presidents of Chinese Society for Rock Mechanics and Engineering and Committee of Tunnel and Underground Engineering of China Civil Engineering Society. He is a Co-editor in Chief of International Journal of Underground Space and an executive editorial board member of Frontiers of Structural and Civil Engineering (FSCE-CAE Transaction).

His research interests are in Rock Mechanics and Numerical Methods in Geo-engineering, Life-cycle Design Theory of Tunnel and Underground Engineering, Smart Infrastructure Construction, Fire Disaster Prevention and Reduction for Underground Space. He has published more than 300 journal papers (100 SCI papers) and 8 books as the editor or co-editor. He was awarded with the T.H.H. medal at ICCES'13 and the Humboldt Research Prize (2015) in recognition of his seminal contributions to research on geo-mechanics and underground engineering, two second national prizes of Science and Technology of China and 9 first prizes of Science and Technology from Ministry of Education, Province and Academic Institute, China.