Preface

In rock engineering, the mechanical properties, orientations, and spatial distribution of joints, faults, foliations, etc., often control the deformation and stability of structures such as slopes and tunnels. While analyzing rock masses, discontinuum-related methods, such as discrete element method (DEM), discontinuous deformation analysis (DDA), and numerical manifold method (NMM), provide greater flexibility in modeling rock mass behavior than the conventional approaches, such as FEM with interface elements.

However, three-dimensional discontinuum-related methods have a few limitations, and a lot of efforts have been made to overcome them. After two decades of hardship, Dr. Shi GenHua has found a surprisingly simple but an effective way to tackle contacts among discontinuous objects with arbitrary shapes. His novel work, as documented in the paper entitled “Contact theory”, has been published in this special issue. With this, the treatment of contact and impact will be founded on a rigorous basis.

A special issue is an ideal forum for researchers worldwide to share knowledge and report recent advancements in the field of discontinuum-related methods and their applications. *Science China Technological Sciences* therefore considered to organize this special issue dedicated to this discipline and was warmly responded from researchers actively working on this area.

After a thorough review, 12 papers were selected in this special issue. The authors report their advances in various aspects of the discontinuum-related methods, such as complementarity DDA, spherical DDA model, NMM coupled with non-uniform rational B-splines and T-splines, DDA coupled with FEM, DDA coupled with BEM, and continuous-discontinuous element method. Other papers focus on the simulation of rock failure process, including the toppling failure of slopes, the semi-circular bend dynamic fracture toughness test, and the hydraulic fracture process.

We hope this special issue, with its leading paper of “Contact theory,” will provide important and valuable references to the researchers working in this area.

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