

Systematic Investigation of the Planar Shape of Rock Fractures using PFC3D Numerical Experiments



Lianyang Zhang, Department of Civil Engineering and Engineering Mechanics, University of Arizona, Tucson, AZ 85721

It is important to know the planar shape of rock fractures when characterizing a fractured reservoir. The goal of this project is to investigate the fundamental mechanism of fracture propagation in rock and the factors affecting the planar shape of rock fractures, based on the numerical simulation with the three dimensional Particle Flow Code (PFC3D). The work includes (1) development and calibration of the numerical model using the experimental data including unconfined compressive strength, tensile strength and stress-strain curves; (2) validation of the calibrated numerical model by comparing the simulated fracturing pattern with the experimental fracturing results of the same rock; and (3) investigation of the planar shape of rock fractures and the different factors affecting the fracturing of rocks using the validated numerical model. So far several accomplishments have been achieved:

- PFC3D has been applied with modifications to successfully analyze different rock mechanics problems
- An “excavation” procedure is developed to create the initial flaw(s) for fracturing tests
- A unique “zoned” particle assembly procedure is developed to generate the numerical sample which can not only simulate the real particle size in the zone containing the initial flaw(s) but significantly decrease the total number of particles for the whole sample

