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Calibration of the Discrete Element Method Using a Large Shear Box

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Abstract : One of the main challenges in using the Discrete Element Method (DEM) is to specify the correct input parameter values. In general, the models are sensitive to the input parameter values and accurate results can only be achieved if the correct values are specified. For the linear contact model, micro-parameters such as the particle density, stiffness, coefficient of friction, as well as the particle size and shape distributions are required. There is a need for a procedure to accurately calibrate these parameters before any attempt can be made to accurately model a complete bulk materials handling system. Since DEM is often used to model applications in the mining and quarrying industries, a calibration procedure was developed for materials that consist of relatively large (up to 40 mm in size) particles. A coarse crushed aggregate was used as the test material. Using a specially designed large shear box with a diameter of 590 mm, the confined Young's modulus (bulk stiffness) and internal friction angle of the material were measured by means of the confined compression test and the direct shear test respectively. DEM models of the experimental setup were developed and the input parameter values were varied iteratively until a close correlation between the experimental and numerical results was achieved. The calibration process was validated by modelling the pull-out of an anchor from a bed of material. The model results compared well with experimental measurement.

Keywords : Discrete Element Method (DEM), calibration, shear box, anchor pull-out
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