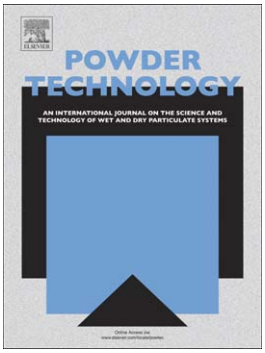

A new contact detection algorithm for three-dimensional non-spherical particles

C.W. Boon, G.T. Houlsby, S. Utili

PII: S0032-5910(12)00839-X
DOI: doi: 10.1016/j.powtec.2012.12.040
Reference: PTEC 9326

To appear in: *Powder Technology*

Received date: 17 August 2012
Revised date: 15 December 2012
Accepted date: 19 December 2012

Please cite this article as: C.W. Boon, G.T. Houlsby, S. Utili, A new contact detection algorithm for three-dimensional non-spherical particles, *Powder Technology* (2012), doi: 10.1016/j.powtec.2012.12.040

A NEW CONTACT DETECTION ALGORITHM FOR THREE-DIMENSIONAL NON-SPHERICAL PARTICLES

C.W. Boon[1], G. T. Houlsby[1] and S. Utili[2]

[1]Department of Engineering Science, Oxford University Parks Road, Oxford OX1 3PJ, United Kingdom

[2]School of Engineering, University of Warwick, Coventry CV4 7AL, United Kingdom; formerly at University of Oxford.

ABSTRACT

A new contact detection algorithm between three-dimensional non-spherical particles in the discrete element method (DEM) is proposed. Houlsby previously proposed the concept of potential particles where an arbitrarily shaped convex particle can be defined using a 2nd degree polynomial function [1]. The equations in 2-D has been presented and solved using the Newton-Raphson method. Here the necessary mathematics is presented for the 3-D case, which involves non-trivial extensions from 2-D. The polynomial structure of the equations is exploited so that they are second-order cone representable. Second order-cone programs have been established to be theoretically and practically tractable, and can be solved efficiently using primal-dual interior-point methods [13]. Several examples are included in this paper to illustrate the capability of the algorithm for particles of various shapes.

Keywords: DEM; non-spherical; polyhedral; contact detection; potential particles;