DEM simulations of weakly wetted granular materials: implementation of capillary bridge models

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Weakly wetted granular material is the subject of many studies. They play an important role in geology, geomechanics and many other technical applications, e.g. construction, pharmaceuticals, civil engineering etc. Liquid or capillary bridges are present between grains, which produce inter-grain forces on the micro-scale level and drastically modify the mechanical properties of the granular media on the macro-scale levels [3].

The talk will be focused on capillary bridge models for DEM particles [1], which are able to simulate the weakly wetted state (a few volume percent liquid binders) of granular materials as well as the liquid migration model. The implementation of several state of the art capillary bridge models in different open source DEM-programs (YADE, LIGGGHTS, MercuryDPM etc.) is described. Efficiency and accuracy of the different implementations is tested. The split-bottom ring shear cell [2] and hopper discharge process will be used as test-cases to simulate the granular flow in intermediate flow regime. Quantities, such as total number of contacts, average liquid content and other relevant parameters will be used to compare and evaluate programs output.

Some technical and license questions will be discussed for the purpose of improving the source code quality and increasing the possibility of program including into the repositories of free operating systems on the example of Debian OS.

References

[1] A. Gladkyy and R. Schwarze. Comparison of different capillary bridge models for application in the discrete element method. *Granular Matter*, 16(6):911–920, 2014.

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