

ABSTRACT

Ranjan, Harsh M.S.M.E., Purdue University, May 2017. A Methodology for DEM Parameter Calibration. Major Professor: Carl R. Wassgren, School of Mechanical Engineering.

Modelling real-world behaviour of granular systems requires many variables to be specified. Many critical DEM parameters might be difficult to measure directly and so, their calibration is required.

In this thesis work, the most important DEM input parameters are identified based on a literature survey. Then appropriate calibration tests are designed for the identified parameters that are simple to implement for physical experiments and computationally inexpensive at the same time.

These tests are then checked for sensitivity to different parameters to isolate the most important ones. Additionally, they are performed in a specific order, with those having least number of independent variables being performed first. This would allow tests with greater number of independent variables to fix some of their unknown parameters via calibration tests done before them. The overall calibration procedure is validated using a dynamic test in a rheometer by comparing its simulation at the calibrated parameters with the experiments.

The thesis demonstrates the working of this proposed calibration procedure by using three different materials, viz., glass beads, Ottawa sand, and mustard seeds. For glass beads and mustard seeds, the simulations at the calibrated parameters showed agreement with the experiments, however, for Ottawa sand the rheometer test simulations results did not match. This was attributed to differences in the actual and simulated particle sizes for Ottawa sand, thereby highlighting the importance of particle size in calibration studies.