

Modelling the Soil Heterogeneity in the Discrete Element Model of Soil-Sweep Interaction

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ABSTRACT

In agriculture the analyse of soil compaction and soil-tool interaction has a significant role. The equipments of agricultural farms are getting bigger and more complicated, and it has huge importance to optimize agronomical tillage methods. Two of most frequently investigated factors are the soil tool's mixing-effect and the draught force on the tool; these results are important for agronomical experts to design tillage tools and culture processes. Discrete Element Method (DEM) is one of the numerical methods to model soil's behaviour and soil-tool interaction. Aim of this study is trying to develop a 3D DEM model for clay soil and analyse the behaviour of soil model regarding to non-homogeneous soil condition of agricultural fields. Simulation results will be compared with field test measurements for draught force and cone penetration tests. In this paper effects of particle's type will be investigated and simulations will be compared using spherical particles and so-called clumps in model. Clumps are aggregations that are set of spheres. Study researches the differences in modelling of soil with clumps and spheres and it will be tried to model the thixotropic behaviour of soil with another kind of particles. Damping property of soil was modelled use of clumps, excluding the viscous damping factor between particles. Non-homogenous property and varied compaction of field soil will be modelled with more layers, keep to be comparable the simulation results with field tests. Measurements were set for different moisture contents, study investigates appropriate set of parameters to simulate moisture content's effect. In modelling of moisture content cohesion had high importance during simulations.

REFERENCES

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