

耕作土壤动力学的三维离散元建模和仿真方案策划

Modeling and methodological strategy of discrete element method simulation for tillage soil dynamics

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作者	单位
徐泳	中国农业大学
李红艳	中国农业大学
黄文彬	中国农业大学

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中文摘要:

提出了采用基于颗粒接触力学原理的离散元法对耕作土壤动力学问题进行数值模拟的新思路。介绍了若干可供选择的适合不同土壤条件的颗粒作用模型,包括无粘连/粘连干颗粒模型和牛顿流体/非牛顿流体湿颗粒模型,后者是作者与合作者近年来所致力于的离散元建模方面的新成果。讨论了用离散元法进行土壤动力学仿真的可行性和若干关键技术问题及对策。指出本方案的实施将更新对耕作过程的力学机理的认识,发展土壤动力学理论,促进耕作机械设计的科学化、合理化。

英文摘要:

A new simulation strategy using the Discrete Element Method (DEM) based on spherical particle contact mechanics to tillage soil dynamics was proposed. Several suitable selected particle interaction models for different soil types were briefly introduced, including dry particle models with or without adhesion and wet granule models with Newtonian or non-Newtonian fluids, of which the models for non-Newtonian fluids have recently been found by the authors. Feasibilities and several key techniques, as well as their possible solution for such simulations, were discussed. The importance of this new approach would update the understanding of the mechanical mechanism of tillage processing, and promote the development of soil dynamics and the premium design of tillage machine tools.

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服务热线: 010-65929451 传真: 010-65929451 邮编: 100026 Email: tcsae@tcsae.org

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