高性能离散元软件MatDEM

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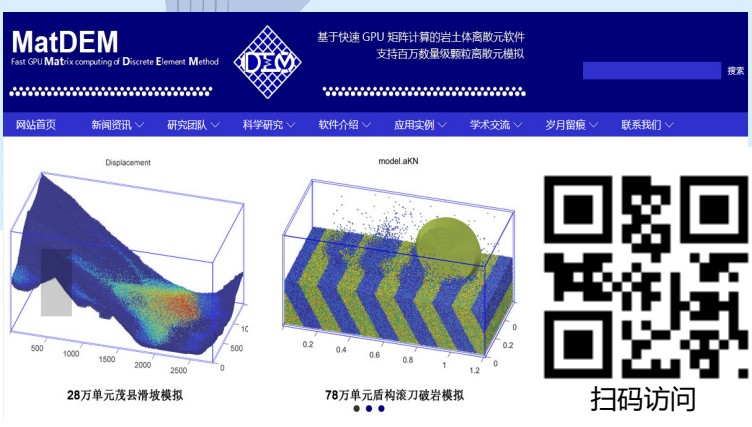
地质和岩土工程领域的很多问题都涉及到大变形和破坏，离散元数值计算方法能够有效地模拟这些过程，在岩土工程、地质工程和能源开采等领域具有广泛的应用价值。但是，长期以来，离散元法面临着计算量巨大、定量化建模困难和多场耦合理论不完善三个主要问题，极大地限制了其实际工程应用。

通过十一年的理论研究和系统研发，我们自主研发了高性能离散元软件MatDEM。采用创新的矩阵离散元计算法，软件突破性地实现了数百万颗粒的高效离散元数值模拟，将离散元分析由试样尺度推进到工程应用。软件支持自动材料训练，多场和流固耦合数值模拟，可实现复杂的地质和工程问题的定量分析。

MatDEM支持Windows和Linux操作系统，其综合了前处理、计算、后处理，以及基于Matlab语言的二次开发，具有良好的可扩展性。相关创新成果已申请和获得10余项国家发明专利，3项软件著作权，拥有核心技术和知识产权。并在JGR-Solid Earth，Computers & Geosciences等国际一流期刊发表了一系列学术论文。

在中国岩石力学与工程学会的大力支持下，MatDEM软件于2018年5月正式发布。目前，软件已应用于滑坡、岩爆、撞击破坏、桩土作用、滚刀破岩和水力压裂等一系列问题的数值模拟。进一步，通过完善多场耦合和流固耦合模拟，为国家大规模工程建设提供高效的数值模拟仿真技术支持。

MatDEM软件学术使用免费。软件和教学视频可于网站下载http://matdem.com

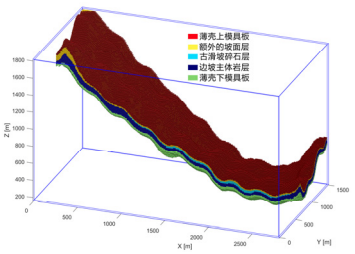


28万单元茂县滑坡模拟　78万单元盾构滚刀破岩模拟

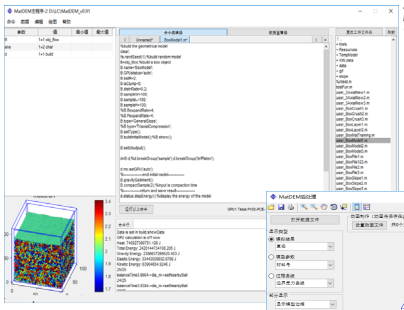
扫码访问

用户界面

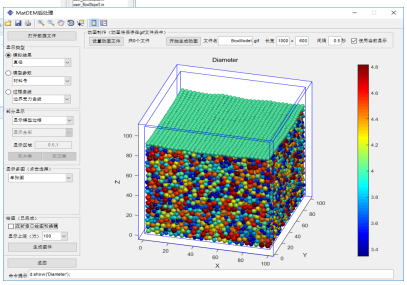
支持六种语言



复杂三维边坡模型

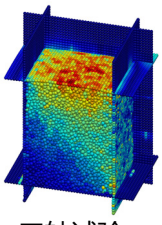


强大的二次开发

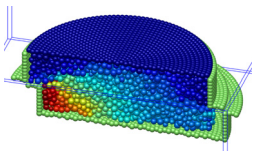


后处理

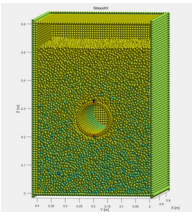
示例



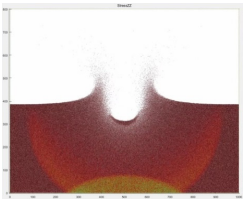
三轴试验



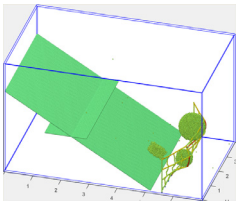
直剪试验



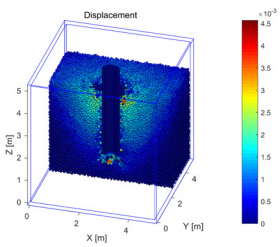
隧道问题



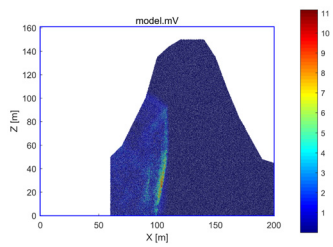
陨石撞击地面



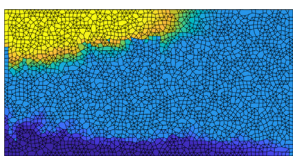
滚石撞击挡网



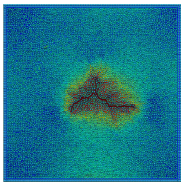
能源桩热力耦合



地震波作用



冷热水的流动



水力压裂

High-performance Discrete Element Software MatDEM

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School of Earth Sciences and Engineering, Nanjing University

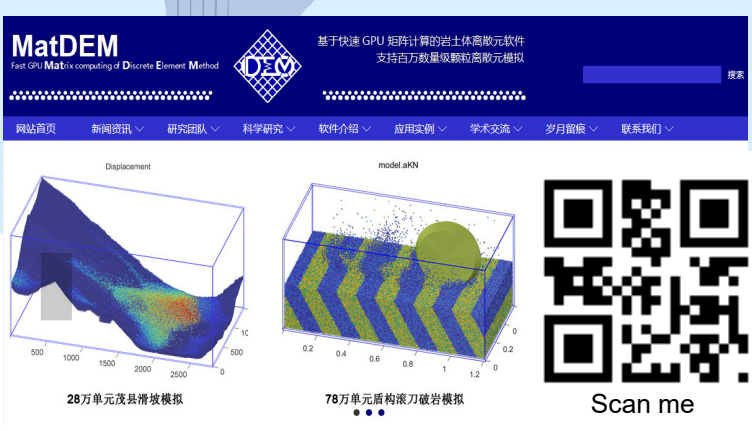
Discrete element method has wide demands from geotechnical engineering, geological engineering, agriculture and material fields, etc., since it permits large deformation and failure etc. However, there are still three major issues in the method: huge computing cost, difficult in modeling, and imperfect multi-field coupling simulation, which greatly limits its applications.

Through 11 years of theoretical research and software development, we developed the high-performance discrete element software MatDEM from scratch. By using innovative Matrix Discrete Element computing method, the software can handle millions of elements in one computer. It also supports automatic material training, multi-field and solid-fluid coupling numerical simulation.

The software runs on Windows and Linux operating system. It includes pre-processing, numerical calculation, post-processing and powerful secondary development functions that based on Matlab language.

Since MatDEM1.0 was released in May 2018, it has been applied in the numerical simulation of a series of processes, such as landslide, rock burst, pile-soil interaction, tunnel issues and hydraulic fracturing, etc. Source codes of the examples are provided online (150~300 lines of code)

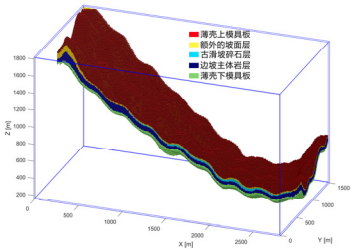
MatDEM is free for academic research, now and in the future. The software and teaching video (with English subtitles) can be downloaded from http://matdem.com



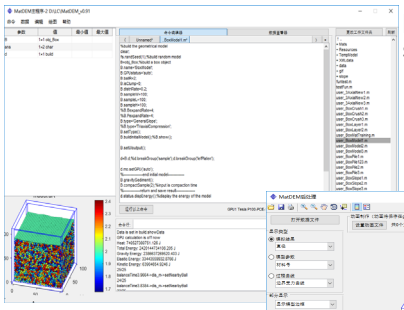
Scan me

User Interface

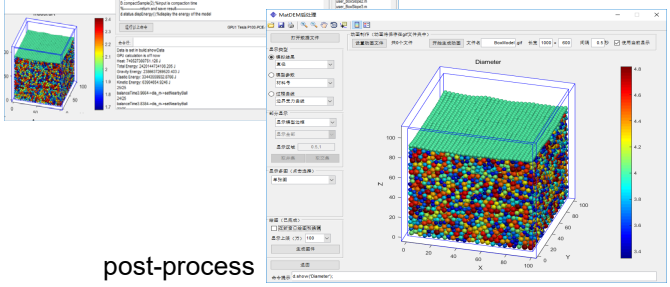
supports six languages



building complex models

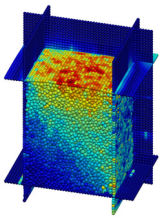


powerful secondary development

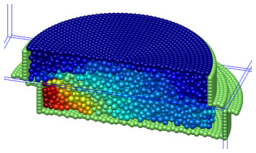


post-process

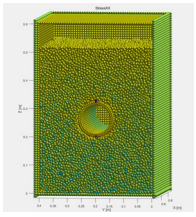
Examples



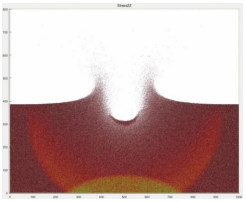
triaxial test



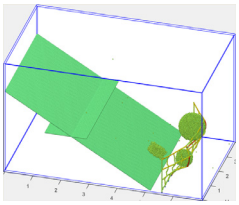
shear box test



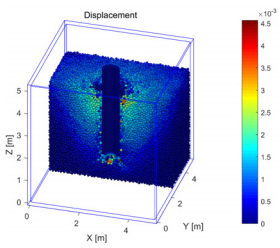
tunnel issues



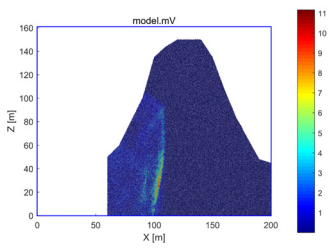
meteorite hitting



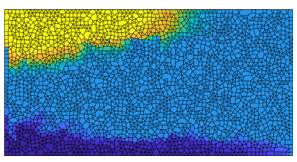
rolling stone



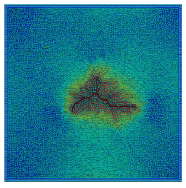
multi-field coupling



dynamic effect



flow of hot and cool water



hydraulic fracturing