

Predavanje HDM-a:

Mechanics of multi-body systems and its numerical implementation: the discrete-element method

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SUMMARY

There are many challenges for engineers when it comes to handling powder storage, grain conveying in industrial processing or dry-wall structures in civil engineering because they are neither a continuous solid nor fluid - they are granular materials. In these materials, the grains or blocks are distinct objects so each of them has to be treated as a single rigid or deformable body with its own degrees of freedom.

We could consider media composed of particles as a continuous medium and use the methods of continuum mechanics along with appropriate numerical methods, such as the finite-element method. But we can also apply the principles of multibody-system mechanics considering each particle interacting with the others through contact laws. This approach is more appropriate for granular matter since we can investigate mechanisms at the particle scale: we can expect to relate macroscopic behaviour (expressed through e.g. stress and strain fields) to microscopic properties (e.g. particle geometry, polydispersity).

In this lecture, the key equations of solid mechanics and contact laws will be presented and their numerical implementation in the discrete-element methods will be shown. We will conclude with several results in mechanical and civil engineering.