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Numerički model procesa kompaktifikacije granularnog sistema

Granularni materijali predstavljaju ansamble velikog broja makroskopskih objekata. U radu je numeričkim modelom ispitivan uticaj intenziteta vertikalnih vibracija na granularni sistem. Posmatran je proces kompaktifikacije sistema baziran na ideji adsorpciono-desorpcionog modela. Model je realizovan na jednodimenzionalnoj rešetki primenom ovih stohastičkih procesa na linijske segmente. Proučavan je memorijski efekat koji nastaje trenutnom promenom intenziteta vibracija.

Rezultati pokazuju da ovaj model reprodukuje osnovne osobine procesa kompaktifikacije i memorije sistema. Pokazano je da u ravnotežnom stanju gustina sistema raste opadanjem verovatnoće desorpcije. Brzina promene gustine raste srazmerno verovatnoći desorpcije. Granularni sistemi pamte kako su došli u određeno stanje, odnosno dalje ponašanje tih sistema, pri istim uslovima, nije ekvivalentno već zavisi od njihove predistorije.

A Numerical Model of the Compactification of a Granular System

Granular materials are ensembles of a large number of macroscopic objects. In this paper we used a numerical model to investigate the influence of vertical vibrations on a granular system. We have observed the process of compactification based on the idea of the adsorption-desorption model. The model was realised on a 1D lattice by applying these stochastic processes on line segments. We payed special attention to investigating the memory effect which occurs when the intensity of the vibration changes abruptly.

The results we obtained show that this model reproduces the fundamental traits of the compactification process and the memory of a granular system. We have shown that the equilibrium density of the system increases when the desorption probability decreases, and that the density change rate is proportional to the desorption probability. We have also shown the existence of memory effects – the system remembers how it reached its current state, so its behaviour depends on its history.

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