

Mathematical Modeling in Mechanics of Granular Materials

Mathematical Modelling

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Preface

This monograph contains original results in the field of mathematical and numerical modeling of mechanical behavior of granular materials and materials with different strengths. Zones of the strains localization are defined by means of proposed models. The processes of propagation of elastic and elastic-plastic waves in loosened materials are analyzed. Mixed type models, describing the flow of granular materials in the presence of quasi-static deformation zones, are constructed. Numerical realizations of mechanics models of granular materials on multiprocessor computer systems are considered.

The book is intended for scientific researchers, university lecturers, post-graduates, and senior students, who specialize in the field of the mechanics of deformable bodies, mathematical modeling, and adjacent fields of applied mathematics and scientific computing.

This monograph is a revised and supplemented edition of the book “Mathematical Modeling in the Problems of Mechanics of Granular Materials”, published by “Fizmatlit” (Moscow) in 2008 in Russian. Compared with the Russian edition, its content is expanded by a new [Chap. 10](#), devoted to mathematical modeling of dynamic deformations of structurally inhomogeneous media, taking into account the rotational degrees of freedom of the particles. Besides, in [Chap. 7](#) the [Sect. 7.4](#), containing new results on the analysis of wave motions in layered media with viscoelastic interlayers, is added, and [Chap. 9](#), [Sect. 9.8](#) is added with the results of solving the problem of radial expansion of spherical and cylindrical layers of a granular material under finite strains.

The results presented in the monograph were used when reading special courses in the Siberian Federal University. The work was performed at the Institute of Computational Modeling of the Siberian Branch of Russian Academy of Sciences. It was partially supported by the Russian Foundation for Basic Research (grants no. 04-01-00267, 07-01-07008, 08-01-00148, 11-01-00053), the Krasnoyarsk Regional Science Foundation (grant no. 14F45), the Complex Fundamental Research Program no. 17 “Parallel Computations on Multiprocessor Computer Systems” of the Presidium of RAS, the Program no. 14 “Fundamental Problems of Informavtics and Informational Technologies” of the Presidium of RAS, the

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It should be noted that significant improvements in the presentation of the material in comparison with the Russian edition was achieved through the attentive participation of the scientific editor of the monograph—Prof. Holm Altenbach, who has made many invaluable comments on the content.

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