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CONTACT MECHANICS : MODELLING, ANALYSIS AND APPLICATIONS

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ABSTRACT

Considerable progress has been achieved recently in modelling, mathematical analysis and numerical simulations of various contact processes and, as a result, a general Mathematical Theory of Contact Mechanics is currently emerging. It is concerned with the mathematical structures which underly general contact problems with different constitutive laws, i.e., materials, varied geometries, and different contact conditions. Its aim is to provide a sound, clear and rigorous background to the following: a) construction of models based on thermodynamic principles which are motivated by applications; b) establishing the existence of solutions; c) proving the uniqueness of the solutions, or establishing their nonuniqueness and finding criteria for choosing the appropriate solution; d) investigating the stability of solutions and their asymptotic behavior; e) analysis of approximation schemes including convergence results of the discrete solutions and optimal error estimates; f) construction of reliable and efficient algorithms for the numerical approximations of the models with guaranteed convergence; g) application on engineering problems where contact processes are present and their numerical solution.

The mathematical concepts of variational and hemivariational inequalities, complementarity problems, differential inclusions, as well as the terms unilateral or nonsmooth mechanics are tightly related with the topic. The Theory also provides an environment or a structure where a number of engineering problems can be investigated and reliable results can be found.

The aim of this minisymposium is to provide the state of the art on the Mathematical Theory of Contact Mechanics and to present some of its applications in engineering. The speakers will provide treatment of various contact problems by presenting arguments and results in modelling, analysis and numerical simulations.