

Elastic and Plastic Collision Comparison Using Finite Element Method

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Abstract : The prevision of post-impact conditions and the behavior of the bodies during the impact have been object of several collision models. The formulation from Hertz's theory is generally used dated from the 19th century. These models consider the repulsive force as proportional to the deformation of the bodies under contact and may consider it proportional to the rate of deformation. The objective of the present work is to analyze the behavior of the bodies during impact using the Finite Element Method (FEM) with elastic and plastic material models. The main parameters to evaluate are, the contact force, the time of contact and the deformation of the bodies. An advantage of using the FEM approach is the possibility to apply a plastic deformation to the model according to the material definition: there will be used Johnson‐Cook plasticity model whose parameters are obtained through empirical tests of real materials. This model allows analyzing the permanent deformation caused by impact, phenomenon observed in real world depending on the forces applied to the body. These results are compared between them and with the model-based Hertz theory.

Keywords : collision, impact models, finite element method, Hertz Theory

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