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Plastic Deformation by Impacts in Multibody Systems

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In machine dynamics, the multibody system approach proves to be most efficient for the dynamical analysis of the overall motion. Collisions in multibody systems might result in impacts between the system's bodies and the coefficient of restitution is generally used to describe the energy loss during impact. The loss of kinetic energy is due to the initiation of elastic waves in the bodies and local plastic deformation resulting from high forces in the contact region. However, the coefficient of restitution cannot be computed within the multibody system approach. In this paper a numerical method on a fast time scale is presented to evaluate the coefficient of restitution considering plastic deformation in the contact region and wave propagation in the bodies. Numerous longitudinal impacts of a steel sphere on different aluminum rods are used as benchmark for the presented approach and the results are verified by measurements, too.

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