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An Overview of Numerical Methods for Discrete Dynamical Systems with Frictionless Unilateral Constraints: Mathematical Issues and Convergence Results

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Abstract: The dynamics of rigid multibody systems subjected to frictionless non-penetration conditions leads to vibrations with impacts and velocity jumps, and classical good properties of dynamical systems, like uniqueness or continuity on data, are not always satisfied. As a consequence reliable simulations of such systems cannot be performed easily and the use of any numerical algorithm has to be substantiated by a convergence result.
Starting from the basic description of the mechanical problem, we derive its mathematical formulation as a Measure Differential Inclusion. The main difficulties in the approximation of solutions will be discussed and an overview of especially suited algorithms will be proposed together with the corresponding convergence results.