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Indeterminacy and inconsistency in non smooth contact dynamics

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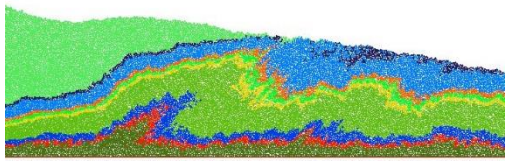

Fig.1: Sandbox

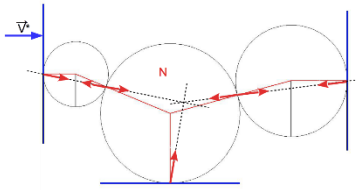

Fig.2: Wedging 1

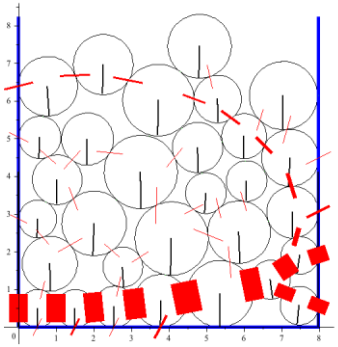

Fig.3: Wedging 2

The NonSmooth Contact Dynamics method has been developed for dealing with large collections of packed bodies and then for simulating the behavior of a collection of (especially rigid) bodies involving different and mixed regimes: static, slow dynamics (solid), fast dynamics (fluid). But it is not a panacea.

For illustrating the limits of the NSCD approach we focus our attention on dense granular systems that are strongly confined. In order to respect the "elegant rusticity" of the Moreau's approach we restrict the analysis to a collection of rigid bodies without considering global or local deformations of the grains. Some simple examples highlight the issue of inconsistencies, i.e. some configurations for which no solution exists, as well as indeterminacies, i.e. configurations that lead to non-uniqueness of solutions. We recover here the Painlevé paradox underlined at the beginning of the twentieth century. The non existence of solutions is the more important challenge we have to face. We can first identify the situations leading to this non existence among them the granular systems submitted to moving walls. If such a case may not be avoided another response consists in changing the Coulomb friction law.

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