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MIXED IMPLICIT AND EXPLICIT FORMULATION AND DOMAIN DECOMPOSITION METHOD OF CONTACT DYNAMICS

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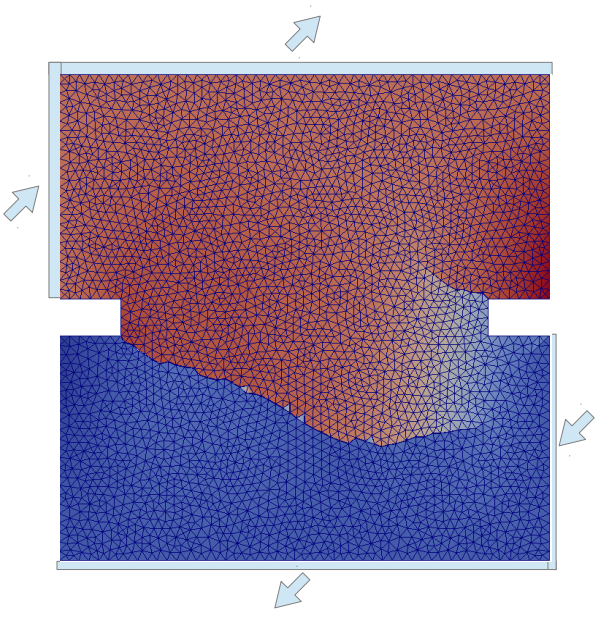
The Non-Smooth Contact Dynamics approach aims at solving frictional contact problems without regularization nor penalization techniques [1].

In this framework both dynamics and contact problems were solved by implicit algorithms.

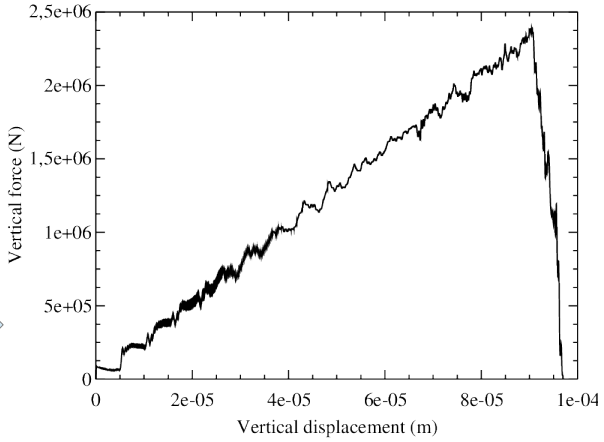
The software developed called LMGC90 permits to solve coupled multi physics problems with various constitutive models and interaction laws [2].

The fracture of heterogeneous materials is modeled using a Cohesive Zone Models approach [3] implemented in a LMGC90-based software called Xper [4]. This method needs very small time steps, smaller than one verifying the Courant-Friedrich-Levy criterion for explicit scheme. Thus, to reduce computational cost while keeping results accuracy, we developed an hybrid method based on an explicit integration of dynamics and an implicit description of contact solved by a non linear Gauss-Seidel algorithm. High Performance Computing is adressed by a Domain Decomposition Strategy based on domain overlaping multithreaded.

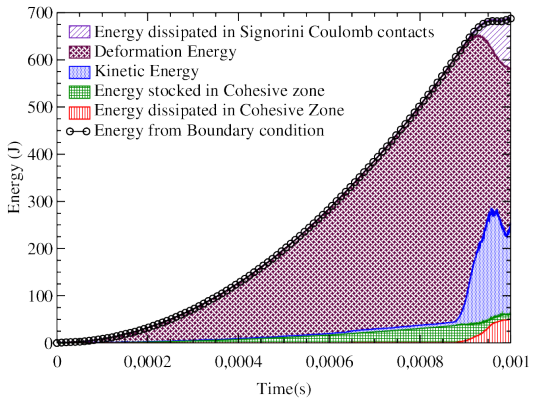
The numerical strategy is applied to the so called Nooru Mohamed test case. Results are similar for implicit and explicit approach, and also for sequential and multithreaded computations. Implementation is validated by analysing balance energy. The insights of numerical algoritms wil be exposed during the presentation.



Computational domain, colored by vertical displacement



Vertical force vs displacement



Energy Balance

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