Asymptotic behavior for textiles with loose contact

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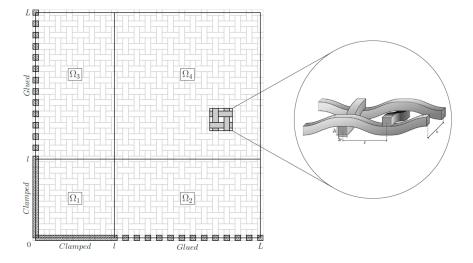[2]UPMC Paris 6
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May 12, 2022

Abstract

The paper is dedicated to the modeling and asymptotic investigation of a linear elasticity problem, in the form of variational inequality, for a textile structure. The textile is made of long and thin fibers crossing each others, forming a periodic squared domain. The domain is clamped only partially and an in plane sliding between the fibers is bounded by a contact function, which is chosen to be loose. We also assume a non-penetration condition for the fibers. Both partial clamp and loose contact arise a domain split, leading to different behaviors in each of the four parts. The homogenization is made via unfolding method, with an additional dimension reduction to further simplify the problem. The four cell problems are inequalities heavily coupled by the outer plane macro-micro constraints, while the macroscopic limit problem results to be an inequality of Leray-Lions type with only macro in plane constraints. On both scales, no uniqueness is expected.

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