Improving the convergence rate of a non-intrusive stochastic coupling scheme

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ABSTRACT

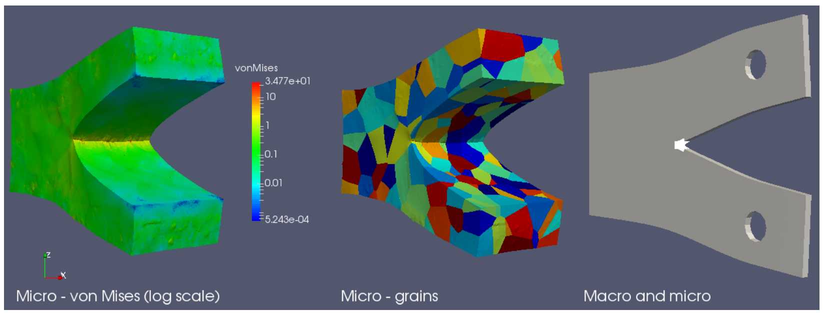

Figure 1: Von Mises stresses (left), grain boundaries (center) and global-local coupled model (right)[3].

This presentation will describe an overlapping coupling scheme between a stochastic model of a polycrystalline material and its homogenized counterpart [1, 2]. This coupling technique allows to model the influence of localized defects, such as for instance the influence of the heterogeneity at the tip of a fracture, which cannot be taken into account through classical homogenization. A fully scalable implementation will also be presented, where the solution of each model is approximated by its own dedicated software and the coupling is solved through an iterative scheme, itself approximated with a third dedicated software. A careful implementation allows to use different parallelization choices (memory-shared or memory-distributed for instance) for each of the model-dedicated software, and for the coupling step [3].

The presentation will more particularly concentrate on the convergence rate of the global iterative scheme, comparing conditioning of the matrices corresponding to a single realization of the random medium and averages appearing naturally in the stochastic-deterministic coupling technique in [1]. Influence of the mesh on the convergence rate will be discussed, as well as potential strategies to devise adapted pre-conditioners for the coupling scheme.

This work benefited from French state funding managed by the National Research Agency under project number ANR-14-CE07-0007 CouESt. The coupling software is freely available at https://cottereau.github.io/CArl/.

REFERENCES

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