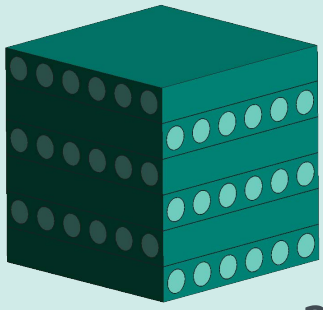


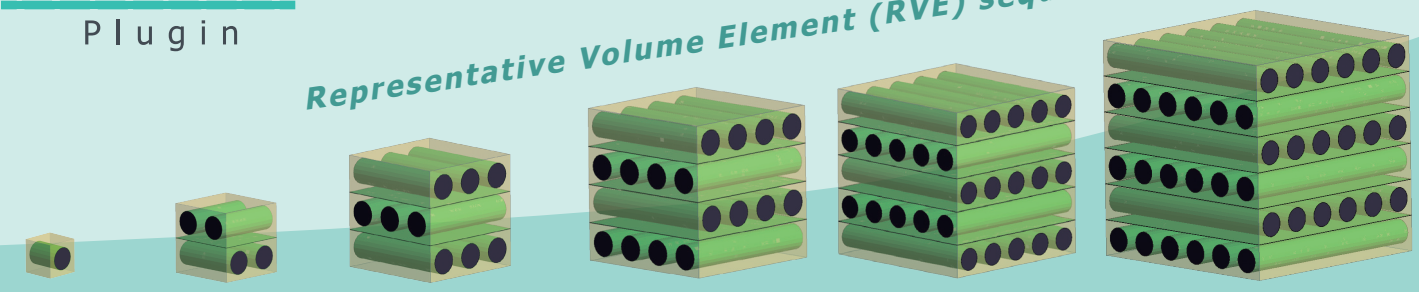
Hyper-reduced multiscale material plugin

"Defeating the tyranny of scales"

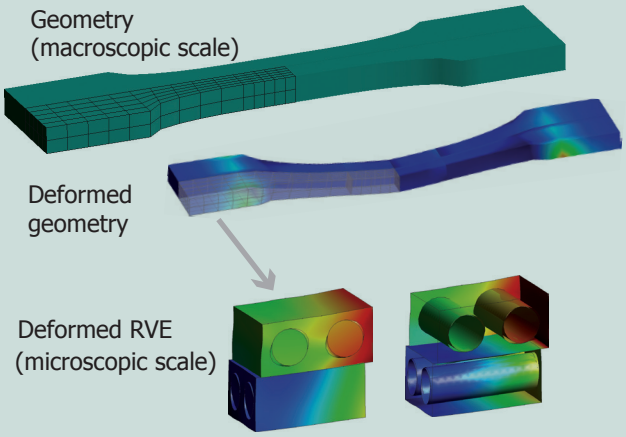
HR-FE^2

Plugin

Representative Volume Element (RVE) sequence

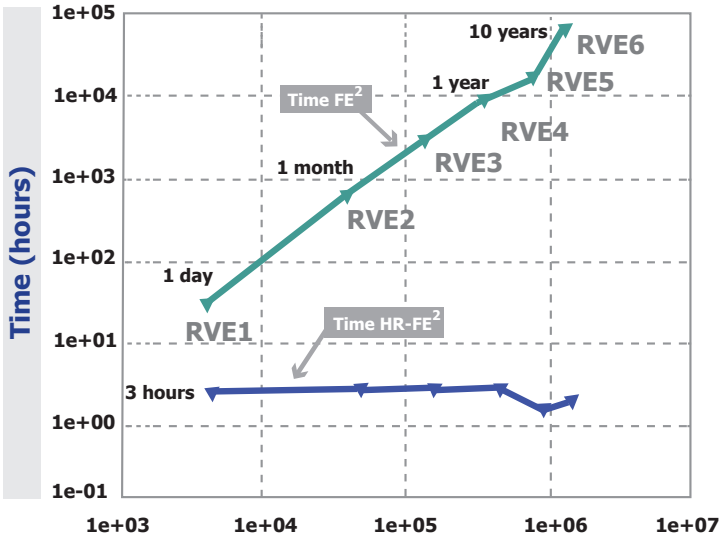


DOGBONE SPECIMEN



HUGE COMPUTATIONAL PERFORMANCE

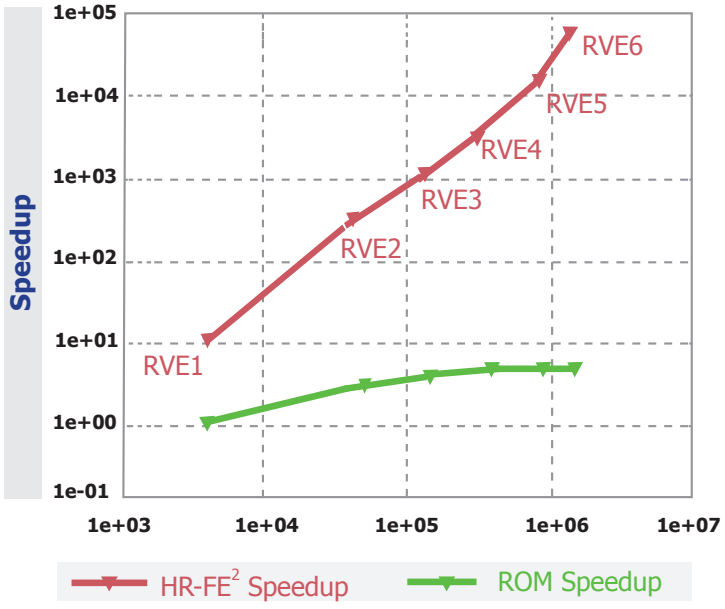
- **Up to 10^5 algorithmic speedup with less than 1% error with respect to FE^2 (standard multi-scale) analysis, on top of parallel computation speedup**
- **Highly outperforming standard single-reduction (ROM) solutions**



RVE complexity (nr. of integration points)

Dogbone specimen

Standard (FE^2) and hyper-reduced (HR-FE^2) computational times



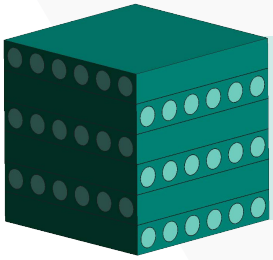
RVE complexity (nr. of integration points)

Dogbone specimen

HR-FE^2 and ROM computational speedups (with respect to standard multiscale analysis)

HR-FE^2

Plugin



Benefits of the HR-FE^2 technique

Consistent: convergent with macromesh refinement and ROM parameters increase

Tunable: material parameters are user-customizable

Complete: retains the complete physics of the original RVE (High Fidelity finite element) model

Easy to be plugged into general FE solvers

High and low-scale information can be simultaneously retrieved for user decision-making

Applicable to a wide range of multiscale material families

Contact

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