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# Solving stochastic FEM problems with high performance domain decomposition in GPUs

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One of the most widely used and straightforward techniques for solving stochastic partial differential equations are the non-intrusive Monte Carlo methods. They can handle any type of problems (linear, nonlinear, dynamic) as well as any kind of uncertainty in the load or in the system properties and they can be implemented in a non-intrusive manner in the framework of existing deterministic solvers at the expense of requiring excessive computational effort. However, the solution process can be greatly accelerated, especially when dealing with deterministic external loading, if the numerical properties of the successive solution of linear systems with multiple left-hand sides that occur can be exploited.

In this work, a highly scalable methodology involving domain decomposition methods and custom-tailored preconditioners for the iterative solution of the resulting equations is being utilized. A GPU implementation for solving large-scale stochastic FEM problems is presented where domain decomposition solvers are used for the preconditioning step of the iterative solvers. The kernels used are explained and described in detail, along with various test cases that showcase the performance of the proposed methodology.

## REFERENCES

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