

Reduced basis method for noncoercive variational inequalities

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We consider variational inequalities with different trial and test spaces and a possibly noncoercive bilinear form. Well-posedness has been shown under general conditions that are e.g. valid for the space-time formulation [3] of parabolic variational inequalities. Using space-time formulations, we do not have a time-stepping scheme anymore, but take the time as an additional variable in the variational formulation of the problem. As an example for a parabolic variational inequality, we may think about time-dependent obstacle problems or option pricing, e.g. for American Options.

Fine discretizations for such problems resolve in large scale problems and thus in long computing times. To reduce the size of these problems, we use the Reduced Basis Method (RBM)[2]. The objective of the RBM is to efficiently reduce discretized parametrized partial differential equations. Problems are considered where not only a single solution is needed but solutions for a range of different parameter configurations.

Combining the RBM with the space-time formulation, a residual based rigorous error estimator has been derived in [1]. In this talk, we will provide new numerical results for a computational realization of the model.

References

- [1] S. Glas and K. Urban. On noncoercive variational inequalities. *SIAM Journal on Numerical Analysis*, 52:2250–2271, 2014.
- [2] A. Patera and G. Rozza. *Reduced Basis Approximation and A Posteriori Error Estimation for Parametrized Partial Differential Equations*. Graduate Studies in Mathematics. Copyright MIT, to appear in (tentative rubric) MIT Pappalardo Graduate Monographs in Mechanical Engineering., 1.0 edition, 2006.
- [3] K. Urban and A. T. Patera. An improved error bound for reduced basis approximation of linear parabolic problems. *Mathematics of Computation*, 83(288):1599–1615, 2014.