

Numerical Zoom for Multi-Scale Problems

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Abstract

The safety assessment of a nuclear waste repository underground in a clay layer is by nature a multiscale problem for which, in principle it is not possible to obtain a numerical solution without extensive computer resources [3].

However if the solution is needed only in some small restricted region of space then a multiscale decomposition is possible which, when combine with a numerical zoom or domain decomposition, allows optimal precision with much less computer memory and cpu time.

The domain is decomposed into a large one where the simulations may not be precise and a small one where precision is required and the process can be iterated. A similar approach has been used before in Steger's Chimera method [5]. In Brezzi et al [1] it was shown to be a particular implementation of Schwarz' method and of Lions' Hilbert space decomposition method [4]. Error estimates in the context of numerical zoom have been obtained by Wagner et al[6] and we will present here a better version for convergence of the iterative algorithm.

References

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