Abstracts

Multilevel Methods Applied to the Design of Resonant Cavities

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An application of multilevel (ML) methods to compute the modes and eigenvalues of resonant cavities is presented. The involved methods include an ML eigenvalue solver, an ML mode separation technique, a boundary treatment method, and a subspace continuation technique (SCT) for sequences of problems. In the presented numerical experiments, an asymptotic convergence factor of order 0.1 is obtained for ML cycles on all fine levels, while performing only a few relaxations per cycle. This factor is obtained for a rectangular cavity as well as for cavities having reentrant corners, holes and narrow regions, and presenting clusters of close and equal eigenvalues. A second order scheme is obtained for the computed eigenvalues and modes with an amount of work of order O (qN) for q modes of size N on the finest level. The SCT is illustrated on a moving boundary problem, where solutions change fast at a small boundary change. Such computations are applied to the design of new microwave selective devices.

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