

KRYLOV SUBSPACE SPECTRAL METHODS FOR VARIABLE-COEFFICIENT INITIAL-BOUNDARY VALUE PROBLEMS*

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Abstract. This paper presents an alternative approach to the solution of diffusion problems in the variable-coefficient case that leads to a new numerical method, called a Krylov subspace spectral method. The basic idea behind the method is to use Gaussian quadrature in the spectral domain to compute components of the solution, rather than in the spatial domain as in traditional spectral methods. For each component, a different approximation of the solution operator by a restriction to a low-dimensional Krylov subspace is employed, and each approximation is optimal in some sense for computing the corresponding component. This strategy allows accurate resolution of all desired frequency components without having to resort to smoothing techniques to ensure stability.

Key words. spectral methods, Gaussian quadrature, variable-coefficient, Lanczos method

AMS subject classifications. 65M12, 65M70, 65D32

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