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A numerical method based on a bilinear pseudo-spectral method to solve the convection-diffusion optimal control problems. (English) Zbl 07476574

Summary: In this paper, we consider the bilinear pseudo-spectral method for solving convection-diffusion optimal control problems (OCPs). First, we convert the optimal control problem to a partial differential equation (PDE) system including the state equation of the original problem and the adjoint equation which must be solved. Next, we approximate the coupled system by a bilinear pseudo-spectral method based on Chebyshev polynomials and obtain a coupled Sylvester system and then use some iterative and direct methods to solve it. We used bilinear pseudo-spectral method to have simplicity in implementation and Chebyshev polynomials to have accuracy and stability. Robustness and accuracy of the method are verified by solving some numerical experiments.

MSC:
65M70 Spectral, collocation and related methods for initial value and initial-boundary value problems involving PDEs
65N35 Spectral, collocation and related methods for boundary value problems involving PDEs
49J20 Existence theories for optimal control problems involving partial differential equations
49M25 Discrete approximations in optimal control

Keywords:
convection-diffusion equation; optimal control; bilinear pseudo-spectral method; coupled Sylvester system; Chebyshev polynomials

Full Text: DOI

References:


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