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Chebyshev-Legendre method for discretizing optimal control problems. (English)

Summary: A numerical method for solving optimal control (OC) problems is presented. The method is enlightened by the Chebyshev-Legendre method for solving partial differential equations. The Legendre expansions are used to approximate both the control and the state functions. The constraints are discretized over Chebyshev-Gauss-Lobatto collocation points. A Legendre technique is used to approximate the integral involved in the performance index. The OC problem is changed into an equivalent nonlinear programming problem which is directly solved. The fast Legendre transform is employed to reduce the computation time. Several further illustrative examples demonstrate the efficiency of the proposed method.

MSC:
65K10 Numerical optimization and variational techniques
49J20 Existence theories for optimal control problems involving partial differential equations
90C30 Nonlinear programming
49M37 Numerical methods based on nonlinear programming

Keywords:
optimal control; Chebyshev-Legendre method; fast Legendre transform; nonlinear programming; numerical examples; Chebyshev-Gauss-Lobatto collocation points

Software:
Ipopt; SNOPT

Full Text: DOI

References:


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