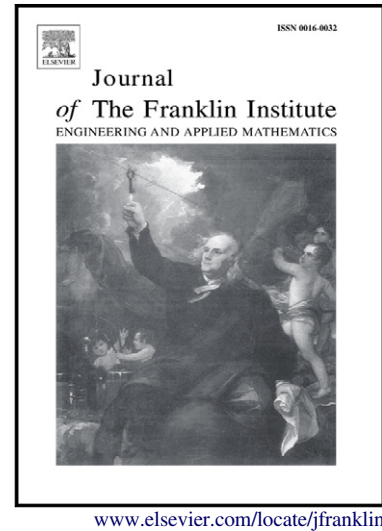


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A symplectic sequence iteration approach for nonlinear optimal control problems with state-control constraints

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Abstract: a sequence iteration numerical method with symplectic discretization form for solving nonlinear constrained optimal control problems with given terminal or free terminal states is presented. The nonlinear optimal problem with state-control constraints is firstly transcribed into a sequence of constraint linear quadratic (LQ) optimal control problems. Then, the symplectic discretization form is applied to the constrained LQ optimal control problem and then the explicit linear complementary problem can be derived. Finally, the solutions of nonlinear constrained optimal control problems can be obtained by employing a standard linear complementary solver. Because the proposed numerical method is symplectic preserved and the state-control constraints are imposed at the discrete points of time interval, the high accuracy and high efficiency numerical solutions can be obtained with large time interval and small iteration times. Meanwhile, the state-control constraints and the terminal states constraints can be satisfied exactly for given accuracy. Numerical simulations show than various types of optimal control problems are investigated to demonstrate the effectiveness of the proposed approximation scheme. The method is robust, easy to implement and provides very accurate results.

Keywords: optimal control problem; state-control constraint; symplectic approach; complementary problem. Hamiltonian boundary value problem;

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