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基于神经网络的鲁棒制导律设计

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ROBUST GUIDANCE LAW DESIGN FOR HOMING MISSILES USING NEURAL NETWORKS

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摘要 基于神经网络理论对寻的导弹鲁棒制导律进行了优化设计。建立了制导系统非线性运动学方程和鲁棒性能函数,并将鲁棒性能函数转化成了微分对策的极小极大化问题。采用伴随 BP技术,将微分对策的两点边值求解问题转化为 2个神经网络的学习问题,训练后的 2个神经网络分别作为对策双方的最优控制器在线使用,避免了直接求解复杂的鲁棒制导律问题,仿真结果表明了该方法有效性

关键词： 微分对策   神经网络   导弹制导   鲁棒控制

Abstract： A robust guidance law for homing missile is designed and optimized using neural networks. The nonlinear kinematics and robust performance of the guidance system are presented, and then, the robust performance is equated to a min max problem of the differential games. It makes the solving of a two points boundary value problem of differential games into the training of two neural networks by using the adjoint techniques of optimal control and backpropagation techniques of neural networks. When neural networks are converged, the two neural networks can be used as the optimal differential games controllers on line, avoiding solving the complex robust missile guidance law problem directly. The sensitivity to initial states in solving optimal controller can be avoided to some extent by making the changes of initial states into the robust performance or by learning on differential initial states using neural networks. The simulation results show the effectiveness of the method.

Keywords： differentia l g ames   neural netw or ks   missile guidance   ro bust co nt ro l

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