IDENTIFICATION AND CONTROL OF CHAOTIC SYSTEMS VIA RECURRENT HIGH-ORDER NEURAL NETWORKS

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ABSTRACT—In practice, most physical chaotic systems are inherently with unknown nonlinearities, and conventional adaptive control for such chaotic systems typically faces with formidable technical challenges. As a better alternative, we propose using the recurrent high-order neural networks to identify and control the unknown chaotic systems, in which the Lyapunov synthesis approach is utilized for tuning the neural network model parameters. The globally uniform boundedness of the parameters estimation errors and the asymptotical stability of the tracking errors are proved by Lyapunov stability theory and LaSalle-Yoshizawa theorem. This method, in a systematic way, enables stabilization of chaotic motion to a steady state as well as tracking of any desired trajectory. Computer simulation on a complex chaotic system illustrates the effectiveness of the proposed control method.