Robust Neural Control Strategies for Discrete-Time Uncertain Nonlinear Systems

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Abstract

In this paper, three neural control strategies are addressed to a class of single input-single output (SISO) discrete-time nonlinear systems affected by parametric variations. According to the control scheme, in a first step, a direct neural model (DNM) is developed to emulate the behavior of the system, then an inverse neural model (INM) is synthesized using specialized learning technique and cascaded to the system as a controller. The sliding mode backpropagation algorithm (SM-BP), which presents in a previous study robustness and high speed learning, is adopted for the training of the neural models. However, in the presence of strong parametric variations, the synthesized (INM) shows limitations to present satisfactory tracking performances. In fact, in order to improve the control results, two neural control strategies such as hybrid control and neuro-sliding mode control are proposed in this work. A simulation example is treated to show the effectiveness of the proposed control strategies.

References


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Index Terms

Computer Science

Control Systems
Keywords

SISO Discrete-time uncertain nonlinear systems, neural modelling, sliding mode, backpropagation algorithm, INM control, hybrid control, neuro-sliding mode control.