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Robust Output Feedback Stabilization and Boundedness of Highly Nonlinear Induction Motors Systems Using Single-Hidden-Layer Neural-Networks

H. Ait Abbas [1*], A. Seghiour [2], M. Belkheiri [3] and M. Rahmani [3]

[1] *Laboratory of Materials and Durable Development-LM2D, Electrical Engineering Department, Faculty of Sciences and Applied Sciences, University of Bouira, (10000) Bouira, Algeria.*
[2] *Electrical Engineering Department, Higher School of Electrical Engineering and Energetic, (31000) Oran, Algeria.*
[3] *Laboratory of Telecommunications Signals and Systems, Amar Telidji University – Laghouat, BP G37 Road of Ghardaia (03000 Laghouat), Algeria.*

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Abstract: This paper presents a new single-hidden-layer neural-network (SHL NN)-based adaptive input-output feedback linearization control (IOFLC) to handle the flux and speed tracking problems of the induction motor (IM) subjected to unknown parametric uncertainty, modelling errors and external load disturbances. In this approach, we first apply the IOFLC to divide the IM dynamics into two decoupled subsystems. The resulted controller is then augmented via an on-line SHL NN in order to overcome effects of both the neglected dynamics and the modeling errors. The NN is lunched over input-output signals of the controlled system. The adaptive laws augmented using NN parameters are expressed in terms of the estimated tracking error dynamics of the nominal systems. Of main interest, Lyapunov's direct method is involved to exhibit the ultimate boundedness of the error signals. Computer simulations are presented to emphasize the practical potential of the proposed approach.

Keywords: *nonlinear systems; feedback control; perturbations; adaptive or robust stabilization; neural nets and related approaches; stability; boundedness; simulation.*

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* Corresponding author: mailto:h.aitabbas@univ-bouira.dz