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REDUCED ORDER NEURAL BLOCK CONTROL FOR SYNCHRONOUS ELECTRIC GENERATOR

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Abstract. In this paper, we present a novel identification and control scheme, which is able to identify and to control a synchronous generator using a neural identifier. The generator is modelled as a full (eight) order system. A third order neural network is used to identify a reduced order model of this generator. Moreover, a discontinuous control law based on the neural identifier is designed using the block control technique, in order to track reference signals and rejects external disturbances produced by generator terminal short circuits. Simulation results, using the full order model of the generator, are presented in order to test the applicability of the proposed approach.

Keywords. Recurrent High Order Neural Networks, Identification, Block Control.

AMS (MOS) subject classification: Neural Networks

1 Introduction

It is known that the model of power systems is highly nonlinear; lately feedback linearization have been used [2], [8] to design nonlinear controllers, which overcome the known limitations of traditional linear ones. However the direct implementation of feedback linearization scheme results in a computationally expensive and sensitive to the plant parameters variation controller. An inherent drawback of the feedback linearization approach is the non-robustness due to the need for exact knowledge, both in terms of structure and parameters of the power system model. Adaptive control has been used to compensate for parameter variation in a framework that allows the controller to learn the nonlinearities on-line [11]. Traditionally the control schemes of synchronous machines are commonly based on reduced order linearized model and on classical control algorithms, which ensure asymptotic stability of the equilibrium point under small disturbances, but hardly a robust controller is obtained. Due to mathematical complexity of the nonlinear state space model representing the high order single machine infinite bus system (SMIB), most papers are devoted to develop controllers based in a simplified 3rd order model. This paper presents a design which addresses the on-line identification and control trajectory tracking based on the 3rd order neural model of the power system and the application of the resulting controller to the 8th order plant. The main contribution of this paper is related to the