Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Applications & Algorithms* **15 (2008)** 719-758
Copyright ©2008 Watam Press http://www.watam.org

FAULT DETECTION AND DIAGNOSIS FOR FOSSIL ELECTRIC POWER PLANTS VIA RECURRENT NEURAL NETWORKS

Jose A. Ruz-Hernandez[1], Edgar N. Sanchez[2] and Dionisio A. Suarez[3]

[1]Universidad Autonoma del Carmen, Avenida 56 No. 4 Esq. Avenida Concordia,
Col. Aviacion, CP 24180, Cd. del Carmen, Campeche, MEXICO
E-mail: jruz@pampano.unacar.mx

[2]CINVESTAV, Unidad Guadalajara, Apartado Postal 31-430, Plaza La Luna,
C.P. 45091, Guadalajara, Jalisco, MEXICO
E-mail: sanchez@gdl.cinvestav.mx

[3]Instituto de Investigaciones Electricas, Calle Reforma No. 113, Col. Palmira,
C.P. 62490, Cuernavaca, Morelos, MEXICO
E-mail: suarez@iie.org.mx

Abstract. This paper presents the development and application of a neural networks-based scheme for fault diagnosis, including detection and classification, for fossil electric power plants. The scheme is constituted by two components: residual generation and fault classification. The first component generates residuals via the difference between measurements coming from the plant and a neural network predictor. The neural network predictor is trained with healthy data collected from a full scale simulator reproducing reliably the process behavior. For the second component detection thresholds are used to encode the residuals as bipolar vectors which represent fault patterns. The fault patterns are stored in an associative memory based on a recurrent neural network. The scheme is evaluated via a full scale simulator to diagnose the main faults appearing in this kind of power plants.

Keywords. Associative memory, residuals, fault diagnosis, fossil electric power plant, full scale simulator.

1 Introduction

Due to increasing demands on reliability and safety of technical processes, various fault detection and diagnosis methodologies have been proposed in the literature, which can be broadly divided into model based techniques, knowledge-based methodologies and empirical or signal processing techniques [4]. There are two classes of model-based approaches. In the first class, quantitative models are used which generally utilize results from the field of control theory. In the second class qualitative reasoning and qualitative modelling are used. The quantitative model-based approach relies on the idea of analytical redundancy that makes use of system analytical mathematical model. Among them are the fault detection filter [1], the parity space approach [3], the parameter estimation approach [12] and the observer approach, ([25] and [10]). However, good diagnostic performance is difficult to