International Journal of Innovative
Computing, Information and Control
Volume **6**, Number **11**, November **2010**

ICIC International ©2010 ISSN 1349-4198
pp. 5275–5286

NONLINEAR IDENTIFICATION AND MEDICAL DIAGNOSIS SYSTEM USING FUNCTIONAL-TYPE SIRMS CONNECTED FUZZY INFERENCE METHOD

Hirosato Seki[1], Hiroaki Ishii[2] and Masaharu Mizumoto[3]

[1]Department of Technology Management
Osaka Institute of Technology
5-16-1, Omiya, Asahi-ku, Osaka 535-8585, Japan
h_seki@ieee.org

[2]Department of Mathemathical Sciences
Kwansei Gakuin University
2-1, Gakuen, Sanda, Hyogo 669-1337, Japan
ishiihiroaki@kwansei.ac.jp

[3]Department of Engineering Informatics
Osaka Electro-Communication University
18-8, Hatu-cho, Neyagawa-shi, Osaka 572-8530, Japan
mizumoto3003@yahoo.co.jp

Received September 2009; revised May 2010

Abstract. *The single input rule modules connected fuzzy inference method (SIRMs method) can decrease the number of fuzzy rules drastically in comparison with the conventional fuzzy inference methods. Moreover, Seki et al. have proposed a functional-type SIRMs method which generalizes the consequent part of the SIRMs method from real numbers to functions. In this paper, we derive a learning algorithm of the functional-type SIRMs method from the steepest descent method, and the functional-type SIRMs method is shown to be superior to the conventional SIRMs method and neuro-fuzzy method by applying to identification of nonlinear functions and a medical diagnosis system.*
Keywords: Approximate reasoning, Fuzzy inference systems, SIRMs connected fuzzy inference method, Learning algorithm, Classification

1. **Introduction.** As for the "IF-THEN" rules in the conventional fuzzy inference methods [1], all the input items of the system are set to the antecedent part, and all output items are set to the consequent part. Therefore, the problem is apparent that the number of fuzzy rules becomes increasingly huge; hence, the setup and adjustment of fuzzy rules become difficult. On the other hand, a "single input rule modules connected type fuzzy inference method" (SIRMs method) by Yubazaki *et al.* [2-7] which unifies the inference output from fuzzy rule modules of one input type "IF-THEN" form can reduce the number of fuzzy rules drastically. The method has been applied to nonlinear function identification, control of a first order lag system with dead time, orbital pursuit control of a non-restrained object, and stabilization control of a handstand system, etc, and good results are obtained. However, since the number of rules of the SIRMs method is limited compared to the traditional inference method, inference results gained by the SIRMs method are simple in general.

From the above reason, Seki *et al.* [8, 9] have proposed a "functional-type SIRMs method" in which the consequent parts are generalized to functions from real numbers. However, the applicability of this method was not discussed there.