International Journal of Innovative Computing, Information and Control
Volume **2**, Number **6**, December **2006**

ICIC International ©2006 ISSN 1349-4198
pp. **1207–1217**

MULTIVARIABLE FUZZY LOGIC CONTROLLER BASED ON A COMPENSATOR OF INTERACTIONS AND GENETIC TUNINGR

Khaled Belarbi

Laboratoire d'automatique et de Robotique
University of Constantine
Route de Ain el Bey, Constantine 25000, Algeria
kbelarbi@yahoo.com

Ahmed Belhani

Institute of Electronics
Centre Universitaire de Oum el Bouaghi
Oum el Bouaghi 04000, Algeria

Kuniaki Fujimoto

School of Engineering
Kyushu Tokai University
9-1-1, Toroku, Kumamoto 862-8652, Japan

Received November 2005; revised June 2006

Abstract. *A fuzzy controller for multivariable systems based on fuzzy controllers for the decoupled monovariable subsystems and a fuzzy compensator of the interactions is introduced. The fuzzy compensator acts as a feedforward controller. It has as inputs the outputs of the monovariable controllers considered as known perturbations and produces compensation signals which are added to the single loop control signals for minimizing the effect of the interactions. The proposed algorithm improves the interpretability of a fuzzy multivariable Mamdani fuzzy controller. A genetic algorithm is used for determining the parameters of the fuzzy controller and compensator. The performance of the methodology is analyzed on two systems: a benchmark model of a distillation column and two-link manipulators.*
Keywords: Fuzzy control, Multivariable controller, Feedforward control, Genetic algorithms

1. **Introduction.** The design of fuzzy controllers for single input single output, SISO, is a mature subject and its applications are diverse [4,12,17], however this is generally not the case for multivariable fuzzy logic controllers. In this case, the number and length of rules explodes with the number of variables and the control system loses essential properties such as compactness and transparency. In general, the methods developed for the control of multivariable systems can be subdivided in two classes [11]. In the first class, the system is first decoupled or quasi decoupled to produce a set of non interacting monovariable systems, for which monovariable controller such as PI, PID are designed using classical methods. These methods are useful when one wishes to extend classical well-known design for SISO systems to multivariable systems. For the second class multivariable controller is designed for the global system using modern or modern/classical methods.