The Ninth IEEE International Conference on Fuzzy Systems

FUZZ IEEE 2000

Volume 1 of 2

7-10 May 2000
Hilton Palacio del Rio
San Antonio, Texas

Sponsored by
The IEEE Neural Networks Council

in collaboration with
Texas A&M University
International Fuzzy Systems Association (IFSA)
Japan Society for Fuzzy Theory and Systems (SOFT)
CONTENTS

Volume 1

Keynote Speech—Computing with Words as a Basis for an Enlargement of the Role of Natural Languages in Information Processing, Decision, and Control ............................................................... 1
Lotfi A. Zadeh

Keynote Speech—The Evolution of Data Mining .................................................................... 2
Jacek Myczkowski

Pioneer Speech—Stability and Stabilization of Mamdani-like Fuzzy Systems ....................... 3
Michio Sugeno

Keynote Speech—Engineering Intelligence ........................................................................ 4
James Albus

Panel Discussion—Soft Computing Techniques for an Intelligent Use of Internet Resources ................................................................. 5

Session MA1—Adaptive and Optimal Control 1

Direct Adaptive Fuzzy Control for MIMO Processes ............................................................... 7
Edy Bertolissi, Antoine Duchâteau, Hugues Bersini, and Frank Vanden Berghen

A Self-Organized Rule Generation Scheme for Fuzzy Controllers ........................................ 13
Tandra Pal, Nikhil R. Pal, and S. Deb Ray

Cell State Space Based Incremental Best Estimate Directed Search Algorithm for Takagi-Sugeno
Type Fuzzy Logic Controller Automatic Optimization .......................................................... 19
Feijun Song and Samuel M. Smith

Adaptive Critic Based Approximate Dynamic Programming for Tuning Fuzzy Controllers ................................................................. 25
Thaddeus T. Shannon and George G. Lendaris

Optimization of Takagi-Sugeno Fuzzy Controllers Using a Genetic Algorithm .................... 30
Marcio A. T. de Sousa and Marconi K. Madrid

Session MA2—Fuzzy Clustering and Pattern Classification

Generalized Min-Max Classifier ............................................................................................... 36
A. Rizzi, F. M. Frattale Mascioli, and G. Martinelli

A Staged Approach for Generation and Compression of Fuzzy Classification Rules ............ 42
Giovanna Castellano and Anna Maria Fanelli

K-Means-Based Fuzzy Classifier Design ................................................................................ 48
Ching-Chang Wong, Chia-Chong Chen, and Shih-Liang Yeh

Using Fuzzy Clustering to Improve Naïve Bayes Classifiers and Probabilistic Networks ........ 53
Christian Borgelt, Heiko Timm, and Rudolf Kruse

Effect of Rule Weights in Fuzzy Rule-Based Classification Systems ...................................... 59
Hisao Ishibuchi and Tomoharu Nakashima
Session MA3—Fuzzy Set Theory and Algebra

Minimizing Fuzzy Finite Automata ................................................................. 65
Hsuan-Shih Lee

A Method for Ranking Fuzzily Fuzzy Numbers ........................................... 71
Jee-Hyong Lee and Hyung Lee-Kwang

The Inclusion Variation of Nonadditive Set Functions ................................ 77
Qiang Zhang and Ziyou Gao

Information Granulation: Percepts and Their Stability ................................ 83
Witold Pedrycz and Michael H. Smith

Session MA4—Soft and Intelligent Computing

Efficient Learning by Symbol Emergence in Multi-layered Network and Agent Collaboration ................................................................. 1056
S. Tano, D. Futamura, and Y. Uemura

Extraction of Quantified Fuzzy Rules from Numerical Data .......................... 1062
Motohide Umano, Takahiro Okada, Itsuo Hatono, and Hiroyuki Tamura

Differentiation of Choquet Integral for Nonnegative Measurable Function and Its Application to Capital Investment Decision Making ............. 89
Toshihiro Kaino and Kaoru Hirota

Data Retrieval Using Conceptual Fuzzy Sets ................................................ 94
Tomohiro Takagi, Kazushi Kawase, Kazuhiko Otsuka, and Toru Yamaguchi

Pattern Recognition Using Fuzzy Inference with Lacked Input Data ............... 100
Shuji Sato, Yoshinori Arai, and Kaoru Hirota

Session MA5—Industrial Application 1

Target Value Computing in Paper Machine Grade Changes by Fuzzy System ........ 105
Pauli Viljamaa, Heikki Peltonen, and Heikki N. Koivo

Recurrent Neuro-Fuzzy Predictor for Multi-Step Prediction of v-i Characteristics of Electric Arc Furnaces ............................................. 110
A. R. Sadeghian and J. D. Lavers

A Neuro-Fuzzy Supervisory Control System for Industrial Batch Processes .... 116
Chr. W. Frey, M. Sajidman, and H. -B. Kuntze

Fuzzy Modeling of a Magnetorheological Damper Using ANFIS .................... 122
Kyle C. Schurter and Paul N. Roschke

A Mixed-Signal Fuzzy Controller and Its Application to Soft Start of DC Motors 128
Rafael Navas-González, Fernando Vidal-Verdú, and Angel Rodríguez-Vázquez

Session MM1—Adaptive and Optimal Control 2

A Direct Model Reference Adaptive Fuzzy Control for MIMO Takagi-Sugeno Model ...................................................... not available
Young-Wan Cho, Sang-Hyung Lee, and Mignon Park

The Regression-Type Fuzzy Controllers Design by GA .................................. not available
Jin-Jye Lin, Danny Liu, and Hung-Yuan Chung

Feijun Song and Samuel M. Smith
 behaviour Based Decision Control in Autonomous Vehicles: A Fuzzy Approach Using Khepera
Antionio Abreu and Luis Correia

On Tuning Nonlinear Fuzzy Control Systems
Carlos Pinheiro and Fernando Gomide

Session MM2—Fuzzy Clustering and Pattern Classification 2
Fuzzy Entropy Clustering
Dat Tran and Michael Wagner
Simultaneous Clustering and Attribute Discrimination
Hichem Frigui and Olfa Nasraoui
A C-Fuzzy Means Algorithm for Prototype Induction
J. F. Baldwin and J. Lawry
A Novel Approach to Unsupervised Robust Clustering Using Genetic Niching
Olfa Nasraoui and Raghu Krishnapuram
Weighted Possibilistic c-means Clustering Algorithms
Adam Schneider

Session MM3—Fuzzy Logic and Reasoning
An Application of Fuzzy Hypothesis Testing to Signal Integration
S. W. Leung, J. W. Minett, and M. K. Lee
A Study on Fuzzy Reasoning Mechanism Based on Extension Principle
Xiu Yang, E. E. Kerre, Da Ruan, and Song Zhenming
A Resolution Procedure Based on a Fuzzy Logic
Liu Jun, Song Zhenming, and Qin Keyun
On Implicative Closure Operators in Approximate Reasoning
R. O. Rodriguez, F. Esteva, P. Garcia, and L. Godo
Incoherence Detection and Approximate Solving of Equations Using Fuzzy Qualitative Reasoning
Didier Dubois, Allel Hadj-Ali, and Henri Prade

Session MM4—Decision Making
Soft Decision Trees: A New Approach Using Non-linear Fuzzification
Keeley A. Crockett, Zuhair Bandar, and Akeel Al-Attar
Fuzzy Interval Ranking Evaluation
Ladislav J. Kohout and Eunjin Kim
Decision Making Process via Constraint-Oriented Fuzzy Logic Based on Chu Space Theory
Ken Sato, Tadashi Horiuchi, Toshihiro Hiraoka, Hiroshi Kawakami, and Osamu Katai
Specifying Fuzzy Constraints Interactions Without Using Aggregation Operators
Joao Moura-Pires and Henri Prade
Intervals (Pairs of Fuzzy Values), Triples, etc.: Can We Thus Get an Arbitrary Ordering?
Vladik Kreinovich and Masao Mukaidono
Session MM5—Industrial Application 2

Design of a Dynamic Fuzzy Controller IC with Application to Garage Parking Control ...........................................239
Tzuu-Hseng S. Li, Cheng-Seng Hsu, and Yu-Ji Su

Automated Simulation of Robotic Dynamic Systems Using a New Fuzzy- Fractal-Genetic Approach .........................245
Oscar Castillo and Patricia Melin

Fuzzy Reasoning Based Motion Estimation from Range Images ..................................................................................251
Marcos A. Rodrigues and Yonghuai Liu

A Pipeline Parallel Architecture for a Fuzzy Inference Processor ...........................................................................257
Giuseppe Ascia and Vincenzo Catania

Sensor Selected Fusion Using Selection Rules Acquired by ES (Application to Inference of Surface Roughness in Grinding System) .................................................................1068
Futoshi Kobayashi, Fumihito Arai, Toshio Fukuda, Makoto Onoda, and Yuzo Hotta

Session MP1—Fuzzy Control (Invited)

Systematically Constructing Stabilization Fuzzy Controllers for Single and Double Pendulum Systems ..................263
Jianqiang Yi, Naoyoshi Yubazaki, and Kaoru Hirota

Design of Fuzzy Controller via Universal Regulators for the Incomplete Information Nonlinear Systems ................269
Jin-Tsong Jeng and Tsu-Tian Lee

Highway Ramp Control via Fuzzy Logic .......................................................................................................................274
Shing-Fei Lee, You-Wei Teng, and Wen-June Wang

An Uncertain Structure on Takagi-Sugeno Fuzzy Model .........................................................................................279
Ji-Chang Lo and Min-Long Lin

Continuous Time-Invariant Optimal Fuzzy Tracker Design Based on Local Concept Approach ..................................285
Shinq-Jen Wu and Ching-Teng Lin

Session MP2—Fuzzy Clustering and Pattern Classification 3

Using Fuzzy Logic to Recognize Geometric Shapes Interactively .............................................................................291
Manuel J. Fonseca and Joaquim A. Jorge

Design of Fuzzy Classification System Using Genetic Algorithms ............................................................................297
Ching-Chang Wong, Chia-Chong Chen, and Bo-Chen Lin

A Fuzzy Clustering Model of Data and Fuzzy c-Means ............................................................................................302
S. Nascimento, B. Mirkin, and F. Moura-Pires

Building Adaptive User Profiles by a Genetic Fuzzy Classifier with Feature Selection ...........................................308
Maria J. Martin-Bautista, María-Amparo Vila, and Henrik L. Larsen

Integrating Quality in Fuzzy Reasoning Edge Detection ............................................................................................313
Vincent Bombardier, Oliver Perez-Oramas, and Jacques Bremont

Session MP3—Fuzzy Logic Foundations

Fuzzy Integral Equation ..................................................................................................................................................319
James J. Buckley, Thomas Feuring, and Yoichi Hayashi

Pseudo Rule-Driven Model for a Programmable T-norm ..........................................................................................324
Enrique Frías-Martínez, Julio Gutiérrez-Ríos, and Felipe Fernández-Hernández
Interval Type-2 Fuzzy Logic Systems ............................................. 328
Qilian Liang and Jerry M. Mendel

On the Representation of Veristic Variables .................................... 334
Ronald R. Yager

Shadows of Fuzzy Sets—A Natural Way Towards Describing 2-D
and Multi-D Fuzzy Uncertainty in Linguistic Terms ......................... 340
Hung T. Nguyen, Berlin Wu, and Vladik Kreinovich

Session MP4—Scheduling and Operations Research

A Fuzzy Solution Approach for the Roster Planning Problem ............. 346
W. El Moudani and F. Mora-Camino

Solving Fuzzy Problems in Operations Research: Inventory Control .......... 352
James J. Buckley, Thomas Feuring, and Yoichi Hayashi

New Methods for Traffic Signal Control—Development of Fuzzy Controller .......... 358
Ville Könönen and Jarkko Niitrymäki

Palmer-based Flexible Flow-Shop Scheduling for Continuous Fuzzy Domains ........ 363
Tsung-Pei Hong, Tzu-Ting Wang, and Shyue-Liang Wang

Extension of Petri Nets and Its Applications to Model Systems with Imprecise Task Duration ........ 369
Stanislav Kurkovsky and Rasiah Loganathanaraj

Session MP5—Data Mining & Information Retrieval

Combining Fuzzy Clustering and Fuzzy Inferencing in Information Retrieval ................ 375
Donald H. Kraft, Jianhua Chen, and Andreja Mikulcic

A Fuzzy-Based Instance Selection Approach for Data Mining ............. 381
Peggy Wright and Julia Hodges

Linguistic Classifiers with Application to Management Questionnaires ........ 387
James M. Keller, Sansanee Auephanwiriyakul, and Allyson Adrian

Uncertainty Handling in the Datamining Process with Fuzzy Logic ........ 393
Michalis Varziagiannis and Maria Halkidi

An Ordinal Framework for Data Mining of Fuzzy Rules ....................... 399
John W. T. Lee

Session TA1—Fuzzy Control 1

Fuzzy Tracking Control Design for Nonlinear Discrete-Time Dynamic Systems via TS Fuzzy Model ........ 405
Chung-Shi Tseng and Bor-Sen Chen

Generalized Predictive Control with Fuzzy Sift Constraints ................ 411
Shao Yuan Li and Yugeng Xi

Decoupling MBPC uUsing Fuzzy Models .................................. 417
S. Mollov, R. Babuska, and H. B. Verbruggen

Performance Evaluation of a Fuzzy Rule Base for Control Purpose .......... 423
D. Passaquay, M. Bross, R. Babuska, S. Boverie, and A. Titli

An Improved Lyapunov Function Based Stability Analysis Method for Fuzzy Logic Control Systems ........ 429
L. K. Wong, Frank H. F. Leung, and Peter K. S. Tam
Session TA2—Hierarchial, Multi-stage and Complex Systems

A Fuzzy Approach for Modeling Chaotic Dynamics with Assigned Properties ........................................ 435
M. Porto and P. Amato

Extended Fuzzy Petri Net for Multi-Stage Fuzzy Logic Inference ......................................................... 441
Hung-Pin Chen and Zong-Mu Yeh

Evolutionary Design of Takagi-Sugeno Fuzzy Systems: A Modular and Hierarchical Approach ........ 447
Myriam Regattieri Delgado, Fernando Von Zuben, and Fernando Gomide

Multilevel Composite Fuzzy Models ................................................................................................. 453
Gancho Vachkov and Toshio Fukuda

Fuzzy Global Control for Complex Systems ..................................................................................... 459
Q. P. Ha, D. C. Rye, H. F. Durrant-Whyte, and H. Trinh

Session TA3—Fuzziness in Interpolative Reasoning (invited)

Fuzzy Interpolation by Convex Completion of Sparse Rule Bases ....................................................... 465
Laurent Ughetto, Didier Dubois, and Henri Prade

Interpolation in Hierarchical Fuzzy Rule Bases .................................................................................. 471
László T. Kóczy, Kaoru Hirota, and Leila Muresan

Alpha-Cut Interpolation Technique in the Space of Regular Conclusion ............................................ 478
Péter Baranyi, Domonkos Tikk, Tamás D. Gedeon, and László T. Kóczy

Interpolative Reasoning Based on Graduality ..................................................................................... 483
B. Bouchon-Meunier, C. Marsala, and M. Rifqi

A Fuzzy Rule Interpolation Technique Based on Bi-Splines in Multiple Input Systems ................ 488
Mayuka F. Kawaguchi and Masaaki Miyakoshi

Session TA4—Forecasting, Resource Management and Multimedia

Dynamic Financial Forecasting with Automatically Induced Fuzzy Associations ................................ 493
Yazann Romahi and Qiang Shen

R. M. Faye, S. Sawadogo, F. Mora-Camino, and A. K. Achaibou

Soft Computing Applied to Irrigation in Farming Environments ....................................................... 505
Juan A. Botía, Antonio F. Gómez-Skarmeta, Gracia Sánchez, Mercedes Valdés, and Juan A. López Morales

Tools of Soft Computing as Applied to the problem of Facilities Layout Planning ......................... not available
Essam Zaneldin, Fakhri Karray, Abdulkarim Shabeeb, and Emad Elbetagi

Design of Multimedia Web Server Using a Neuro-Fuzzy Framework ............................................... 510
Zafar Ali, C. S. George Lee, and Arif Ghafoor

Session TA5—Biological and Biosystems

A Lightweight Fuzzy Process to Support Early Diagnosis of Confusable Diseases Using Causation and Time Relationships ................................................................. 516
P. R. Innocent

A Fuzzy Linguistic Model for Ambulatory Systolic Blood Pressure Variation Prediction ............. 522
Sylvie Galichet, Sylvie Charbonnier, Gilles Mauris, and Jean-Philippe Siché

A Time-Varying Fuzzy On-Off Control System with Application to the Control of Tissue Temperature during Laser Heating ................................................................. 528
Yongsheng Ding, Hao Ying, and Shihuang Shao

Fuzzy Self-Tuning Immune Feedback Controller for Tissue Hyperthermia .................................. 534
Yongsheng Ding and Lihong Ren