

**2002 IEEE International  
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## Proceedings of the

# 2002 IEEE International Conference on Fuzzy Systems

## FUZZ-IEEE'02

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Honolulu, Hawaii



Co-sponsored by

Institute of Electrical and Electronics Engineers (IEEE)

IEEE Neural Networks Society (NNS)



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# Welcome and Congratulations!

I want to welcome you to the 2002 IEEE World Congress on Computational Intelligence (WCCI), a forum that combines three key conferences: the International Joint Conference on Neural Networks (IJCNN), the Congress on Evolutionary Computation (CEC), and the IEEE International Conference on Fuzzy Systems (FUZZ-IEEE). Every four years we provide a common scientific forum for our three scientific communities to create new opportunities for cross-education and awareness of our related fields.

I also want to congratulate you, because you now have a *home*. On February 17, 2002, the IEEE Neural Network Council (NNC), which organized this forum in the past, became the IEEE Neural Network Society (NNS), the lead sponsoring entity of this year's congress. Individual members like you, representing the best of our technical and scientific communities, will be part of this new society. Probably, you are already familiar with some of our offerings, since you might have attended some of our past conferences (IJCNN, CEC, FUZZ-IEEE) or subscribed to one or more of our transactions (TNN, TEC, TFS). The IEEE NNS will further improve these educational products, while defining a professional identity that truly reflects your technical area of expertise.

As an attendee of WCCI 2002, you are now entitled to receive a free copy of our electronic newsletter, containing information about our society, calendar of events, review articles, and other items of interest. We would also like to extend to you an invitation to become a member of the Neural Network Society for 2003. Our yearly membership fee of \$10.00 for IEEE members or IEEE affiliates will allow you to take full advantage of our high-quality educational product offerings. Next year's membership benefits will include a newsletter, limited access to our electronic publications, and the opportunity of buying all three transactions (TNN, TEC, TFS) at a bundled price of \$50.00 (an \$18.00 discount). As a member, you may also have an active participation in the operations of the Neural Network Society, by running for an AdCom representative position, nominating candidates, and voting for the candidates. Membership renewal for 2003 will start around September 2002.

We look forward to your participation in our new society, and we are certain that the IEEE Neural Network Society will continue to grow and provide you with the best educational and professional services that you deserve.

Sincerely

Piero P. Bonissone  
IEEE Neural Network Society  
President 2002

Sincerely

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# A Message from the General Chairman

## 2002 IEEE World Congress on Computational Intelligence

Aloha! Welcome to the 2002 IEEE World Congress on Computational Intelligence (WCCI2002), a joint meeting of the 2002 International Joint Conference on Neural Networks (IJCNN2002), the 2002 Congress on Evolutionary Computation (CEC2002), and the 2002 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE2002). These meetings are sponsored by the IEEE Neural Networks Society, the International Neural Networks Society, the IEEE, and the Evolutionary Programming Society. We have the opportunity once every four years to bring these three major conferences together in a single location and time, to foster technology transfer across all areas of computational intelligence and build long-lasting relationships with our colleagues. It's my pleasure to be the general chairman of this third World Congress on Computational Intelligence, held at the Hilton Hawaiian Village Hotel, in Honolulu, Hawaii, USA, on the Island of Oahu, known as "the gathering place."

WCCI2002 features over 1150 papers from scientists, practitioners, students, engineers, and other colleagues from around the globe. In addition, we are fortunate to have a series of outstanding plenary and special lecturers to share their knowledge with us over the week, as well as a very strong tutorial program to open WCCI2002 on Sunday, May 12, 2002. Although the final statistics are not available as I write this message, I expect that we will have participants from every major continent, a truly international representation, and an indication of the success that neural, evolutionary, and fuzzy computation is enjoying.

I would like to thank the many people who have helped ensure the success of WCCI2002. The program chairs, Lee Giles, Xin Yao, and Toshi Fukuda, and their technical co-chairs deserve particular mention, as do Don Wunsch and Piero Bonissone for their instrumental efforts in handling the technical programs for IJCNN2002 and FUZZ-IEEE2002. Mohamed El-Sharkawi, the vice general chairman, offered valuable assistance, and Tom Cholewo, our web system chair, was simply invaluable. Thanks are also owed to the other conference organizers, Russ Eberhart (proceedings), Mary Lou Padgett (tutorials), Charlie Robinson (plenary and special lectures), Tony Kuh (local arrangements), Simon Lucas and Bernhard Sendoff (competitions), and Slawo Wesolkowski (student grants), as well as the organizers of the numerous special sessions and tracks, the authors, and the program committee members who reviewed the submissions.

Of course, last and most importantly, I thank you for coming to WCCI2002. I hope that you find the conference both memorable and enjoyable, and I trust that it will serve as a foundation for our efforts going forward, united under our new banner of the IEEE Neural Networks Society.

Sincerely,

David B. Fogel  
General Chairman  
Natural Selection, Inc.  
La Jolla, CA, USA

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# Message from Toshio Fukuda

## FUZZ-IEEE 2002 Program Chair

Aloha, and Welcome to IEEE Conference of Fuzzy Systems in Hawaii. This is the most important conference within our fuzzy community. The purpose of this conference is to promote the dissemination and understanding of the most recent advances in intelligent systems.

The Program Committee selected the best papers on fuzzy system from more than 300 submitted papers. The conference program includes papers on fuzzy intelligent system, knowledge representation, data mining and knowledge discovery, internet and hypermedia, optimization, finance and investment, linguistics, computing in words, cognitive science, brain system, control, robotic systems, hybrid systems, humancentered assisting system, entertainment, education, et cetera.

Enjoy our FUZZ-IEEE 2002 conference by discussing new ideas with your colleagues, not only in the conference rooms but also on the beautiful beaches of Hawaii, under a blue sky.

Finally, I would like to thank all the program committee members who made this conference possible in spite of many scheduling difficulties.



## FUZZ-IEEE '02

### TABLE OF CONTENTS

#### **Session 405: Intelligent Control**

*Monday, May 13, 8:00am-9:20am, South Pacific Ballroom 3*

*Chair: TBA*

<b>Applied Intelligent Control - Control of Automotive Paint Process .....</b>	<b>1</b>
Dimitar Filev	
<b>Application of Multiple Artificial Intelligence Techniques for an Aircraft Carrier Landing Decision Support Tool .....</b>	<b>7</b>
Robert Richards	
<b>Intelligent Signal Segment Fault Detection using Fuzzy Logic .....</b>	<b>12</b>
Yi L. Murphey	
<b>A Rough Set Solution to a Fuzzy Set Problem .....</b>	<b>18</b>
C.L.Bean, C.Kambhampati and S.Rajasekharan	

#### **Session 413: Data Analysis**

*Monday, May 13, 8:00am-9:20am, Sea Pearl Suite 4*

*Chair: TBA*

<b>Partitioned Fuzzy Integral Logit Model .....</b>	<b>24</b>
Fang-Mei Tseng, Ching -Ying Yu and Gwo-Hsing Tzeng	
<b>Fuzzy-Rough Sets for Descriptive Dimensionality Reduction.....</b>	<b>29</b>
R. Jensen and Q. Shen	
<b>Fuzzy Targeting of Customers based on Product Attributes .....</b>	<b>35</b>
Vivek Jain, Krishna Kummamuru, Raghu Krishnapuram, and Vikas Agarwal	
<b>Fuzzy Information Space Characterization and Analysis of the Combustion Process in Spark Ignition Engines .....</b>	<b>41</b>
Wladimir Rodriguez and Flor Narciso	

#### **Session 406: Control in Electrical Engineering**

*Monday, May 13, 9:30am-10:50am, South Pacific Ballroom 3*

*Chair: TBA*

<b>A Universal Fuzzy Controller for A Non-Linear Power Electronic Converter .....</b>	<b>46</b>
K.Viswanathan, D.Srinivasan and R.Oruganti	
<b>Fuzzy Control Experiments on DC Drives Using Various Inference Connectives .....</b>	<b>52</b>
Francesco Cupertino, Mariagrazia Dotoli, Vincenzo Giordano, Bruno Maione and Luigi Salvatore	

Speed Control Design of a 2-Mass Drive System by Using Integrated Fuzzy Observer and Linear Quadratic Control .....	58
Neng-Sheng Pai and Tzue-Hseng S. Li	

Power System Load Frequency Control With Fuzzy Gain Scheduling Designed by New Genetic Algorithms.....	64
Chia-Feng Juang and Chun-Feng Lu	

#### **Session 420: TSK Fuzzy Models**

Monday, May 13, 9:30am-10:50am, Sea Pearl Suite 4

Chair: TBA

Structure Identification in Takagi-Sugeno Fuzzy Modeling.....	69
Toshiharu Hatanaka, Katsuji Uosaki and Norio Manabe	

Minimization of Quadratic Performance Function in T-S Fuzzy Model.....	75
Takashi Mitsuishi and Yasunari Shidama	

On the Local Interpretation of Takagi-Sugeno Fuzzy Models from a Dynamical Systems View .....	80
Seok-beom Lee and Gary G. Yen	

Backpropagation Based Training Algorithm for Takagi-Sugeno Type MIMO Neuro-Fuzzy Network to Forecast Electrical Load Time Series .....	86
Ajoy Kumar Palit, Gerhard Doeding, Walter Anheier and Dobrivoje Popovic	

#### **Session 440: Optimization and Theory**

Monday, May 13, 1:30pm-2:50pm, Honolulu 3

Chair: TBA

Upper Bound Covariance Control for Continuous Fuzzy Stochastic Systems with Structured Perturbations .....	92
Wen-Jer Chang and Shenq-Ming Wu	

An Efficient Optimality Test for the Fuzzy c-Means Algorithm.....	98
Jian Yu, Houkuan Huang and Shengfeng Tian	

Context-Based Fuzzy System for Optimization.....	104
Moeljono Widjaja and Ly Fie Sugianto	

Finalizing the Reason of the Inconsistency of Fuzzy Inference Templates Based On Triangular Fuzzy Relational Compositions: A Generic Case.....	110
Nasreddine Hallam	

#### **Session 408: Fuzzy Model-based Control**

Monday, May 13, 1:30pm-2:50pm, South Pacific Ballroom 3

Chair: TBA

Multi-Objective Structure Design for Mechanical Systems .....	116
Shigeki Hori, Kazuo Tanaka and Hua O. Wang	



<b>Fuzzy Linearizing Control Approach for a Class of Nonlinear Discrete-Time Systems and its Equivalence with Internal Model Control Structure .....</b>	<b>122</b>
Reda Boukezzoula, Sylvie Galichet and Laurent Foulloy	
<b>Minimizing TS controller via HOSVD.....</b>	<b>128</b>
P.Baranyi, D.Tikk, Y.Yam, I.Rudas and A.R. Varkonyi Koczy	
 <b>Session 560: Soft Computing Agents: Fuzzy Behaviors in Agent-Based Frameworks</b>	
Monday, May 13, 1:30pm-2:50pm, South Pacific Ballroom 4	
Chair: Vincenzo Loia	
<b>Clustering in the Framework of Collaborative Agents .....</b>	<b>134</b>
Witold Pedrycz and George Vukovich	
<b>A Fuzzy Incremental Synchronous Learning Technique for Embedded-Agents Learning and Control in Intelligent Inhabited Environments .....</b>	<b>139</b>
Hani Hagraas, Martin Colley, Victor Callaghan, Graham Clarke, Hakan Duman and Arran Holmes	
<b>Dynamic Domination for Fuzzy Cognitive Maps .....</b>	<b>145</b>
Jian Ying Zhang and Zhi-Qiang Liu	
<b>Discovering Related Web Pages through Fuzzy-Context Reasoning .....</b>	<b>150</b>
Vincenzo Loia, Sabrina Senatore and Maria M. Sessa	
 <b>Session 418: New Trends in Fuzzy Modeling</b>	
Monday, May 13, 1:30pm-2:50pm, Sea Pearl Suite 4	
Chair: TBA	
<b>An Approach for Dynamical Adaptive Fuzzy Modeling.....</b>	<b>156</b>
M. Cerrada, J. Aguilar, E. Colina and A. Titli	
<b>Hierarchical Fuzzy Relational Models: Linguistic Interpretation and Universal Approximation .....</b>	<b>162</b>
Ricardo J. G. B. Campello and Wagner C. Amaral	
<b>Microtuning of Membership Functions: Accuracy vs. Interpretability.....</b>	<b>168</b>
Q. Shen and J. G. Marin-Blazquez	
<b>Efficient Data-Driven Modeling with Fuzzy Relational Rule Network.....</b>	<b>174</b>
Adam E. Gaweda, Jacek M. Zurada and Peter B. Aronhime	
 <b>Session 561: Soft Computing Agents: Fuzzy Behaviors in Agent-Based Frameworks</b>	
Monday, May 13, 3:00pm-5:00pm, South Pacific Ballroom 4	
Chair: Vincenzo Loia	
<b>Adaptive coordination among fuzzy reinforcement learning agents performing distributed dynamic load balancing.....</b>	<b>179</b>
David Vengerov, Hamid R. Berenji and Alex Vengerov	
<b>An Intelligence Representation in Agent Systems: an Extended Pi-Calculus .....</b>	<b>185</b>
Shahram Rahimi, Maria Cobb, Dia Ali, Huiqing Yang and Frederick E. Petry	

<b>Decomposition of complex systems into set of autonomous agents by fuzzy-genetic approach and its application in economic and business environments .....</b>	<b>191</b>
Rafik Aliev and B. Fazlollahi	

<b>A Fuzzy Evolutionary Approach for Collaborative Clustering in Multi-Agent Systems with Application to Emergent Virtual Organizations.....</b>	<b>197</b>
Mihaela Ulieru	

<b>Combination of Evidence in Recommendation Systems Characterized by Distance Functions .....</b>	<b>203</b>
Luis M. Rocha	

<b>Multi-layered Multi-Agent Architecture with Fuzzy Application In Electrical Power Systems.....</b>	<b>209</b>
R. Khosla and Q. Li	

### ***Session 407: Lyapunov Methods in Fuzzy Control***

*Monday, May 13, 3:00pm-5:00pm, Sea Pearl Suite 4*

*Chair: TBA*

<b>Generalized H2 Controller Synthesis of Fuzzy Dynamic Systems based on Piecewise Lyapunov Functions.....</b>	<b>215</b>
Gang Feng and Dong Sun	

<b>A Construction Method of Switching Lyapunov Function for Nonlinear Systems .....</b>	<b>221</b>
Hiroshi Ohtake, Kazuo Tanaka and Hua O. Wang	

<b>Adaptive Fuzzy Controller for a Class of Nonlinear Systems with Uncertainty .....</b>	<b>227</b>
Hugang Han, Chun-Yi Su, and Shuta Murakami	

<b>Design and Stability Analysis of Fuzzy Model Based Nonlinear Controller for Nonlinear Systems Using Genetic Algorithm .....</b>	<b>232</b>
H. K. Lam, F. H. F. Leung and P. K. S. Tam	

<b>Global Stability Condition of Fuzzy Model-based Controllers via Evolutionary Computation .....</b>	<b>238</b>
Lanka Udawatta, Keigo Watanabe, Kazuo Kiguchi and Kiyotaka Izumi	

<b>Relaxed Stability Condition for T-S Fuzzy Discrete System.....</b>	<b>244</b>
Wen-June Wang, and Chun-Shiun Sun	

### ***Session 840: Poster Session 1***

*Monday, May 13, 7:00pm-9:00pm, Tapa Ballroom*

*Chair:*

<b>Robust Analysis of Fuzzy Logic Control Systems with Uncertainties.....</b>	<b>250</b>
Wen-Hou Chu, Chyun-Chau Fuh, and Pi-Chen Tung	

<b>High-speed Learning Algorithm for Constructive Granular Systems .....</b>	<b>256</b>
Yan-Qing Zhang	

<b>Fault Diagnosis for Dynamical Systems Using Soft Computing.....</b>	<b>261</b>
Fuminori Yakuwa, Shingo Satoh, Muhammad Shafique Shaikh, and Yasuhiko Dote	



<b>Mining Fuzzy Association Rules in Incomplete Databases .....</b>	<b>267</b>
Dragos Arotaritei	
<b>An Intelligent Algorithm for Engine Transient State Working Condition Test Stand.....</b>	<b>272</b>
J. Sun, X.Y.Gao and Y.Sun	
<b>Design the T-S Fuzzy Controller for A Class of T-S Fuzzy Models Via Genetic Algorithm .....</b>	<b>278</b>
C.C. Sun, H.Y. Chung and W.J. Chang	
<b>Quantitative Measures on the Accuracy, Comprehensibility, and Completeness of a Fuzzy Expert System.....</b>	<b>284</b>
Phayung Meesad and Gary G. Yen	
<b>Robust T-S Fuzzy Model-Based for Chaotic Cryptosystem .....</b>	<b>290</b>
Tung-Sheng Chiang, Chun-Chieh Wang and Ching-Tsan Chiang	
<b>FL-FN Based Traffic Signal Control .....</b>	<b>296</b>
Wu Wei and Yi Zhang	
<b>Block Replacement for Multi-Component System with Fuzzy Lifetimes .....</b>	<b>301</b>
Ruiqing Zhao, Kaoping Song and Jianhua Zhu	
<b>Universal Fuzzy System to Takagi-Sugeno Fuzzy System Compiler.....</b>	<b>305</b>
Enrique Frias-Martinez	
<b>Fuzzy Sliding Mode Control for Trajectory Tracking on Mechatronic Arms .....</b>	<b>310</b>
Wen-Shyong Yu	
<b>Fuzzy Terrain-Based Path Planning for Planetary Rovers.....</b>	<b>316</b>
Ayanna Howard, Homayoun Seraji and Barry Werger	
<b>Optimal nonlinear filters based on the Takagi-Sugeno fuzzy model .....</b>	<b>321</b>
Kiriakos Kiriakidis	
<b>Fuzzy Logic in the Supply Chain Management - A Approach to Quantify the Uncertainties in Production and Supply Processes .....</b>	<b>324</b>
Tobias Teich, Lars Zschorn, Ralf Neubert and Otmar Görlitz	
<b>Fuzzy Adaptive Control of Multivariable nonlinear Systems.....</b>	<b>330</b>
N. Golea and A. Golea	
<b>Two New Approaches for Linguistic Fuzzy Modeling and Introduction to Their Stability Analysis.....</b>	<b>335</b>
A. A. Suratgar and S. K. Nikraves	
<b>Combining Fuzzy Rules and a Neural Network in an Adaptive System.....</b>	<b>340</b>
Rainer Spiegel, M.E. Le Pelley, Mark Suret and I.P.L. McLaren	
<b>Fault-Tolerant Model-Based Predictive Control Using Multiple Takagi-Sugeno Fuzzy Models .....</b>	<b>346</b>
A. Ichtev, J. Hellendoom, R. Babuska and S. Molloy	
<b>FPGA Based Fuzzy Computation Accelerator.....</b>	<b>352</b>
S.Himavathi and B.Umamaheswari	
<b>Automatic Fingerprint Classification System Using Fuzzy Neural Techniques.....</b>	<b>358</b>
Suliman M Mohamed and Henry O Nyongesa	

<b>A Classifier Based on the Fuzzy Similarity in the Lukasiewicz Structure with Different Metrics.....</b>	<b>363</b>
Kalle Saastamoinen, Ville K��n��nen, and Pasi Luukka	
<b>A New Fuzzy Normalization Algorithm for Handwritten Chinese Characters Recognition .....</b>	<b>368</b>
Cheng-Min Cho and Shuenn-Shyang Wang	
<b>Fuzzy Integral for Leaf Image Retrieval.....</b>	<b>372</b>
Zhiyong Wang, Zheru Chi and Dagan Feng	
<b>Color Design Support System Considering Color Harmony .....</b>	<b>378</b>
Masataka Tokumaru, Noriaki Muranaka and Shigeru Imanishi	
<b>Automatic Feature Selection for Adaptive Resolution Classifiers.....</b>	<b>384</b>
A. Rizzi, M. Panella, F. M. Frattale Mascioli, and G. Martinelli	
<b>A New Information Fusion Algorithm for Handling Heterogeneous Group Decision-Making Problems.....</b>	<b>390</b>
Shi-Jay Chen and Shyi-Ming Chen	
<b>Structure Identification of Fuzzy Controllers in Real Time.....</b>	<b>396</b>
H��ctor Pomares, Ignacio Rojas and Jes��s Gonz��lez	
<b>An Optimal Controller with Synthetic Fuzzy Logic for Tracking Mean Arterial Pressure.....</b>	<b>402</b>
Shing-Hong Liu, I-Fang Chung and Chin-Teng Lin	
<b>Parameter Tuning of Fuzzy Neural Networks By Immune Algorithm.....</b>	<b>408</b>
Dong Hwa Kim	
<b>Fuzzy Clusterings of Gene Expression Data .....</b>	<b>414</b>
Futschik and Kasabov	
<b>Mapping Lightning Processes Using Fuzzy Inference System .....</b>	<b>420</b>
Andre Nunes de Souza, Ivan Nunes da Silva, Maria Goretti Zago and Rogerio Andrade Flauzino	
<b>A Real-Time Method to Tune Rules base of Fuzzy Control System.....</b>	<b>425</b>
Yu Yongquan, Zeng Bi, Zhong Guokun and Peng Haixia	
<b>Intelligent Fuzzy Image Filter for Impulse Noise Removal.....</b>	<b>431</b>
Chang-Shing Lee, Chin-Yuan Hsu and Yau-Hwang Kuo	
<b>On the effect of membership function in a high-order fuzzy time series.....</b>	<b>437</b>
Chao-Chih Tsai, Shun-Jyh Wu, Wen-Huei Ting	
<b>On Interpretation of Graffiti Digits and Commands for eBooks: Neural Fuzzy Network and Genetic Algorithm Approach.....</b>	<b>443</b>
H. K. Lam, K. F. Leung ,S. H. Ling, F. H. F. Leung and P. K. S. Tam	
<b>A Color Image Segmentation Approach Based on Fuzzy Similarity Measure.....</b>	<b>449</b>
Ming-Cheng Cheng and Been-Chian Chien	
<b>Fuzzy Hinf Output Feedback Control for Rotor Magnetic Bearing System .....</b>	<b>455</b>
Sae Kyu Nam, Ho Shik Kang and Oh Seop Song	
<b>Modified Center average defuzzifier for improving the inverted pendulum dynamics .....</b>	<b>460</b>
Miguel Melgarejo	

<b>Hardware/Software Codesign Methodology for Fuzzy Controllers Implementation .....</b>	<b>464</b>
A. Cabrera, S. Sánchez-Solano, R. Senhadji, A. Barriga and C. J. Jiménez	
<b>Behavior-Based Fuzzy Logic Control for a One-on-One Robot Soccer Competition .....</b>	<b>470</b>
Tzuu-Hseng S. Li, I-Fong Lin, and Tsung-Ming Hung	
<b>Prototyping and Browsing Image Databases Using Linguistic Summaries .....</b>	<b>476</b>
R. Saint-Paul, G. Rashia and N. Mouaddib	
<b>On the Choice of the Adequate Fuzzy Implication Operator with the Center of Gravity Defuzzification Method Based on Precision Criterion in Fuzzy Control .....</b>	<b>482</b>
Anis Sakly and Mohamed Benrejeb	
<b>Improving the Performance of Fuzzy Classification Systems by Membership Function Learning and Feature Selection.....</b>	<b>488</b>
Tomoharu Nakashima, Gaku Nakai, and Hisao Ishibuchi	
<b>Mining from Quantitative Data with Linguistic Minimum Supports and Confidences .....</b>	<b>494</b>
Tzung-Pei Hong, Ming-Jer Chiang and Shyue-Liang Wang	
<b>Multi Axis Fuzzy Control And Performance Analysis For An Industrial Robot .....</b>	<b>500</b>
P. J. Breedon, K. Sivayoganathan, V. Balendran and D. Al-Dabass	
<b>Fuzzy Systems Design via Ensembles of ANFIS.....</b>	<b>506</b>
Clodoaldo Ap. M. Lima, André L. V. Coelho and Fernando J. Von Zuben	
<b>Subspace Clustering For Hierarchical Fuzzy System Construction .....</b>	<b>512</b>
A. Chong, T.D. Gedeon	

#### ***Session 550: Interval Computations and Fuzzy Techniques***

*Tuesday, May 14, 8:00am-9:20am, South Pacific Ballroom 2*

*Chair: Vladik Kreinovich and Scott A. Starks*

<b>Association Analysis with Interval Valued Fuzzy Sets and Body of Evidence .....</b>	<b>518</b>
Ping Chen, Andre de Korvin, and Chenyi Hu	
<b>A Conditioning Interval Based on Superconditionals and Superpower Sets.....</b>	<b>524</b>
Bart Kosko	
<b>Probability of Implication, Logical Version of Bayes' Theorem, and Fuzzy Logic Operations .....</b>	<b>530</b>
Hung T. Nguyen, Masao Mukaidono, and Vladik Kreinovich	
<b>Use of Satellite Images Referencing Algorithms to Characterize Asphaltic Concrete Mixtures.....</b>	<b>536</b>
Scott A. Starks, Soheil Nazarian, Vladik Kreinovich, and Joseph Adidhela	

#### ***Session 409: Fuzzy and Stochastic Control***

*Tuesday, May 14, 8:00am-9:20am, South Pacific Ballroom 3*

*Chair:*

<b>Comparative Analysis of Fuzzy PI/PD/PID Controller Based on Classical PID Controller Approach.....</b>	<b>541</b>
Petr Pivonka	



<b>A Survey of Fuzzy Control Strategies for Neuromuscular Blockade using Continuous Infusion of Atracurium .....</b>	<b>547</b>
Paulo A. P. Fazendeiro and J. Valente de Oliveira	
<b>Analysis And Design of Fuzzy Control Systems with Random Delays Using Invariant Cones .....</b>	<b>553</b>
A.S.C. Sinha, R. Pidaparti, M. Rizkalla and M.A. El-Sharkawy	
<b>Extending Covariance Control for a Class of Discrete Fuzzy Stochastic Systems .....</b>	<b>558</b>
Wen-Jer Chang and Chong-Cheng Shing	
 <b>Special Track 570: Granular Computing, Perceptions and Applications</b>	
Tuesday, May 14, 8:00am-9:20am, South Pacific Ballroom 4	
Chair: T. Y. Lin	
<b>Granular Computing and as a Basis for Computational Theory of Perceptions.....</b>	<b>564</b>
Lofti Zadeh	
<b>Neural Networks, Qualitative-Fuzzy Logic and Granular Adaptive Systems.....</b>	<b>566</b>
T. Y. Lin	
<b>Parallel Granular Neural Networks for Fast Credit Card Fraud Detection .....</b>	<b>572</b>
Mubeena Syeda, Yan-Qing Zhang and Yi Pan	
 <b>Session 422: Granular Computing</b>	
Tuesday, May 14, 8:00am-9:20am, Sea Pearl Suite 4	
Chair:	
<b>A Model of Granular Data: A Design Problem with the Tchebyshev-Based Clustering .....</b>	<b>578</b>
Andrzej Bargiela and Witold Pedrycz	
<b>Constraint-based Granular Computing for Fuzzy Modeling .....</b>	<b>584</b>
Robert Lai and David Chiang	
<b>Knowledge-Based Representation of Fuzzy Sets .....</b>	<b>590</b>
Rolly Intan, Masao Mukaidono and Masashi Emoto	
<b>Towards a Linguistic Probability Theory .....</b>	<b>596</b>
J. Halliwell and Q. Shen	
 <b>Session 551: Interval Computations and Fuzzy Techniques</b>	
Tuesday, May 14, 9:30am-10:50am, South Pacific Ballroom 2	
Chair: Vladik Kreinovich and Scott A. Starks	
<b>Interval Representation of Sets: Dempster-Pawlak-Fuzzy Correspondence.....</b>	<b>602</b>
I. Burhan Turksen	
<b>Inequalities in De Morgan Systems I.....</b>	<b>607</b>
Carol Walker and Elbert A. Walker	
<b>Inequalities in De Morgan Systems II.....</b>	<b>610</b>
Elbert A. Walker and Carol Walker	

Interval and Fuzzy Techniques for Plan Checking under Uncertainty.....	616
Raul A. Trejo	

### **Special Track 571: Granular Computing: Fuzzy Sets and Applications**

Tuesday, May 14, 9:30am-10:50am, South Pacific Ballroom 4

Chair: Vladik Kreinovich

Text Classification with Enhanced Semi- Supervised Fuzzy Clustering .....	621
Girish Keswani and Lawrence O. Hall	

3M Algorithm: Finding an Optimal Fuzzy Cluster Scheme for Proximity Data.....	627
Ying Xie, Vijay. V. Raghavan and Xiaoquan Zhao	

### **Session 410: Robust Fuzzy Control**

Tuesday, May 14, 9:30am-10:50am, Sea Pearl Suite 4

Chair: TBA

Robust H(Infinity) Fuzzy Control via Dynamic Output Feedback for Discrete-time Systems.....	633
Ji-Chang Lo and Yu-Cheng Lin	

Robustly Stable Fuzzy Controller for Uncertain Nonlinear Systems with Unknown Input Gain Sign.....	639
Jang-Hyun Park, Sung-Hoe Huh, Pil-Sang Yoon and Gwi-Tae Park	

Variable Structure Control Using Takagi-Sugeno Fuzzy System as a Sliding Surface .....	644
Boyko Iliev and Iasen Hristozov	

Design of Fuzzy Adaptive Robust Control Algorithm via Small Gain Approach.....	650
Yansheng Yang and Changjiu Zhou	

### **Session 411: Fuzzy Sliding Mode Control**

Tuesday, May 14, 1:30pm-2:50pm, South Pacific Ballroom 3

Chair: TBA

Hierarchical Fuzzy Sliding-mode Control .....	656
Yi-Jen Mon and Chih-Min Lin	

Decoupled Fuzzy Sliding-Mode Control of a Nonlinear Aeroelastic Structure.....	662
Chih-Min Lin and Chun-Fei Hsu	

Decentralized Adaptive Fuzzy Controller Design of Large-Scale Nonlinear Systems with Unmatched Uncertainties.....	668
Chiang-Cheng Chiang and Zu-Hung Kuo	

Adaptive Fuzzy Sliding Mode Controller Design .....	674
Chung-Chun Kung, Tung-Yun Kao, and Ti-Hung Chen	