

# **2010 Second World Congress on Nature and Biologically Inspired Computing**

**(NaBIC 2010)**

**Kitakyushu, Japan  
15 – 17 December 2010**



IEEE Catalog Number: CFP1095H-PRT  
ISBN: 978-1-4244-7377-9

## TABLE OF CONTENTS

### SWARM INTELLIGENCE 1

SELECTIVE REGENERATION PARTICLE SWARM OPTIMIZATION FOR INVENTORY CLASSIFICATION IN SUPPLY CHAIN SYSTEMS.....	1
<i>J. Kao, C. Tsia</i>	
ABC-GSX: A HYBRID METHOD FOR SOLVING THE TRAVELING SALESMAN PROBLEM.....	7
<i>A. Banharnsakun, T. Achalakul, B. Sirinaovakul</i>	
ARTIFICIAL BEE COLONY ALGORITHM ON DISTRIBUTED ENVIRONMENTS.....	13
<i>A. Banharnsakun, T. Achalakul, B. Sirinaovakul</i>	
AVERAGE RANK DOMINATION RELATION FOR NSGAII AND SMPSO ALGORITHMS FOR MANY-OBJECTIVE OPTIMIZATION .....	19
<i>S. Kachroudi, M. Grossard</i>	

### ARTIFICIAL IMMUNE SYSTEMS 1

DETECTION OF WEB SERVER ATTACKS USING PRINCIPLES OF IMMUNOCOMPUTING.....	25
<i>V. Kotov, V. Vasilyev</i>	
USING AN ARTIFICIAL IMMUNE SYSTEM FOR CLASSIFYING AERODYNAMIC INSTABILITIES OF CENTRIFUGAL COMPRESSORS.....	31
<i>R. Schulze, F. Dietel, J. Jakel, H. Richter</i>	
HUMORAL ARTIFICIAL IMMUNE SYSTEM (HAIS) FOR SUPERVISED LEARNING.....	37
<i>W. Ahmad, A. Narayanan</i>	
OUTLIER DETECTION USING HUMORAL-MEDIATED CLUSTERING (HAIS) .....	45
<i>W. Ahmad, A. Narayanan</i>	

### CELLULAR AUTOMATA

CONTINUOUS CELLULAR AUTOMATA ON IRREGULAR TESSELLATIONS: MIMICKING STEADY-STATE HEAT FLOW .....	53
<i>J. Baetens, B. Baets</i>	
EVOLUTIONARY DESIGN OF EDGE DETECTOR USING RULE-CHANGING CELLULAR AUTOMATA .....	60
<i>S. Sato, H. Kanoh</i>	
TUNING SELECTION PRESSURE IN DIFFERENTIAL EVOLUTION USING LOCAL SELECTION.....	66
<i>N. Noman, J. Vatanutanon, H. Iba</i>	
BLOCK CIPHER ALGORITHM BASED ON PROGRAMMABLE CELLULAR AUTOMATA .....	72
<i>P. Anghescu</i>	

### ROBOTICS

EVOLUTION OF A YOGA PERFORMING HUMANOID .....	78
<i>D. Hettiarachchi, H. Iba</i>	
AGE BASED CONTROLLER STABILIZATION IN EVOLUTIONARY ROBOTICS.....	84
<i>S. Merkel, L. Konig, H. Schmeck</i>	
ESTIMATION OF FEEDBACK SYSTEM DURING PROGRAMMED BEHAVIOR EXHIBITED BY SILKWORM MOTH.....	92
<i>A. Takashima, R. Minegishi, D. Kurabayashi, R. Kanzaki</i>	

## ARTIFICIAL IMMUNE SYSTEMS 2

A FUZZY INFERENCE SYSTEM TO DETERMINE THE NUMBER OF CLONES IN THE CLONAL SELECTION ALGORITHM .....	98
<i>L. Carraro, L. Castro, A. Re</i>	
DISEASE PROGNOSTICATION AND CRISIS MANAGEMENT USING ARTIFICIAL INTELLIGENCE APPROACH -ANALYSIS OF NATURAL KILLER CELL ACTIVITY, MENTAL CONDITION AND SUPPORT AFTER DISASTER- .....	103
<i>H. Shimoda, Y. Okamoto, H. Fukuyama, R. Takahashi</i>	
TECNO-STREAMS APPROACH FOR CONTENT-BASED IMAGE RETRIEVAL .....	109
<i>M. Analoui, M. Beheshti, M. Mahmoudi, Z. Jadidi</i>	
A NEW SYSTEM TO EVALUATE GA-BASED CLUSTERING ALGORITHMS IN INTRUSION DETECTION ALERT MANAGEMENT SYSTEM.....	115
<i>H. Bahrbegi, A. Navin, A. Ahrabi, M. Mirnia, A. Mollanejad</i>	

## CONTROL SYSTEMS

FRACTIONAL ORDER PI <sup>1</sup> CONTROL STRATEGY FOR A LIQUID LEVEL SYSTEM .....	121
<i>P. Narayanaswamy, P. Kanthabhabha, S. Hamamci</i>	
A NOVEL PIPELINE ARCHITECTURE OF REPLACING INK DROP SPREAD.....	127
<i>M. Firouzi, S. Shouraki, M. Tabandeh, H. Mousavi</i>	
A LEAST SQUARE APPROACH FOR THE DETECTION AND REMOVAL OF OUTLIERS FOR FUZZY LINEAR REGRESSIONS .....	134
<i>M. H. Mashinchi, M. Orgun, M. R. Mashinchi</i>	
LIGHTING CONTROL SYSTEM USING AN ACTOR - CRITIC TYPE LEARNING ALGORITHM .....	140
<i>T. Hiroyasu, M. Miki, A. Nakamura, H. Yokouchi, M. Yoshimi</i>	

## DATA MINING

AN ANT COLONY OPTIMIZATION APPROACH FOR STACKING ENSEMBLE .....	146
<i>Y. Chen, M. Wong</i>	
DATA MINING FOR THE INVESTIGATION OF UNSTEADY FLOW FIELD IN A HARD DISK DRIVE .....	152
<i>S. Morizawa, S. Jeong, K. Shimoyama, S. Obayashi</i>	
NAÏVE BAYES AND UNSUPERVISED ARTIFICIAL NEURAL NETS FOR CANCUN TOURISM SOCIAL MEDIA DATA ANALYSIS .....	158
<i>W. Claster, H. Dinh, M. Cooper</i>	
THE PROPOSAL OF A CONSTRUCTIVE PARTICLE SWARM CLASSIFIER .....	164
<i>A. Szabo, L. Castro</i>	

## BIOINFORMATICS

MODIFIED EO-BASED EVOLUTIONARY ALGORITHM FOR REDUCING CROSSOVERS OF RECONCILIATION GRAPH .....	169
<i>N. Hara, K. Tamura, H. Kitakami</i>	
BIOLOGICAL PATHWAY DATA INTEGRATION TRENDS, TECHNIQUES, ISSUES AND CHALLENGES: A SURVEY .....	177
<i>S. Kher, J. Dickerson, N. Rawat</i>	
LOCAL LINEAR MULTI-SVM METHOD FOR GENE FUNCTION CLASSIFICATION.....	183
<i>B. Chen, F. Sun, J. Hu</i>	
CAN HUMAN DECISIONS BE PREDICTED THROUGH HEART RATE CHANGES?.....	189
<i>P. Lee, C. Chang, T. Hsiao</i>	

## COGNITIVE MODELLING AND ARCHITECTURES

SYNTHETIC DESIGN OF A SOCIAL REGRESSOR AND ITS IMPLEMENTATION USING KNOWLEDGE REQUEST-BROKER ARCHITECTURE.....	194
<i>H. Khandan, T. Terano</i>	

<b>DYNAMIC LINK MODELS FOR GLOBAL DECISION MAKING WITH BINDING-BY-SYNCHRONY .....</b>	201
<i>Y. Sato, J. Jitsev, T. Burwick, C. Von Der Malsburg</i>	
<b>EXPERIMENTAL STUDY OF ACQUISITION OF ORIENTATIONAL CONCEPT BASED ON EMBODIMENT OF VIRTUAL AGENT .....</b>	209
<i>O. Hanagata</i>	
<b>SUPERVISED REINFORCEMENT LEARNING IN DISCRETE ENVIRONMENT DOMAINS .....</b>	215
<i>B. Jensen, D. Ortiz-Arroyo, N. Cruz-Cortes, F. Rodriguez-Henriquez</i>	

## **IMAGE PROCESSING AND PATTERN RECOGNITION 1**

<b>SIMILARITY-BASED IMAGE RETRIEVAL CONSIDERING ARTIFACTS BY SELF-ORGANIZING MAP WITH REFRACTORINESS — ARTIFACTS EXTRACTION BY RBF NETWORK — .....</b>	221
<i>T. Okawa, Y. Osana</i>	
<b>PERCEPTION-BASED APPROACH IN RECOGNITION OF STRUCTURED PATTERNS .....</b>	227
<i>T. Nguyen</i>	
<b>AN ADAPTIVE SWITCHING MEDIAN FILTER WITH ANISOTROPIC LINKING PCNN NOISE DETECTION FOR SALT AND PEPPER NOISE REDUCTION .....</b>	233
<i>Z. Shi, J. Hu</i>	

## **HYBRID APPROACHES**

<b>A HYBRID METHOD OF DIJKSTRA ALGORITHM AND EVOLUTIONARY NEURAL NETWORK FOR OPTIMAL MS. PAC-MAN AGENT .....</b>	239
<i>K. Oh, S. Cho</i>	
<b>A HYBRID APPROACH OF EDAS AND GAS BASED ON MASTER/SLAVE COOPERATION FOR CONTINUOUS FUNCTION OPTIMIZATION .....</b>	244
<i>S. Said, M. Nakamura</i>	
<b>COMPUTATIONAL REPLICATORS: A TAXONOMY OF PROPERTIES AND A PRELIMINARY MODEL .....</b>	249
<i>R. Xavier, L. Castro</i>	
<b>AN EVOLUTIONARY DESIGN FOR SOFTWARE SYSTEMS .....</b>	255
<i>T. Nguyen</i>	
<b>A HYBRID PBIL-BASED HARMONY SEARCH METHOD WITH APPLICATION IN WIND GENERATOR OPTIMIZATION .....</b>	261
<i>X. Gao, T. Jokinen, X. Wang, S. Ovaska, A. Arkkio</i>	

## **GENETIC ALGORITHMS**

<b>A GENETIC ALGORITHM SYSTEM FOR PRODUCT LINE EXPLORATION AND OPTIMIZATION .....</b>	268
<i>C. Chapman, J. Alford</i>	
<b>A GENETIC TAKAGI-SUGENO FUZZY SYSTEM FOR FISH HABITAT PREFERENCE MODELLING .....</b>	274
<i>S. Fukuda, N. Onikura, B. De Baets, W. Waegeman, A. Mouton, J. Nakajima, T. Mukai</i>	
<b>OFFICE LAYOUT SUPPORT SYSTEM USING GENETIC ALGORITHM – GENERATION OF LAYOUT PLANS FOR POLYGONAL SPACE – .....</b>	280
<i>R. Tachikawa, Y. Osana</i>	
<b>USING GENETIC ALGORITHMS TO SOLVE THE SOUTH AFRICAN SCHOOL TIMETABLING PROBLEM .....</b>	286
<i>R. Raghujee, N. Pillay</i>	

## **IMAGE PROCESSING AND PATTERN RECOGNITION 2**

<b>3D OBJECT RECOGNITION BASED ON CONFIDENCE LUT OF SIFT FEATURE DISTANCE .....</b>	293
<i>Y. Usui, K. Kondo</i>	

<b>DETECTION OF SUSPICIOUS ACTIVITY AND ESTIMATE OF RISK FROM HUMAN BEHAVIOR SHOT BY SURVEILLANCE CAMERA.....</b>	298
<i>M. Takai</i>	
<b>A NOVEL SHAPE DESCRIPTOR BASED ON VON MISES DISTRIBUTIONS .....</b>	305
<i>K. Ueaki, K. Iwata</i>	
<b>DE-NOISING METHOD RESEARCH ON BEARING FAULT SIGNAL BASED ON PARTICLE FILTER .....</b>	311
<i>H. Pan, J. Men</i>	

## **SPECIAL SESSION: INTERACTIVE EVOLUTIONARY COMPUTATION AND AFFECTIVE COMPUTING 1**

<b>PSO OPTIMIZATION OF SYNERGETIC NEURAL CLASSIFIER FOR MULTICHANNEL EMOTION RECOGNITION .....</b>	316
<i>W. Wong, A. Tan, C. Loo, W. Liew</i>	
<b>FACIAL POSE ESTIMATION USING MODIFIED SYNERGETIC COMPUTER.....</b>	322
<i>G. Lee, C. Loo</i>	
<b>ADAPTIVE EVOLUTIONARY OPTIMIZATION ALGORITHM FOR PROBLEMS WITH HYBRID INDICES.....</b>	328
<i>D. Gong, X. Ji, M. Li, X. Quan</i>	
<b>A SPONTANEOUS FACIAL EXPRESSION RECOGNITION METHOD USING HEAD MOTION AND AAM FEATURES.....</b>	334
<i>Y. Lv, S. Wang</i>	

## **BIO-INSPIRED MODELS FOR INDUSTRIAL AND MEDICAL APPLICATIONS 1**

<b>IMPROVING ENTERPRISE RESOURCE PLANNING RESULTS USING KNOWLEDGE EXTRACTION AND LEARNING .....</b>	340
<i>A. Sedano, J. Villar, M. Garcia-Tamargo, E. Corchado</i>	
<b>AN OVERVIEW OF DECISION MAKING IN ROUGH NON-DETERMINISTIC INFORMATION ANALYSIS.....</b>	345
<i>H. Okuma, M. Nakata, D. Slezak, H. Sakai</i>	
<b>HSAS: HEART SOUND AUTHENTICATION SYSTEM .....</b>	351
<i>N. El-Bendary, H. Al-Qaheri, H. Zawbaa, M. Hamed, A. Hassanien, Q. Zhao, A. Abraham</i>	
<b>PATTERN-BASED SUBSPACE CLASSIFICATION MODEL.....</b>	357
<i>M. Salama, A. Hassanien, A. Fahmy</i>	

## **SWARM INTELLIGENCE 2**

<b>A HIBERNATING MULTI-SWARM OPTIMIZATION ALGORITHM FOR DYNAMIC ENVIRONMENTS .....</b>	363
<i>M. Kamosi, A. Hashemi, M. Meybodi</i>	
<b>REGIONAL ACO-BASED ROUTING FOR LOAD-BALANCING IN NOC SYSTEMS.....</b>	370
<i>H. Hsin, E. Chang, C. Chao, A. Wu</i>	
<b>A NOVEL PARALLEL HYBRID PSO-GA USING MAPREDUCE TO SCHEDULE JOBS IN HADOOP DATA GRIDS.....</b>	377
<i>G. Sadasivam, D. Selvaraj</i>	
<b>CURRENT POSITION-BASED FITNESS EUCLIDEAN-DISTANCE RATIO PARTICLE SWARM OPTIMIZER FOR MULTI-MODAL OPTIMIZATION .....</b>	383
<i>B. Qu, P. Suganthan, S. Zhao</i>	
<b>MULTIOBJECTIVE PARTICLE SWARM OPTIMIZER WITH DYNAMIC EPSILON-DOMINANCE SORTING .....</b>	389
<i>S. Zhao, P. Suganthan, B. Qu</i>	

## **SPECIAL SESSION: INTERACTIVE EVOLUTIONARY COMPUTATION AND AFFECTIVE COMPUTING 2**

<b>GRID-BASED KNOWLEDGE-GUIDED INTERACTIVE GENETIC ALGORITHM AND ITS APPLICATION TO CURTAIN DESIGN .....</b>	395
<i>X. Sun, J. Chen, X. Ma, D. Gong</i>	
<b>A SYSTEM FOR DECORATING QR CODE WITH FACIAL IMAGE BASED ON INTERACTIVE EVOLUTIONARY COMPUTATION AND CASE-BASED REASONING .....</b>	401
<i>S. Ono, S. Nakayama</i>	
<b>EXTENDED INTERACTIVE EVOLUTIONARY COMPUTATION USING HEART RATE VARIABILITY AS FITNESS VALUE FOR COMPOSING MUSIC CHORD PROGRESSION .....</b>	407
<i>M. Fukumoto, S. Ogawa, S. Nakashima, J. Imai</i>	
<b>A NOVEL OBJECTIVE FUNCTION TO OPTIMIZE NEURAL NETWORKS FOR EMOTION RECOGNITION FROM SPEECH PATTERNS .....</b>	413
<i>K. Huang, Y. Kuo</i>	

## **SPECIAL SESSION: BIO-INSPIRED MODELS FOR INDUSTRIAL AND MEDICAL APPLICATIONS 2**

<b>COMMUNICATION VIA QUANTUM NEURAL NETWORKS.....</b>	418
<i>A. Sagheer, N. Metwally</i>	
<b>A BIO-INSPIRED COMPUTATIONAL HIGH-PRECISION DENTAL MILLING SYSTEM .....</b>	423
<i>V. Vera, A. Garcia, R. Redondo, E. Corchado, M. Sanchez, A. Gil, J. Sedano</i>	
<b>A BIO-KNOWLEDGE BASED METHOD TO PREVENT CONTROL SYSTEM INSTABILITY .....</b>	430
<i>J. Calvo-Rolle, A. Couce, E. Ma, A. Sanchez, A. Gil</i>	
<b>EVOLUTIONARY INSPIRED OPTIMIZATION OF FEATURE SUBSET ENSEMBLES .....</b>	437
<i>D. Slezak, S. Widz</i>	
<b>PREDICTIVE INTERNAL NEURAL DYNAMICS FOR DELAY COMPENSATION .....</b>	443
<i>J. Kwon, Y. Choe</i>	

## **EMERGING PARADIGMS 1**

<b>BINARY INVASIVE WEED OPTIMIZATION .....</b>	449
<i>C. Veenhuis</i>	
<b>VINE CREEPING ALGORITHM FOR GLOBAL OPTIMISATION .....</b>	455
<i>C. Young, J. Zou, C. Leo</i>	
<b>AN EVOLUTIONARY ALGORITHM HYPER-HEURISTIC FOR PRODUCING FEASIBLE TIMETABLES FOR THE CURRICULUM BASED UNIVERSITY COURSE TIMETABLING PROBLEM.....</b>	460
<i>R. Els, N. Pillay</i>	
<b>A STUDY ON THE COMPUTATIONAL EFFICIENCY OF BALDWINIAN EVOLUTION.....</b>	467
<i>S. Liu, H. Iba</i>	

## **ARTIFICIAL IMMUNE SYSTEMS 3**

<b>A REFINED IMMUNE SYSTEMS INSPIRED MODEL FOR MULTI-ROBOT SHEPHERDING .....</b>	473
<i>S. Razali, Q. Meng, S. Yang</i>	
<b>AN ADAPTIVE MUTATION OPERATOR FOR ARTIFICIAL IMMUNE NETWORK USING LEARNING AUTOMATA IN DYNAMIC ENVIRONMENTS.....</b>	479
<i>A. Rezvanian, M. Meybodi</i>	
<b>AIS<sub>TTP</sub> : AN ARTIFICIAL IMMUNE ALGORITHM TO SOLVE TRAVELING TOURNAMENT PROBLEMS.....</b>	484
<i>L. Perez, M. Riff</i>	

## **MULTI-OBJECTIVE OPTIMIZATION**

A STUDY ON INTERACTIVE SEARCH IN MOGA WITH ISLAND MODEL BASED ON USER'S REQUIREMENTS USING VISUALIZATION IN NSP .....	490
<i>M. Yamamoto, T. Yoshikawa, T. Furuhashi</i>	
IMPROVING MULTI-OBJECTIVE RANDOM ONE-BIT CLIMBERS ON MNK-LANDSCAPES .....	496
<i>J. Pasia, H. Aguirre, K. Tanaka</i>	
MULTIOBJECTIVIZATION FROM TWO OBJECTIVES TO FOUR OBJECTIVES IN EVOLUTIONARY MULTI-OBJECTIVE OPTIMIZATION ALGORITHMS.....	502
<i>H. Ishibuchi, Y. Hitotsuyanagi, Y. Nakashima, Y. Nojima</i>	
EXAMINATION OF MULTI-OBJECTIVE GENETIC ALGORITHM USING THE CONCEPT OF A PEER-TO-PEER NETWORK.....	508
<i>T. Hiroyasu, M. Miki, T. Noda, M. Yoshimi, H. Yokouchi</i>	

## **OPTIMIZATION**

ASYNCHRONOUS P SYSTEMS FOR SAT AND HAMILTONIAN CYCLE PROBLEM.....	513
<i>K. Ishii, A. Fujiwara, H. Tagawa</i>	
PROPOSAL OF F-F-OBJECTIVE OPTIMIZATION FOR MANY OBJECTIVES AND ITS EVALUATION WITH A 0/1 KNAPSACK PROBLEM.....	520
<i>M. Inoue, H. Takagi</i>	
SOLVING NONLINEAR OPTIMIZATION PROBLEMS BY DIFFERENTIAL EVOLUTION WITH A ROTATION-INVARIANT CROSSOVER OPERATION USING GRAM-SCHMIDT PROCESS.....	526
<i>T. Takahama, S. Sakai</i>	
TWO-PHASE HEURISTIC FOR CAPACITATED VEHICLE ROUTING PROBLEM .....	534
<i>H. Shen, Y. Zhu, L. Jin, W. Zou</i>	

## **NEURAL NETWORKS**

IDENTIFICATION OF ARTIFACTS IN SCENERY IMAGES USING COLOR AND LINE INFORMATION BY RBF NETWORK AND K-MEANS .....	540
<i>Y. Saito, Y. Osana</i>	
NEURO-EVOLUTION FOR COMPETITIVE CO-EVOLUTION OF BIOLOGICALLY CANONICAL PREDATOR AND PREY BEHAVIORS .....	546
<i>G. Nitschke, L. Langenhouven</i>	
CLASSIFICATION USING REDUNDANT MAPPING IN MODULAR NEURAL NETWORKS .....	554
<i>Y. Meena, K. Arya, R. Kala</i>	

## **EMPIRICAL AND STATISTICAL TECHNIQUES**

SEASONAL ADJUSTMENT IN A SVR WITH CHAOTIC SIMULATED ANNEALING ALGORITHM TRAFFIC FLOW FORECASTING MODEL .....	560
<i>W. Hong, Y. Dong, W. Hung, S. Wei</i>	
EXPERIMENTAL STUDY ON QUANTUM-ENTANGLED COOPERATIVE BEHAVIOR OF TWO ANTS .....	566
<i>S. Nakayama, I. Iimura</i>	
THE LONG TAIL IN BAYESIAN OPTIMAL CONTROL IN UNCERTAIN ENVIRONMENTS.....	572
<i>P. Darwen</i>	
CHANGE DETECTION IN DYNAMIC FITNESS LANDSCAPES WITH TIME-DEPENDENT CONSTRAINTS .....	580
<i>H. Richter, F. Dietel</i>	

## **EMERGING PARADIGMS 2**

DISCRETE ADIABATIC QUANTUM COMPUTATION WITH QUADRIC VARIATION .....	586
<i>M. El-Fiky, S. Ono, S. Nakayama</i>	

<b>EXPERIMENT STUDY OF A STRUCTURED DIFFERENTIAL EVOLUTION WITH MIXED STRATEGIES.....</b>	591
<i>T. Ishimizu, K. Tagawa</i>	
<b>POLYNOMIAL SELECTION: A NEW WAY TO TUNE SELECTIVE PRESSURE .....</b>	597
<i>J. Vatanutanon, N. Noman, H. Iba</i>	
<b>EMBRYONIC STREAM PROCESSING USING MORPHOGENS.....</b>	603
<i>K. Sabir, D. Lowe</i>	

## APPLICATION-ORIENTED APPROACHES

<b>OFFICE LAYOUT PLAN EVALUATION SYSTEM USING EVACUATION SIMULATION WITH COMMUNICATION AMONG AGENTS.....</b>	611
<i>K. Kato, Y. Osana</i>	
<b>MULTI-SPACE COMPETITIVE DGA AND ITS APPLICATION TO LOCALIZATION OF MULTIPLE SIGNAL SOURCES .....</b>	617
<i>K. Horio, S. Ishikawa, H. Misawa, T. Tokiwa, T. Yamakawa, R. Kubota</i>	
<b>CONSTRAINTS FOR DNA SEQUENCES BY FORMAL LANGUAGE AND ITS CAPACITY .....</b>	622
<i>H. Kamabe</i>	

## LEARNING

<b>EXPLICIT CLASS STRUCTURE PRODUCED BY INFORMATION-THEORETIC COMPETITIVE AND COOPERATIVE LEARNING .....</b>	628
<i>R. Kamimura</i>	
<b>TWO-CHANNEL QUADRATURE MIRROR BANK FILTER DESIGN USING A FITNESS-ADAPTIVE DIFFERENTIAL EVOLUTION ALGORITHM .....</b>	634
<i>A. Ghosh, R. Giri, A. Chowdhury, S. Das, A. Abraham</i>	
<b>FUZZY ADAPTIVE PRE-PROCESSING MODELS FOR ROAD SIGN RECOGNITION .....</b>	642
<i>C. Lin, M. Wang, T. Yang</i>	
<b>A NONPARAMETRIC BAYESIAN APPROACH TO TIME SERIES ALIGNMENT .....</b>	648
<i>S. Akimoto, N. Suematsu</i>	

## DIGITAL CONVERGENCE

<b>ANT-BASED CLUSTERING OF VISUAL-WORDS FOR UNSUPERVISED HUMAN ACTION RECOGNITION.....</b>	654
<i>K. Wang, O. Popoola</i>	
<b>A SELECTIVE TEMPLATE MATCHING ALGORITHM FOR SHORT AND INTUITIVE GESTURE UI OF ACCELEROMETER-BUILTIN MOBILE PHONES .....</b>	660
<i>J. Min, B. Choe, S. Cho</i>	
<b>APPLICATION OF PERIPHERAL AUDITORY MODEL TO SPEAKER IDENTIFICATION .....</b>	666
<i>M. Abuku, T. Azetsu, E. Uchino, N. Suetake</i>	
<b>INTERLEAVER OPTIMIZATION BY POPULATION BASED METAHEURISTICS .....</b>	672
<i>V. Snasel, J. Platos, P. Kromer, N. Ouddane, A. Abraham</i>	

## EVOLUTIONARY TECHNIQUES

<b>EVOLUTIONARY OPTIMIZATION FOR HUB AND SPOKE NETWORK BASED ON DEMAND AND OPERATION .....</b>	678
<i>S. Iseya, K. Takadama</i>	
<b>ON AGGREGATION OF FITNESS LANDSCAPES .....</b>	684
<i>L. Troiano</i>	
<b>APPROPRIATE GRANULARITY SPECIFICATION FOR FUZZY CLASSIFIER DESIGN BY DATA COMPLEXITY MEASURES.....</b>	691
<i>S. Nishikawa, Y. Nojima, H. Ishibuchi</i>	
<b>INVESTIGATION OF HYBRID OPTIMIZATION METHODS TO EVOLVE EFFECTIVE GAITS OF A HEXAPEDAL ROBOT .....</b>	697
<i>Y. Chang, C. Peng, Y. Wu</i>	

## **SYSTEM ENGINEERING**

<b>AN ADAPTIVE QUANTUM-INSPIRED DIFFERENTIAL EVOLUTION ALGORITHM FOR 0-1 KNAPSACK PROBLEM.....</b>	703
<i>A. Hota, A. Pat</i>	
<b>AN IMPROVED QUANTUM-BEHAVED PARTICLE SWARM OPTIMIZATION USING FITNESSWEIGHTED PREFERENTIAL RECOMBINATION .....</b>	709
<i>A. Pat, A. Hota</i>	
<b>ENHANCED BIOGEOGRAPHY-BASED OPTIMIZATION USING MODIFIED CLEAR DUPLICATE OPERATOR .....</b>	715
<i>S. Pattnaik, M. Lohokare, S. Devi</i>	
<b>Author Index</b>	