



# The Sixth International Conference on Swarm Intelligence The Second BRICS Congress on Computational Intelligence

June 25-29, 2015, BICC, Beijing, China

## Technical Program & Abstracts



<http://www.ic-si.org>

## Welcome Message from General Chair

We are warmly welcoming you, swarm intelligence and computational intelligence researchers from all over the world, to attend the Sixth International Conference on Swarm Intelligence in conjunction with the Second BRICS Congress on Computational Intelligence (ICSI-CCI 2015) in the best season of Beijing. Beijing is the capital of China and is now one of the largest international cities in the world.

As a sequel of the successful Hefei event (ICSI 2014), Harbin event (ICSI 2013), Shenzhen event (ICSI 2012), Chongqing event (ICSI 2011) and Beijing event (ICSI 2010), the ICSI 2015 is the sixth event in its series. The Second BRICS Congress on Computational Intelligence (BRICS-CCI 2015) is the second gathering for BRICS countries's researchers who are interested in computational intelligence after the successful Recife event (BRICS-CCI 2013) in Brazil. We believe that you will enjoy this important and hard-to-get gathering for the swarm intelligence community and computational intelligence community.

The theme of the ICSI-CCI 2015 is "SERVING OUR SOCIETY AND LIFE WITH INTELLIGENCE". With the advent of big data analysis and intelligent computing techniques, we are facing new challenges to make the information transparent and understandable efficiently. The ICSI-CCI 2015 will provide an excellent opportunity and/or an academic forum for academia and practitioners to present and discuss the latest scientific results and methods, the innovative ideas and advantages in theories, technologies and applications in both swarm intelligence and computational intelligence. Thanks to the hard work of the Organization Committee and the Program Committee, the ICSI-CCI 2015 will provide you with excellent program and schedule. The technical program will cover all aspects of swarm intelligence, neural networks, evolutionary computation and fuzzy systems applied to all fields of computer vision, signal processing, machine learning, data mining, robotics, scheduling, game theory, DB, parallel realization, etc.

The venue of the ICSI-CCI 2015 is Beijing International Convention Center (BICC). BICC is located in the Olympic Village, a flourishing area of Beijing which has a collection of conference centers, businesses, shopping centers and entertainment venues. BICC is right across the street from the center of 2008 Beijing Olympic Games – Beijing National Stadium, known as the "Bird's Nest", and the Aquatic Center, known as the "Water Cube".

As the cultural, educational and high-tech centre of the nation, Beijing possesses many world-class conference facilities, communication infrastructures, and hotels, and has successfully hosted many important international conferences and events like the 2008 Beijing Olympic Games, 2014 Asia-Pacific Economic Cooperation (APEC), etc. In addition, Beijing has rich

culture and historical attractions such as the Great Wall, the Forbidden City, the Summer Palace, and the Temple of Heaven. The participants of ICSI-CCI'2015 can also enjoy Peking operas, beautiful landscapes, and the hospitality of the Chinese people, Chinese cuisine, and a modern China.

On the other hand, the ICSI-CCI 2015 will definitely contribute a lot to the globalization of research and teaching in China in addition to the enhancement of the research horizons of the conference delegates. Certainly, the participants of the ICSI-CCI 2015 can also enjoy multiple cultures, beautiful landscapes and night scenes in Beijing, and the hospitality from the people in China.

On behalf of the general chairs and organizing committees of the ICSI-CCI 2015, I wish the ICSI-CCI 2015 will be a memorable event for you to stay in Beijing, China.

Sincerely yours!

ICSI-CCI 2015 Joint General Chair

**Ying Tan**

*Peking University, China*

## Welcome Message from Program Committee Chair

The Sixth International Conference on Swarm Intelligence (ICSI 2015) is the sixth international gathering in the world for researchers working on all aspects of swarm intelligence, following the successful and fruitful Hefei event (ICSI 2014), Harbin event (ICSI 2013), Shenzhen event (ICSI 2012), Chongqing event (ICSI 2011) and Beijing event (ICSI 2010), which provided a high-level academic forum for the participants to disseminate their new research findings and discuss emerging areas of research. It also created a stimulating environment for the participants to interact and exchange information on future challenges and opportunities in the field of swarm intelligence research. The Second BRICS Congress on Computational Intelligence (BRICS-CCI 2015) is the second gathering for BRICS countries's researchers who are interested in computational intelligence after the successful Recife event (BRICS-CCI 2013) in Brazil. These two prestigious conferences are jointly held in Beijing this year for sharing common mutual ideas, promoting transverse fusion, and stimulating innovation.

The aim of this important meeting is to exhibit the state of the art research and development in all aspects of swarm intelligence and computational intelligence from theoretical to practical researches.

ICSI-CCI 2015 received 294 submissions from about 816 authors in 52 countries and regions (Algeria, Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Brunei Darussalam, Canada, Chile, China, Christmas Island, Croatia, Czech Republic, Egypt, Finland, France, Georgia, Germany, Greece, Hong Kong, India, Ireland, Islamic Republic of Iran, Iraq, Italy, Japan, Republic of Korea, Macao, Malaysia, Mexico, Myanmar, New Zealand, Nigeria, Pakistan, Poland, Romania, Russian Federation, Saudi Arabia, Serbia, Singapore, South Africa, Spain, Sweden, Switzerland, Chinese Taiwan, Thailand, Tunisia, Turkey, United Kingdom, USA, Viet Nam) across six continents (Asia, Europe, North America, South America, Africa, and Oceania). Each submission was reviewed by at least two reviewers, and on average 2.7 reviewers. Based on rigorous reviews by the Program Committee members and reviewers, 161 high-quality papers were selected for publication in this proceedings volume with an acceptance rate of 54.76%. The papers are organized in 28 cohesive sections covering all major topics of swarm intelligence and computational intelligence research and development.

In addition to the contributed papers, the ICSI-CCI 2015 technical program included two plenary speeches; one is given by Prof Ponnuthurai Nagaratnam Suganthan (Nanyang Technological University, Singapore), and the other is given by Prof. Qi-Di Wu, Prof. Lei Wang and Dr. Yong-Wei Zhang (Tongji University, China).

As organizers of ICSI-CCI 2015, we would like to express sincere thanks to Peking University

and Xian Jiaotong-Liverpool University for their sponsorship, as well as to the IEEE Computational Intelligence Society, World Federation on Soft Computing, and International Neural Network Society for their technical co-sponsorship. We appreciate the Natural Science Foundation of China and Beijing Xinhui Hi-tech Company for its financial and logistic support. We would also like to thank the members of the Advisory Committee for their guidance, the members of the International Program Committee and additional reviewers for reviewing the papers, and the members of the Publications Committee for checking the accepted papers in a short period of time. Particularly, we are grateful to the proceedings publisher Springer for publishing the proceedings in the prestigious series of Lecture Notes in Computer Science. Moreover, we wish to express our heartfelt appreciation to the plenary speakers, session chairs, and student helpers. In addition, there are still many more colleagues, associates, friends, and supporters who helped us in immeasurable ways; we express our sincere gratitude to them all. Last but not the least, we would like to thank all the speakers, authors, and participants for their great contributions that made ICSI-CCI 2015 successful and all the hard work worthwhile.

We sincerely hope that all ICSI-CCI 2015 participants will enjoy attending conference sessions and social activities, meeting research partners, and setting up new research collaborations.

Have a pleasant stay in Beijing and enjoy!

Cheers!

ICSI-CCI 2015 General Program Committee Chair

**Yuhui Shi**

*Xi'an Jiaotong-Liverpool University, China*

## Contents

<b>Messages</b>	<b>1</b>
Welcome Message from General Chair . . . . .	1
Welcome Message from Program Committee Chair . . . . .	3
<b>Venue</b>	<b>6</b>
<b>Sponsors</b>	<b>9</b>
<b>Committees</b>	<b>10</b>
Organizing Committees . . . . .	10
International Program Committee Members . . . . .	12
<b>Program Schedule Overview</b>	<b>17</b>
<b>Talks</b>	<b>18</b>
Plenary Talk I . . . . .	18
Plenary Talk II . . . . .	19
<b>Technical Program</b>	<b>20</b>
ICSI 2015 Oral Sessions, June 26, 2015(Friday) . . . . .	23
ICSI 2015 Oral Sessions, June 27, 2015(Saturday) . . . . .	28
BRICS-CCI 2015 Oral Sessions, June 26, 2015(Friday) . . . . .	36
BRICS-CCI 2015 Oral Sessions, June 27, 2015(Saturday) . . . . .	38
<b>Abstracts</b>	<b>40</b>
<b>Index</b>	<b>69</b>
<b>Map Overview</b>	<b>back endpage</b>

## Venue



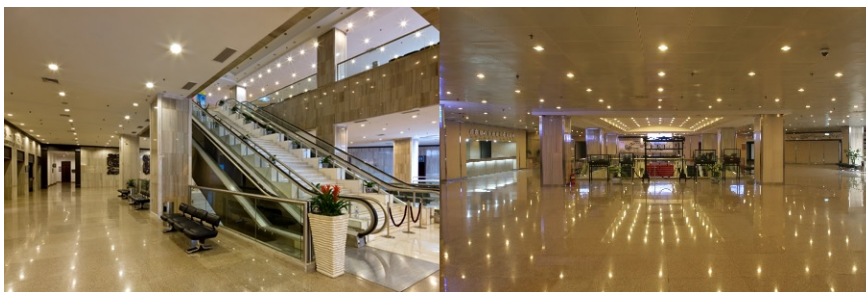
The ICSI-CCI 2015 will be held at Beijing International Convention Center (BICC). BICC is a five-star convention center. In terms of service, BICC is always working to upgrade its facilities and hardware, implements innovative management strategies, provides better quality of service, and gradually grows into a leader in the exhibition industry.

BICC anchors northeast Beijing, hosting almost 1,000 conventions and exhibitions since it opened in 1990 in the Asian Games Village just north of Fourth Ring Road. With over 50 meeting rooms in various configurations and 5,000 square meters of exhibit space, it has hosted the annual meetings of the National People's Congress and Chinese People's Political Consultative Conference, the United Nations Fourth World Conference on Women, the Beijing 2008 Olympic and Paralympic Games, the second China-Africa Young Leaders Forum, the World Mind Sports Games, the Tour of Beijing professional cycling race, and many more major national and international events.

BICC is only nine kilometers away from central Beijing where the Forbidden City, Tiananmen Square and the Silk Market can be found. The convention center is affiliated with Beijing Continental Grand Hotel with its convenient accommodations and restaurants. Shopping and other dining options are just outside the door in the Asian Games Village. Olympic Green, site of the 2008 Summer Olympics, is a short taxi ride away.



## Beijing International Convention Center



Lobby



Meeting Rooms

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## Program Schedule Overview

### Registration

Registration will take place at Registration Desk in the BICC during the following hours:

Date	Time	Place
June 25, 2015	10:00-18:00	BICC Lobby at the First Floor
June 26, 2015	08:00-12:00	Corridor at the Third Floor
June 27, 2015	08:00-12:00	Corridor at the Third Floor

### Notable Events

Date	Time	Events (At Beijing International Convention Center)
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June 26, 2015	08:30-08:55	Opening Ceremony (Room 305 CDE at the Third Floor)
	09:00-12:00	Plenary Talks (Room 305 CDE at the Third Floor)
	12:00-13:30	Lunch (Lijiang Hall at the Second Floor of the Beijing North Star Continental Grand Hotel)
	13:30-17:50	Parallel Oral Sessions (Room 302, 303, 311AB and 311C at the Third Floor)
	18:00	Banquet (Shanghai MIN at the 5th Floor of Times Mingmen)

June 27, 2015	08:00-12:00	Parallel Oral Sessions (Room 302, 303, 311AB and 311C at the Third Floor)
	12:00-13:30	Lunch (Lijiang Hall at the Second Floor of the Beijing North Star Continental Grand Hotel)
	13:30-17:30	Parallel Oral Sessions (Room 302, 303 and 311AB at the Third Floor)

June 28-29, 2015	08:00-16:00	Workshop Post-conference Excursions: Beijing City Tour (Ticket is required)
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# Plenary Talk I

## Recent Advances in Numerical Optimization by Using Population-Based Algorithms

Prof. Ponnuthurai Nagaratnam Suganthan  
Nanyang Technological University, Singapore

### Abstract

This talk will focus on real decision variable optimization by using population based evolutionary and swarm algorithms such as differential evolution and particle swarm optimization. The presentation will include the importance of distance based neighborhood population topology, ensemble parameters - operators, adaptations, no free lunch theorem, and so on. The presentations can be readily extended to various optimization scenarios such as single objective, multi-modal multi-solutions, multi-objective, etc.

### Biography



Ponnuthurai Nagaratnam Suganthan received the B.A degree, Postgraduate Certificate and M.A degree in Electrical and Information Engineering from the University of Cambridge, UK in 1990, 1992 and 1994, respectively. After completing his PhD research in 1995, he served as a predoctoral Research Assistant in the Dept of Electrical Engineering, University of Sydney in 1995 - 96 and a lecturer in the Dept of Computer Science and Electrical Engineering (ITEE), University of Queensland in 1996 - 99. He moved to NTU in 1999. He is an Editorial Board Member of the Evolutionary Computation Journal, MIT Press. He is an associate editor of the IEEE Trans on Cybernetics, IEEE Trans on Evolutionary Computation, Information Sciences (Elsevier), Pattern Recognition (Elsevier) and Int. J. of Swarm Intelligence Research Journals. He is a founding co-editor-in-chief of Swarm and Evolutionary Computation, an Elsevier Journal. His SaDE (April 2009) paper won "IEEE Trans. on Evolutionary Computation" outstanding paper award in 2012. Dr Jane Jing Liang (former PhD student) won the IEEE CIS Outstanding PhD dissertation award, in 2014. His research interests include evolutionary computation, pattern recognition, multi-objective evolutionary algorithms, applications of evolutionary computation and neural networks. His publications have been well cited with Google scholar Citations over 15,000. His SCI indexed publications attracted over 1000 SCI citations in each calendar year since 2013. He is a fellow of the IEEE and an elected AdCom member of IEEE Computational Intelligence Society (2014-2016).

## Plenary Talk II

### Selection of Meta-heuristic Algorithms Based on Standardization Evaluation System

Prof. Qi-Di Wu, Prof. Lei Wang and Dr. Yong-Wei Zhang  
Tongji University, China

#### Abstract

Meta-heuristic algorithms have so many implementations, and more variants and implementations continuously emerged. However, there are few standard systems that select the best algorithm for given problems. The benchmark problems are considered as black box problems. Through sampling of pure random search on the benchmarks, the characteristics of the benchmarks are quantified by statistic indicators. Comparative study validates the effectiveness of using statistic indicators for benchmark problem description. Typical meta-heuristic algorithms and pure random search are tested under the same standard. Based on the statistic indicators of the test results, the theory of evaluation space for meta-heuristic algorithms are proposed, which maps meta-heuristic algorithms into points in the evaluation space. In order to solve the difficulty of comparing the evaluating indicators of different magnitude, the relative grade is introduced and the standard grade system for meta-heuristic algorithms is established. The pure random search is considered as reference point, using the distance between given algorithms and pure random search, the similarity of any algorithm to pure random search can be measured. On the basis of standard grade system, the fittest algorithm for every benchmark problem can be decided. For given problem, by measuring the similarity to benchmark problems, the fittest algorithm for such problem can be forecasted referring to the fittest algorithm of the most similar benchmark problem. Experiment shows that the forecasted algorithm of given problem is relatively accurate.

#### Biography



Qi-Di Wu received PhD degree in electronic engineering from Zurich Federal Polytechnic University in 1986. She was a lecturer, associate professor and professor of control theory and control engineering at Tongji University since 1986. She was vice Minister of Chinese Ministry of Education in 2003. She is now chairman of Shanghai Overseas Returned Scholars Association (SORSA) and senior member of the IEEE.



Lei Wang received PhD degree in control theory in 1998 from Tongji University. He is currently a professor of control theory and control engineering at Tongji University. His current research interests are in swarm-based intelligent algorithms and hybrid algorithms. He is now committee member of IEEE Shanghai section.



Yong-Wei Zhang received the PhD degree in control theory from Tongji University in 2013. Since 2013, he has been with the Department of Electronics and Information Engineering at Jiangsu University of Science and Technology, where he is currently a lecturer. His research interests include evolutionary computation and its applications.



# Technical Program

**June 26, 2015(Friday)**

08:30-08:55	Opening Ceremony	Room 305 CDE
09:00-10:20	Plenary Talk I Speaker: Prof. Ponnuthurai Nagaratnam Suganthan Chair: Prof. Yuhui Shi	Room 305 CDE
10:20-10:40	Tea/Coffee Break	Main Entrance of Room 305 CDE
10:40-12:00	Plenary Talk II Speaker: Prof. Qi-Di Wu, Prof. Lei Wang and Dr. Yong-Wei Zhang Chair: Prof. Ponnuthurai Nagaratnam Suganthan	Room 305 CDE
12:00-13:30	Lunch	<i>Lijiang Hall</i> <sup>1</sup>
13:30-15:30	ICSI 2015 Oral Sessions	Meeting Rooms
<b>Room 311AB</b>	<b>Room 302</b>	<b>Room 303</b>
Novel Swarm-based Optimization Algorithms and Applicagtions	Particle Swarm Optimization (I)	Evolutionary and Genetic Algorithms
13:30-15:30	BRICS-CCI 2015 Oral Session Neural Networks and Machine Learning	Room 311C
15:30-15:50	Tea/Coffea Break	Corridor
15:50-17:50	ICSI 2015 Oral Sessions	Meeting Rooms
<b>Room 311AB</b>	<b>Room 302</b>	<b>Room 303</b>
Differential Evolution and Brain Storm Optimization	Biogeography Based Optimization and Other Biology Based Optimization	Scheduling, Path Planning and Automation Control

BRICS-CCI 2015 Oral Session		
15:50-17:50	Fuzzy Systems and Evolutionary Computation	Room 311C
18:00	Banquet	<i>Shanghai MIN<sup>2</sup></i>

## June 27, 2015(Saturday)

08:00-09:40	ICSI 2015 Oral Sessions	Meeting Rooms
<b>Room 311AB</b>	<b>Room 302</b>	<b>Room 303</b>
Ant Colony Optimization and Artificial Bee Colony Algorithms	Multi-objective Optimization	Swarm Interaction Behavior
08:00-09:40	BRICS-CCI 2015 Oral Session Multimedia Information Processing	Room 311C
09:40-10:00	Tea/Coffea Break	Corridor
10:00-12:00	ICSI 2015 Oral Sessions	Meeting Rooms
<b>Room 311AB</b>	<b>Room 302</b>	<b>Room 303</b>
Fuzzy Methods and Data Mining	Information Security and Structural Damage Detection	Combinatorial Optimization and Constrained Optimization
10:00-12:00	BRICS-CCI 2015 Oral Session Other Applications	Room 311C
12:00-13:30	Lunch	<i>Lijiang Hall</i> <sup>1</sup>
13:30-15:10	ICSI 2015 Oral Sessions	Meeting Rooms
<b>Room 311AB</b>	<b>Room 302</b>	<b>Room 303</b>
Particle Swarm Optimization (II)	Machine Learning	Blind Source Separation and Natural Language Processing
15:10-15:30	Tea/Coffea Break	Corridor
15:30-17:30	ICSI 2015 Oral Sessions	Meeting Rooms
<b>Room 311AB</b>	<b>Room 302</b>	<b>Room 303</b>
Multi-Agent Systems and Swarm Robotics	Segmentation and Detection System	Other Applications

1. Lijiang Hall (荔江厅) is located at the Second Floor of the Beijing North Star Continental Grand Hotel (北辰五洲大酒店). See the map on the back endpage.

2. Shanghai MIN (上海小南国) is located at the 5th Floor of Times Mingmen (时代名门). See the map on the back endpage.

# ICSII 2015 Oral Sessions

## June 26, 2015(Friday)

Session	Novel Swarm-based Optimization Algorithms and Applicagtions	Chair	Andres Iglesias
Date/Time	June 26, 2015(Friday) 13:30-15:30	Venue	Room 311AB
13:30 - 13:50	Effects of Topological Variations on Opinion Dynamics Optimizer <i>Rishemjit Kaur, Ritesh Kumar, Amol Bhondekar, Reiji Suzuki and Takaya Arita</i>	P40	
13:50 - 14:10	Utilizing Abstract Phase Spaces in Swarm Design and Validation <i>Sanza Kazadi, Dexin Jin and Peiyao Li</i>	P40	
14:10 - 14:30	On the Application of Co-Operative Swarm Optimization in the Solution of Crystal Structures from X-Ray Diffraction Data <i>Alexandr Zaloga, Sergey Burakov, Eugene Semenkin, Igor Yakimov, Shakhnaz Akhmedova, Maria Semenkina and Evgenii Sopov</i>	P40	
14:30 - 14:50	A Physarum-Inspired Vacant-Particle Model with Shrinkage for Transport Network Design <i>Yuxin Liu, Chao Gao, Mingxin Liang, Li Tao and Zili Zhang</i>	P40	
14:50 - 15:10	Bean Optimization Algorithm based on Negative Binomial Distribution <i>Xiaoming Zhang, Qilian Xie, Tinghao Feng, Liangtu Song and Chaoyuan Cui</i>	P40	
15:10 - 15:30	Memetic Electromagnetism Algorithm for Finite Approximation with Rational Bezier Curves <i>Andres Iglesias and Akemi Galvez-Tomida</i>	P41	

<b>Session</b>	Particle Swarm Optimization (I)	<b>Chair</b> Ponnuthurai Nagaratnam Suganthan
<b>Date/Time</b>	June 26, 2015(Friday) 13:30-15:30	<b>Venue</b> Room 302

13:30 - 13:50	Improved DPSO Algorithm with Dynamically Changing Inertia Weight <i>Jing Xin, Cuicui Yan and Xiangshuai Han</i>	P41
13:50 - 14:10	An Improved PSO-NM Algorithm for Structural Damage Detection <i>Zepeng Chen and Ling Yu</i>	P41
14:10 - 14:30	A Fully-Connected Micro-Extended Analog Computers Array Optimized by Particle Swarm Optimizer <i>Yilin Zhu, Feng Pan and Xuemei Ren</i>	P42
14:30 - 14:50	An Improved Hybrid PSO Based on ARPSO and the Quasi-Newton Method <i>Fei Han and Qing Liu</i>	P42
14:50 - 15:10	Swarm Diversity Analysis of Particle Swarm Optimization <i>Yuanxia Shen, Linna Wei and Chuanhua Zeng</i>	P42
15:10 - 15:30	A Self-Learning Bare-Bones Particle Swarms Optimization Algorithm <i>Jian Chen, Yuanxia Shen and Xiaoyan Wang</i>	P42

<b>Session</b>	Evolutionary and Genetic Algorithms	<b>Chair</b> Junfeng Chen
<b>Date/Time</b>	June 26, 2015(Friday) 13:30-15:30	<b>Venue</b> Room 303

13:30 - 13:50	Genetic Algorithm Based Robust Layout Design By Considering Various Demand Variations <i>Srisatja Vitayasak and Pupong Pongcharoen</i>	P42
13:50 - 14:10	Design index-based hedging Bundled loss property and hybrid genetic algorithm <i>Frank Xuyan Wang</i>	P43
14:10 - 14:30	Reference Point Based Constraint Handling Method for Evolutionary Algorithm <i>Jinlong Li, Aili Shen and Guanzhou Lu</i>	P43

14:30 - 14:50	New Interactive-Generative Design System: Hybrid of Shape Grammar and Evolutionary Design - an Application of Jewelry Design <i>Somlak Kielarova, Prapasson Prapujphonphet and Erik L.J. Bohez</i>	P43
14:50 - 15:10	A Robust Point Sets Matching Method <i>Xiao Liu, Congying Han and Tiande Guo</i>	P44
15:10 - 15:30	Memetic Self-Configuring Genetic Programming for Fuzzy Classifier Ensemble Design <i>Maria Semenkina and Eugene Semenkin</i>	P44

<b>Session</b>	Differential Evolution and Brain Storm Optimization	<b>Chair</b> Yuhui Shi
<b>Date/Time</b>	June 26, 2015(Friday) 15:50-17:30	<b>Venue</b> Room 311AB

15:50 - 16:10	Differential Evolution with Novel Local Search Operation for Large Scale Optimization Problems <i>Changshou Deng, Xiaogang Dong, Yanlin Yang, Yucheng Tan and Xujie Tan</i>	P44
16:10 - 16:30	Research on Network Coding Optimization Using Differential Evolution Based on Simulated Annealing <i>Liying Zhang, Xinjian Zhuo and Xinchao Zhao</i>	P44
16:30 - 16:50	An Adaptive Brainstorming Optimization Algorithm for Multiobjective Optimization Problems <i>Xiaoping Guo, Yali Wu, Lixia Xie, Shi Cheng and Jing Xin</i>	P45
16:50 - 17:10	Enhanced Brain Storm Optimization Algorithm for Wireless Sensor Networks Deployment <i>Junfeng Chen, Shi Cheng, Yang Chen, Yingjuan Xie and Yuhui Shi</i>	P45
17:10 - 17:30	Random Grouping Brain Storm Optimization Algorithm with a New Dynamically Changing Step Size <i>Zijian Cao, Yuhui Shi, Xiaofeng Rong, Baolong Liu, Zhiqiang Du and Bo Yang</i>	P45



<b>Session</b>	Biogeography Based Optimization and Other Biology Based Optimization	<b>Chair</b> Hongwei Mo
<b>Date/Time</b>	June 26, 2015(Friday) 15:50-17:50	<b>Venue</b> Room 302

15:50 - 16:10	Biogeography Optimization Algorithm for DC motor PID Control <i>Hongwei Mo and Lifang Xu</i>	P45
16:10 - 16:30	Biogeography Based Optimization for Tuning FLC Controller of PMSM <i>Salam Waley, Chengxiong Mao and Nasseer K. Bachache</i>	P46
16:30 - 16:50	Enhancing the Performance of Biogeography-Based Optimization in Discrete Domain <i>Qingzheng Xu, Na Wang, Jianhang Zhang and Xiang Gu</i>	P46
16:50 - 17:10	Motor Imagery Electroencephalograph Classification Based on Optimized Support Vector Machine By Magnetic Bacteria Optimization Algorithm <i>Hongwei Mo and Yanyan Zhao</i>	P46
17:10 - 17:30	Co-Operation of Biology-Related Algorithms for Constrained Multiobjective Optimization <i>Shakhnaz Akhmedova and Eugene Semenkin</i>	P46
17:30 - 17:50	Adaptive Cuckoo Search Algorithm with Two-Parent Crossover for Solving Optimization Problems <i>Ong Pauline, Zarita Zainuddin, Chee Kiong Sia and Badrul Aisham Md Zain</i>	P47

<b>Session</b>	Scheduling, Path Planning and Automation Control	<b>Chair</b> Liangjun Ke
<b>Date/Time</b>	June 26, 2015(Friday) 15:50-17:50	<b>Venue</b> Room 303

15:50 - 16:10	Service Based Packets Scheduling for QoS of Mixed Mobile Ttraffic in Wireless Network <i>Zin Win Aye and Myat Thida Mon</i>	P47
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16:10 - 16:30	Network-centric approach to real-time train scheduling in large-scale railway systems <i>Alexander Belousov, Peter Skobelev and Maksim Stepanov</i>	P47
16:30 - 16:50	An Event-driven based Multiple Scenario Approach for Dynamic and Uncertain UAV Mission Planning <i>Ke Shang, Liangjun Ke, Zuren Feng and Stephen Karungaru</i>	P47
16:50 - 17:10	An Improvement of Shipping Schedule Services: Focusing on Service Provider A in Korea <i>Jae Un Jung, Hyun Soo Kim, Hyung Rim Choi and Chang Hyun Park</i>	P47
17:10 - 17:30	Robotic Rehabilitation of Lower Limbs "Reproduction of Human Physiological Movements" <i>Mohamed Amine Mamou and Nadia Saadia</i>	P48
17:30 - 17:50	Achievment of a myoelectric clamp provided by an optical shifting control for upper limb amputations <i>Ibrahim Sofiane Benchabane and Nadia Saadia</i>	P48

# ICSI 2015 Oral Sessions

**June 27, 2015(Saturday)**

<b>Session</b>	Ant Colony Optimization and Artificial Bee Colony Algorithms	<b>Chair</b> Benlian Xu
<b>Date/Time</b>	June 27, 2015(Saturday) 08:00-09:40	<b>Venue</b> Room 311AB

08:00 - 08:20	Multi-Colony Ant Algorithm Using a Sociometry-Based Network and Its Application <i>Sheng Liu and Xiaoming You</i>	P48
08:20 - 08:40	A Hybrid Multi-Cell Tracking Approach with Level Set Evolution and Ant Colony Optimization <i>Dongmei Jiang, Benlian Xu and Long Ge</i>	P48
08:40 - 09:00	Ant algorithm modification for multi-version software building <i>Margarita V. Karaseva, Igor V. Kovalev, Pavel V. Zelenkov and Dmitry I. Kovalev</i>	P49
09:00 - 09:20	An Artificial Bee Colony Algorithm with History-Driven Scout Bees Phase <i>Xin Zhang and Zhou Wu</i>	P49
09:20 - 09:40	Multiobjective RFID Network Planning by Artificial Bee Colony Algorithm with Genetic Operators <i>Milan Tuba, Nebojsa Bacanin and Marko Beko</i>	P49

<b>Session</b>	Multi-objective Optimization	<b>Chair</b> Mohammad Hamdan
<b>Date/Time</b>	June 27, 2015(Saturday) 08:00-09:40	<b>Venue</b> Room 302

08:00 - 08:20	Cooperative Multi-Objective Genetic Algorithm with Parallel Implementation <i>Christina Brester and Eugene Semenkin</i>	P49
08:20 - 08:40	The Initialization of Evolutionary Multiobjective Optimization Algorithms <i>Mohammad Hamdan and Osamah Qudah</i>	P49

08:40 - 09:00	A New Multi-swarm Multi-objective Particle Swarm Optimization Based Power and Supply Voltage Unbalance Optimization of Three-Phase Submerged Arc Furnace <i>Yanxia Sun and Zenghui Wang</i>	P50
09:00 - 09:20	Cultural Particle Swarm Optimization algorithms for Interval Multi-objective Problems <i>Yinan Guo</i>	P50
09:20 - 09:40	Multi-Objective Particle Swarm Optimization Algorithm Based on Comprehensive Optimization Strategies <i>Huan Luo, Minyou Chen and Tingjing Ke</i>	P50

<b>Session</b>	Swarm Interaction Behavior	<b>Chair</b> Eugene Larkin
<b>Date/Time</b>	June 27, 2015(Saturday) 08:00-09:40	<b>Venue</b> Room 303

08:00 - 08:20	Established Routine of Swarm Monitoring Systems Functioning <i>Alexey Ivutin, Eugene Larkin and Vladislav Kotov</i>	P51
08:20 - 08:40	A Gamified Online Forum Inspiring Group Intelligence Distillation for Policy Making <i>Shueh-Cheng Hu and I-Ching Chen</i>	P51
08:40 - 09:00	The Web as an infrastructure for knowledge management: Lessons learnt <i>Benel Aurélien and Zaher Hedi</i>	P51
09:00 - 09:20	Ontology Based Fusion Engine for Interaction with an Intelligent Assistance Robot <i>Nadia Djaid, Nadia Saadia and Amar Ramdane-Cherif</i>	P51
09:20 - 09:40	Using extensible metadata definitions to create a vendor-independent SIEM system <i>Kai-Oliver Detken, Dirk Scheuermann and Bastian Hellmann</i>	P51

<b>Session</b>	Fuzzy Methods and Data Mining	<b>Chair</b> Milan Tuba
<b>Date/Time</b>	June 27, 2015(Saturday) 10:00-11:40	<b>Venue</b> Room 311AB

10:00 - 10:20	Interval-valued intuitionistic fuzzy prioritized ordered weighted averaging operator and its application in threat assessment <i>Wu Hua and Su Xiuqin</i>	P52
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10:20 - 10:40	Application of Fuzzy Set FScom in the Evaluation of Water Quality Level <i>Yongxi Lv and Zhenghua Pan</i>	P52
10:40 - 11:00	A Novel Algorithm for Finding Overlapping Communities in Networks Based on Label Propagation <i>Bingyu Liu, Cuirong Wang, Cong Wang and Yiran Wang</i>	P52
11:00 - 11:20	Optimizing Production and Distribution Problem for Agricultural Products with Type-2 Fuzzy Variables <i>Xuejie Bai and Lijun Xu</i>	P52
11:20 - 11:40	Improving OCR-Degraded Arabic Text Retrieval through an Enhanced Orthographic Query Expansion Model <i>Tarek Elghazaly</i>	P53

<b>Session</b>	Information Security and Structural Damage Detection	<b>Chair</b> Ling Yu
<b>Date/Time</b>	June 27, 2015(Saturday) 10:00-12:00	<b>Venue</b> Room 302

10:00 - 10:20	Negative Survey-based Privacy Protection of Cloud Data <i>Ran Liu and Shanyu Tang</i>	P53
10:20 - 10:40	Bird Mating Optimizer in Structural Damage Identification <i>H. Li, J.K. Liu and Z.R. Lu</i>	P53
10:40 - 11:00	Structural Damage Detection and Moving Force Identification Based on Firefly Algorithm <i>Chudong Pan and Ling Yu</i>	P53
11:00 - 11:20	Mutual Authentication Protocol based on Smart Card and Combined Secret Key Encryption <i>Guifen Zhao</i>	P54
11:20 - 11:40	Security Challenges & Mitigations for a NFC- enabled Attendance System <i>Manmeet Mahinderjit Singh, Nurul Hashimah Ahamed Hassain Malim, Mohd Heikal Husin, Boon Chew Cheah, Wei Sheng Tan, Chiang Wei Kam and Chiang Wei Kam</i>	P54
11:40 - 12:00	Framework to Secure Data Access in Cloud Environment <i>Rachna Jain, Dr. Sushila Madan and Dr. Bindu Garg</i>	P54

<b>Session</b>	Combinatorial Optimization and Constrained Optimization	<b>Chair</b> Xiaoyang Wang
<b>Date/Time</b>	June 27, 2015(Saturday) 10:00-12:00	<b>Venue</b> Room 303

10:00 - 10:20	Using Discrete PSO Algorithm to Evolve Multi-Player Games on Spatial Structure Environment <i>Xiaoyang Wang, Lei Zhang, Xiaorong Du and Yunlin Sun</i>	P54
10:20 - 10:40	A Hybrid Algorithm based on Tabu Search and Chemical Reaction Optimization for 0-1 Knapsack Problem <i>Chaokun Yan, Siqu Gao, Zhigang Hu and Huimin Luo</i>	P55
10:40 - 11:00	A new Physarum-based hybrid optimization algorithm for solving 0/1 Knapsack problem <i>Shi Chen and Chao Gao</i>	P55
11:00 - 11:20	A Discrete Ecogeography-Based Optimization Algorithm for University Course Timetabling <i>Bei Zhang, Min-Xia Zhang and Neng Qian</i>	P55
11:20 - 11:40	A Dynamic Penalty Function for Constrained Optimization <i>Chengyong Si, Jianqiang Shen, Xuan Zou, Yashuai Duo, Lei Wang and Qidi Wu</i>	P55
11:40 - 12:00	A New Physarum Network Based Genetic Algorithm for Bandwidth-delay Constrained Least-cost Multicast Routing <i>Mingxin Liang, Chao Gao, Yuxin Liu, Li Tao and Zili Zhang</i>	P55

<b>Session</b>	Particle Swarm Optimization (II)	<b>Chair</b> Ben Niu
<b>Date/Time</b>	June 27, 2015(Saturday) 13:30-15:10	<b>Venue</b> Room 311AB

13:30 - 13:50	A Population-based Clustering Technique Using Particle Swarm Optimization and k-means <i>Ben Niu</i>	P56
13:50 - 14:10	A Novel Boundary Based Multiobjective Particle Swarm Optimization <i>Fushan Li, Shufang Xie and Qingjian Ni</i>	P56

14:10 - 14:30	A Novel Control Approach: Combination of Self-tuning PID and PSO-based ESO <i>Yanchun Chang, Feng Pan, Junyi Shu, Weixing Li and Qi Gao</i>	P56
14:30 - 14:50	A Novel Particle Swarm Optimization for Portfolio Optimization based on Random Population Topology Strategies <i>Xushan Yin, Qingjian Ni and Yuqing Zhai</i>	P56
14:50 - 15:10	Directional Analysis of Slope Stability using a Real Example <i>Zhe-Ping Shen and Walter Chen</i>	P57

<b>Session</b>	Machine Learning	<b>Chair</b> Wenjian Luo
<b>Date/Time</b>	June 27, 2015(Saturday) 13:30-15:10	<b>Venue</b> Room 302

13:30 - 13:50	Clustering Time-Evolving Data Using an Efficient Differential Evolution <i>Gang Chen and Wenjian Luo</i>	P57
13:50 - 14:10	Machine learning interpretation of conventional well logs in crystalline rocks <i>Ahmed Amara Konaté, Heping Pan, Muhammad Adnan Khalid, Gang Li, Chengxiang Deng, Jie Huai Yang and Sinan Fang</i>	P57
14:10 - 14:30	Instance Selection Approach for Self-Configuring Hybrid Fuzzy Evolutionary Algorithm for Imbalanced Datasets <i>Vladimir Stanovov, Eugene Semekin and Olga Semenkina</i>	P58
14:30 - 14:50	Multi-objective Differential Evolution Algorithm for Multi-label Feature Selection in Classification <i>Yong Zhang, Dun-Wei Gong and Miao Rong</i>	P58
14:50 - 15:10	River Network Optimization using Machine Learning <i>M Saravanan, Aarthi Sridhar, K. Nikhil Bharadwaj, S.Mohanavalli and V. Srividhya</i>	P58

<b>Session</b>	Blind Source Separation and Natural Language Processing	<b>Chair</b> Md. Nawab Yousuf Ali
<b>Date/Time</b>	June 27, 2015(Saturday) 13:30-14:50	<b>Venue</b> Room 303

- 13:30 - 13:50 Underdetermined blind speech signal separation method based on the improved shortest path method P58  
*Shuping Lv, Chuci Liu, Cheng Zhang and Jieao Wen*
- 13:50 - 14:10 Text Classification Based on Paragraph Distributed Representation and Extreme Learning Machine P59  
*Li Zeng and Zili Li*
- 14:10 - 14:30 Morphological Rules of Bangla Repetition Words for UNL Based Machine Translation P59  
*Md. Nawab Yousuf Ali, Golam Sorwar, Ashok Toru Roy, Md. Anik Islam and Md. Shamsujjoha*
- 14:30 - 14:50 An Enhanced Rule Based Arabic Morphological Analyzer Based on Proposed Assessment Criteria P59  
*Abdelmawgoud Maabid, Tarek Elghazaly and Mervat Gheith*

<b>Session</b>	Multi-Agent Systems and Swarm Robotics	<b>Chair</b> Hongwei Mo
<b>Date/Time</b>	June 27, 2015(Saturday) 15:30-17:30	<b>Venue</b> Room 311AB

- 15:30 - 15:50 A Fleet of Chemical Plume Tracers with the Distributed Architecture Built upon DaNI Robots P59  
*David Oswald, Henry Lin, Xiaoqian Mao, Wei Li, Linwei Niu and Xiaosu Chen*
- 15:50 - 16:10 Hierarchical Self-Organization for Task-Oriented Swarm Robotics P60  
*Yuquan Leng, Cen Yu, Wei Zhang, Yang Zhang, Xu He and Weijia Zhou*
- 16:10 - 16:30 Power-law Distribution of Long-term Experimental Data in Swarm Robotics P60  
*Farshad Arvin, Abdolrahman Attar, Ali Emre Turgut and Shigang Yue*



16:30 - 16:50	Effect of the Emergent Structures in the Improvement of the Performance of the Cognitive Agents <i>Abdelhak Chatty, Philippe Gaussier, Ilhem Kallel and Adel M.Alimi</i>	P60
16:50 - 17:10	Long Term Electricity Demand Forecasting with Multi-Agent-Based Model <i>Jian Zhang, Zhaoguang Hu, Yuhui Zhou and Wei Duan</i>	P60
17:10 - 17:30	Multi-Agent Organization for Hierarchy Dynamic Evolution <i>Lu Wang, Qingshan Li, Yishuai Lin and Hua Chu</i>	P60

<b>Session</b>	Segmentation and Detection System	<b>Chair</b> Komla Folly
<b>Date/Time</b>	June 27, 2015(Saturday) 15:30-17:30	<b>Venue</b> Room 302

15:30 - 15:50	Portrait Image Segmentation based on Improved Grabcut Algorithm <i>Li Shuai, Zheng Xiaohui, Chen Xianjun and Zhan Yongsong</i>	P61
15:50 - 16:10	A Multiple Moving Targets Edge Detection Algorithm Based on Sparse Matrix Block Operation <i>Kun Zhang and Cuirong Wang</i>	P61
16:10 - 16:30	Robust Corner Detection Based on Bilateral Filter in Direct Curvature Scale Space <i>Bin Liao, Jungang Xu, Huiying Sun and Hong Chen</i>	P61
16:30 - 16:50	An Infrared Thermal Detection System <i>Zahira Ousaadi and Nadia Saadia</i>	P61
16:50 - 17:10	Economic Load Dispatch of Power System Using Genetic Algorithm with Valve Point Effect <i>Olurotimi Awodiji and Komla Folly</i>	P61
17:10 - 17:30	FDM-MC:A Fault Diagnosis Model of the Minimum Diagnosis Cost in the System Area Network <i>Jie Huang and Lin Chen</i>	P62

Session	Other Applications	Chair Md. Shamsujjoha
Date/Time	June 27, 2015(Saturday) 15:30-17:30	Venue Room 303
15:30 - 15:50	An Efficient Design of a Reversible Fault Tolerant n-to-2n Sequence Counter Using Nano Meter MOS Transistors <i>Md. Shamsujjoha, Shirin Nahar Sathi, Golam Sorwar, Fahmida Hossain, Md. Nawab Yousuf Ali and Hafiz Md. Hasan Babu</i>	P62
15:50 - 16:10	Transfer of large volume data over Internet with parallel data links and SDN <i>Sergey Khoruzhnikov, Vladimir Grudinin, Andrey Shevel, Oleg Sadov and Arsen Kairkanov</i>	P62
16:10 - 16:30	Gauging the Politeness in Virtual Commercial Contexts Based on Patrons' Collective Perceptions <i>I-Ching Chen and Shueh-Cheng Hu</i>	P62
16:30 - 16:50	Research and Implementation of Parameters Optimization Simulation Environment for Hydrological Models <i>Jiuyuan Huo</i>	P63
16:50 - 17:10	Discovering Traffic Outlier Causal Relationship Based on Anomalous DAG <i>Lei Xing, Wenjun Wang, Guixiang Xue, Hao Yu, Xiaotong Chi and Weidi Dai</i>	P63
17:10 - 17:30	Pre-scaling Anisotropic Orthogonal Procrustes Analysis based on Gradient Descent over Matrix Manifold <i>Peng Zhang, Zhou Sun, Chunbo Fan and Yi Ding</i>	P63

# BRICS-CCI 2015 Oral Sessions

**June 26, 2015(Friday)**

<b>Session</b>	Neural Networks and Machine Learning	<b>Chair</b> Wenle Zhang
<b>Date/Time</b>	June 26, 2015(Friday) 13:30-15:10	<b>Venue</b> Room 311C

- |               |  |     |
|---------------|--|-----|
| 13:30 - 13:50 | The Effective Neural Network Implementation of The Secret Sharing Scheme With The Use of Matrix Projections on FPGA<br><i>Nikolay I. Chervyakov, Mikhail G. Babenko, Nikolay N. Kucherov and Anastasiia I. Garianina</i> | P63 |
| 13:50 - 14:10 | A ROP Optimization Approach Based on Improved BP Neural Network and PSO<br><i>Jinan Duan, Jinhai Zhao, Li Xiao, Chuanshu Yang and Changsheng Li</i>  | P63 |
| 14:10 - 14:30 | Structure Determination of A Generalized ADALINE Neural Network For Application in System Identification of Linear Systems<br><i>Wenle Zhang</i>   | P64 |
| 14:30 - 14:50 | Technical Indicators for Forex Forecasting: A Preliminary Study<br><i>Yoke Leng Yong, David Ngo and Yunli Lee</i>  | P64 |
| 14:50 - 15:10 | A New Disagreement Measure for Characterization of Classification Problems<br><i>Yulia Ledeneva, Rene Arnulfo Garcia Hernandez and Alexander Gelbukh</i>   | P64 |

<b>Session</b>	Fuzzy Systems and Evolutionary Computation	<b>Chair</b> Jining Jia
<b>Date/Time</b>	June 26, 2015(Friday) 15:50-17:10	<b>Venue</b> Room 311C

- |               |  |     |
|---------------|--|-----|
| 15:50 - 16:10 | Fuzzy Concepts in Formal Context<br><i>Luodan Meng and Keyun Qin</i> | P65 |
|---------------|--|-----|

- 16:10 - 16:30 A Self-configuring Metaheuristic for Control of Multi-Strategy P65  
Evolutionary Search  
*Evgenii Sopov*
- 16:30 - 16:50 Fuzzy Clustering-Based Quantitative Association Rules Mining in P65  
Multidimensional Data Set  
*Jining Jia and Yongzai Lu*
- 16:50 - 17:10 The Application of Fuzzy Pattern Fusion Based on Competitive P65  
Agglomeration in Coal-fired Boiler Operation Optimization  
*Jining Jia and Yongzai Lu*

# BRICS-CCI 2015 Oral Sessions

**June 27, 2015(Saturday)**

<b>Session</b>	Multimedia Information Processing	<b>Chair</b> Xiaobu Yuan
<b>Date/Time</b>	June 27, 2015(Saturday) 08:00-09:40	<b>Venue</b> Room 311C

08:00 - 08:20	An Intelligent Media Delivery Prototype System with Low Response Time <i>Hou Jinzhong, Luo Tiejian, Wang Zhu and Li Xiaoqi</i>	P65
08:20 - 08:40	An Approach to Integrating Emotion in Dialogue Management <i>Xiaobu Yuan</i>	P66
08:40 - 09:00	A Novel Wavelet Transform - Empirical Mode Decomposition based Sample Entropy and SVD Approach for Acoustic Signal Fault Diagnosis <i>Jiejunyi Liang and Zhixin Yang</i>	P66
09:00 - 09:20	Single Image Dehazing based on Improved Dark Channel Prior <i>Taimei Zhang and Youguang Chen</i>	P66
09:20 - 09:40	Rotation Invariant Texture Analysis based on Co-occurrence Matrix and Tsallis Distribution <i>Mateus Habermann, Felipe Campos and Elcio Shiguemori</i>	P66

<b>Session</b>	Other Applications	<b>Chair</b> Lin Chen
<b>Date/Time</b>	June 27, 2015(Saturday) 10:00-12:00	<b>Venue</b> Room 311C

10:00 - 10:20	An Access Point Trajectory Tracking Method by the Weight Update <i>Lin Chen, Guilin Cai and Yun Lan</i>	P67
10:20 - 10:40	Urban Principal Traffic Flow Analysis Based on Taxi Trajectories Mining <i>Bing Zhu</i>	P67
10:40 - 11:00	Simulation with input uncertainties using stochastic Petri nets <i>Sérgio Galdino and Francisco Monte</i>	P67

11:00 - 11:20	Strategies for Improving the Profitability of a Korean Unit Train Operator: A System Dynamics Approach <i>Jae Un Jung and Hyun Soo Kim</i>	P67
11:20 - 11:40	Mathematics wall: Enriching mathematics education through AI <i>Somnuk Phon-Amnuaisuk, Saiful Omar, Thien Wan Au and Rudy Ramlie</i>	P68
11:40 - 12:00	Short Term Load Forecasting Based on Hybrid ANN and PSO <i>Komla Folly and Ellen Shezi</i>	P68

## Abstracts

### Novel Swarm-based Optimization Algorithms and Applications

June 26, 2015(Friday) 13:30-15:30 Room 311AB

#### Effects of Topological Variations on Opinion Dynamics Optimizer

*Rishemjit Kaur, Ritesh Kumar, Amol Bhondekar, Reiji Suzuki and Takaya Arita*

**Abstract.** Continuous opinion dynamics optimizer (CODO) is an algorithm based on human collective opinion formation process for solving continuous optimization problems. In this paper, we have studied the impact of topology and introduction of leaders in the society on the optimization performance of CODO. We have introduced three new variants of CODO and studied the efficacy of algorithms on several benchmark functions. Experimentation demonstrates that scale free CODO performs significantly better than all algorithms. Also, the role played by individuals with different degrees during the optimization process is studied.

#### Utilizing Abstract Phase Spaces in Swarm Design and Validation

*Sanza Kazadi, Dexin Jin and Peiyao Li*

**Abstract.** We introduce a swarm design methodology. The methodology uses a seven step process involving a high-level phase space to map the desired goal to a set of behaviors, castes, deployment schedules, and provably optimized strategies. We illustrate the method on the stick-pulling task.

#### On the Application of Co-Operative Swarm Optimization in the Solution of Crystal Structures from X-Ray Diffraction Data

*Alexandr Zaloga, Sergey Burakov, Eugene Semenko, Igor Yakimov, Shakhnaz Akhmedova, Maria Semenkina and Evgenii Sopov*

**Abstract.** A co-operative method based on five biology-related optimization algorithms is used in solving crystal structures from X-ray diffraction data. This method does not need essential effort for its adjustment to the problem in hand but demonstrates high performance. This algorithm is compared with a sequential two-level genetic algorithm, a multi-population parallel genetic algorithm and a self-configuring genetic algorithm as well as with two problem specific approaches. It is demonstrated on a special crystal structure with 7 atoms and 21 degrees of freedom on which the co-operative swarm optimization algorithm exhibits comparative reliability but works faster than other used algorithms. Perspective directions for improving the approach are discussed.

#### A Physarum-Inspired Vacant-Particle Model with Shrinkage for Transport Network Design

*Yuxin Liu, Chao Gao, Mingxin Liang, Li Tao and Zili Zhang*

**Abstract.** Physarum can form a higher efficient and stronger robust network in the processing of foraging. The vacant-particle model with shrinkage (VP-S model), which captures the relationship between the movement of Physarum and the process of network formation, can construct a network with a good balance between exploration and exploitation. In this paper, the VP-S model is applied to design a transport network. We compare the performance of the network designed based on the VP-S model with the real-world transport network in terms of average path length, network efficiency and topology robustness. Experimental results show that the network designed based on the VP-S model has better performance than the real-world transport network in all measurements. Our study indicates that the Physarum-inspired model can provide useful suggestions to the real-world transport network design.

#### Bean Optimization Algorithm based on Negative Binomial Distribution

*Xiaoming Zhang, Qilian Xie, Tinghao Feng, Liangtu Song and Chaoyuan Cui*

**Abstract.** Many complex self-adaptive phenomena in the nature often give us inspirations. Some scholars are inspired from these natural bio-based phenomena and proposed many nature-inspired optimization algorithms. When solving some complex problems which cannot be solved by the traditional optimization algorithms easily, the nature-inspired optimization algorithms have their unique advantages. Inspired by the transmission mode of seeds, a novel evolutionary algorithm named Bean Optimization Algorithm (BOA) is proposed, which can be used to solve complex optimization problems by simulating the adaptive phenomenon of plants in the nature. BOA is the combination of nature evolutionary tactic and limited random search. It has stable robust behavior on explored tests

and stands out as a promising alternative to existing optimization methods for engineering designs or applications. Through research and study on the relevant research results of biostatistics, a novel distribution model of population evolution for BOA is built. This model is based on the negative binomial distribution. Then a kind of novel BOA algorithm is presented based on the distribution models. In order to verify the validity of the Bean Optimization Algorithm based on negative binomial distribution model (NBOA), function optimization experiments are carried out, which include four typical benchmark functions. The results of the experiments are made a comparative analysis with that of particle swarm optimization (PSO) and BOA. From the results analysis, we can see that the performance of NBOA is better than that of PSO and BOA. We also conduct a research on the characters of NBOA. A contrast analysis is carried out to verify the research conclusions about the relations between the algorithm parameters and its performance.

## Memetic Electromagnetism Algorithm for Finite Approximation with Rational Bezier Curves

*Andres Iglesias and Akemi Galvez-Tomida*

**Abstract.** The problem of obtaining a discrete curve approximation to data points appears recurrently in several real-world fields, such as CAD/CAM (construction of car bodies, ship hulls, airplane fuselage), computer graphics and animation, medicine, and many others. Although polynomial blending functions are usually applied to solve this problem, some shapes cannot yet be adequately approximated by using this scheme. In this paper we address this issue by applying rational blending functions, particularly the rational Bernstein polynomials. Our methodology is based on a memetic approach combining a powerful metaheuristic method for global optimization (called the electromagnetism algorithm) with a local search method. The performance of our scheme is illustrated through its application to four examples of 2D and 3D synthetic shapes with very satisfactory results in all cases.

## Particle Swarm Optimization (I)

June 26, 2015(Friday) 13:30-15:30 Room 302

## Improved DPSO Algorithm with Dynamically Changing Inertia Weight

*Jing Xin, Cuicui Yan and Xiangshuai Han*

**Abstract.** Population Diversity in Particle Swarm Optimization (DPSO) algorithm can effectively balance the "exploration" and "exploitation" ability of the PSO optimization algorithm and improve the optimization accuracy and stability of standard PSO algorithm. However, the accuracy of DPSO for solving the multi peak function will be obviously decreased. To solve the problem, we introduce the linearly decreasing inertia weight strategy and the adaptively changing inertia weight strategy to dynamically change inertia weight of the DPSO algorithms and propose two kinds of the improved DPSO algorithms: linearly decreasing inertia weight of DPSO (Linearly-Weight- Diversity-PSO, LWDPSO) and adaptively changing inertia weight of DPSO (Adaptively-Weight-Diversity-PSO, AWDPSO). Three representative benchmark test functions are used to test and compare proposed methods, which are LWDPSO and AWDPSO, with state-of-the-art approaches. Experimental results show that proposed methods can provide the higher optimization accuracy and much faster convergence speed.

## An Improved PSO-NM Algorithm for Structural Damage Detection

*Zepeng Chen and Ling Yu*

**Abstract.** A hybrid particle swarm optimization (PSO) combined with an improved Nelder-Mead algorithm (NMA) is proposed and introduced into the field of structural damage detection (SDD). The improved NMA chooses parts of subplanes of the n-simplex for optimization, a two-step method uses modal strain energy based index (MSEBI) to locate damage firstly, and both of them can reduce the computational cost of the basic PSO-Nelder-Mead (PSO-NM). An index of solution assurance criteria (SAC) is defined to describe the correlation between the identified and actual damage of structures. Numerical simulations on a 2-storey frame model is adopted to assess the performance of the proposed hybrid method. The illustrated results show that the improved PSO-NM can provide a reliable tool for accurate SDD in both single and multiple damage cases. Meanwhile, the improved PSO-NM algorithm has a good robustness to noises contaminated in mode shapes.



## A Fully-Connected Micro-Extended Analog Computers Array Optimized by Particle Swarm Optimizer

*Yilin Zhu, Feng Pan and Xuemei Ren*

**Abstract.** The micro-Extended Analog Computer(uEAC) is a novel hardware implementation of Rubel's EAC model. In this study, we first analyse the basic uEAC mathematical model and two uEAC extensions with minus-feedback and multiplication-feedback, respectively. Then a fully-connected uEACs array is proposed to enhance the computational capability, and to get an optimal uEACs array structure for specific problems, a comprehensive optimization strategy based on Particle Swarm Optimizer(PSO) is designed. We apply the proposed uEACs array to Iris pattern classification database, the simulation results verify that all the uEACs array parameters can be optimized simultaneously, and the classification accuracy is relatively high.

## An Improved Hybrid PSO Based on ARPSO and the Quasi-Newton Method

*Fei Han and Qing Liu*

**Abstract.** Although attractive and repulsive particle swarm optimization (ARPSO) algorithm keeps the diversity of the swarm adaptively to avoid premature convergence, its search performance is still restricted because of its stochastic search mechanism. In this study, a new hybrid algorithm combining ARPSO with the Quasi-Newton method is proposed to improve the search ability of the swarm. In the proposed algorithm, ARPSO keeps the reasonable search space by controlling the swarm not to lose its diversity, while the Quasi-Newton method is used to perform local search efficiently. The Quasi-Newton method makes the hybrid algorithm converge to optimal solution accurately. The experimental results verify that the proposed hybrid PSO has better convergence performance than some classic PSO algorithms.

## Swarm Diversity Analysis of Particle Swarm Optimization

*Yuanxia Shen, Linna Wei and Chuanhua Zeng*

**Abstract.** When particle swarm optimization (PSO) solves multimodal problems, the loss of swarm diversity may bring about the premature convergence. This paper analyses the reasons leading to the loss of swarm diversity by computing and analyzing of the probabilistic characteristics of the learning factors in PSO. It also provides the relationship between the loss of swarm diversity and the probabilistic distribution and dependence of learning parameters. Experimental results show that the swarm diversity analysis is reasonable and the proposed strategies for maintaining swarm diversity are effective. The conclusions of the swarm diversity of PSO can be used to design PSO algorithm and improve its effectiveness. It is also helpful for understanding the working mechanism of PSO theoretically.

## A Self-Learning Bare-Bones Particle Swarms Optimization Algorithm

*Jian Chen, Yuanxia Shen and Xiaoyan Wang*

**Abstract.** In order to solve the premature convergence of BBPSO, this paper proposes a self-learning BBPSO (SLBBPSO) to improve the exploration ability of BBPSO. First, the expectation of Gaussian distribution in the updating equation is controlled by an adaptive factor, which makes particles emphasize on the exploration in earlier stage and the convergence in later stage. Second, SLBBPSO adopts a novel mutation to the personal best position ( $P_{best}$ ) and the global best position ( $G_{best}$ ), which helps the algorithm jump out of the local optimum. Finally, when particles are in the stagnant status, the variance of Gaussian distribution is assigned an adaptive value. Simulations show that SLBBPSO has excellent optimization ability in the classical benchmark functions.

## Evolutionary and Genetic Algorithms

June 26, 2015(Friday) 13:30-15:30 Room 303

## Genetic Algorithm Based Robust Layout Design By Considering Various Demand Variations

*Srisatja Vitayasak and Pupong Pongcharoen*

**Abstract.** Placement of machines in a limited manufacturing area plays an important role to optimise manufacturing efficiency. Machine layout design (MLD) involves the arrangement of machines into shop floor area to optimise performance measures. The MLD problem is classified as Non-deterministic

Polynomial-time hard (NP-hard) problem, in which, the amount of computation required to solve the NP-hard problem increases exponentially with problem size. In the manufacturing context, customers' demands are periodically varied and therefore have an influence on changing production flow between machines for each time-period. With high variation between periods, the volume of material flow changes significantly. Machine layout can be robustly designed under demand uncertainty over time period so that no machine movement is needed. The objective of this paper was to investigate the effect of five degrees of demand variation on Genetic Algorithm based robust layout design that minimises total material handling distance. The experimental results showed that the degrees of demand variation had significantly affected average material handling distance with 95% confident interval except the largest-size problem. Considering standard deviation, increasing in variability of material handling distance had resulted from the higher degrees of variation especially in the small-size problems. This suggested that designing the robust machine layout should recognise the variation of customer demand.

### Design index-based hedging Bundled loss property and hybrid genetic algorithm

*Frank Xuyan Wang*

**Abstract.** For index-based hedging design, the scatter plot of the hedging contract losses versus the to-be-hedged losses is generally used to visualize and quantify basis risk. While studying this scatter plot, which does not cluster along the diagonal as desired, a *undundled loss* phenomenon is found. In a setting where both the hedging and the hedged contracts have 100,000 years of simulated losses, this shows that if we need to hedge one loss in a year for the hedged contract, we may need to pay for other losses in other years in the hedging contract, which are unnecessary and unwanted. The reason is that the index used in the hedging may have identical loss values in different years while the hedged contract may not. This finding is a guiding principle for forming the risk measures and solution frameworks. To solve the problem so formed, a hybrid multi-parent and orthogonal crossover genetic algorithm, GA-MPC-OX, is used and pertinent adjustments are studied. For a problem with hundreds of dimensions, using eleven parents seems best, while a problem with tens of dimensions would prefer nine parents. Depending on the dimensions, relevant best strategies of the orthogonal crossover are also suggested by experimental results. To combat the stagnation of the algorithm, the perturbation by Levy stable distribution is studied. This reveals possible effective parameters and forms. Numerical comparison with other algorithms is also conducted that confirms its competence for the hedging problem.

### Reference Point Based Constraint Handling Method for Evolutionary Algorithm

*Jinlong Li, Aili Shen and Guanzhou Lu*

**Abstract.** Many evolutionary algorithms have been proposed to deal with Constrained Optimization Problems (COPs). Penalty functions are widely used in the community of evolutionary optimization when coming to constraint handling. To avoid setting up penalty term, we introduce a new constraint handling method, in which a reference point selection mechanism and a population ranking process based on the distances to the selected reference point are proposed. The performance of our method is evaluated on 24 benchmark instances. Experimental results show that our method is competitive when compared with the state-of-the-art approaches and has improved the solution and the optima value of instance g22.

### New Interactive-Generative Design System: Hybrid of Shape Grammar and Evolutionary Design - an Application of Jewelry Design

*Somlak Kielarova, Prapasson Prapujphonphet and Erik L.J. Bohez*

**Abstract.** This paper proposes a new methodology for developing a computer-based design system. It places designers at the centre of design process to perform their tasks collaboratively with the design system. The proposed system is developed based on interactive shape grammar and evolutionary design algorithm, which is able to increase the creativity and productivity of design activity. Designers can utilize the generated designs to initialize their conceptual design process more easily and rapidly. The source of form diversity is derived from genetic operators. Subjective user preference is used for design evaluation. The system can be integrated with computer-controlled model-making machines to automatically build physical artifacts. As a result, designers can easily start their conceptual

design process through obtaining the desired designs and the resulting physical artifacts in line. The human-computer synergy is illustrated for the design of jewelry, but it is applicable to other industrial product design problems.

## A Robust Point Sets Matching Method

*Xiao Liu, Congying Han and Tiande Guo*

**Abstract.** Point sets matching method is very important in computer vision, feature extraction, fingerprint matching, motion estimation and so on. This paper proposes a robust point sets matching method. We present an iterative algorithm that is robust to noise case. Firstly, we calculate all transformations between two points. Then similarity matrix are computed to measure the possibility that two transformation are both true. We iteratively update the matching score matrix by using the similarity matrix. By using matching algorithm on graph, we obtain the matching result. Experimental results obtained by our approach show robustness to outlier and jitter.

## Memetic Self-Configuring Genetic Programming for Fuzzy Classifier Ensemble Design

*Maria Semenkina and Eugene Semenkina*

**Abstract.** For a fuzzy classifier automated design a hybrid self-configuring evolutionary algorithm is implemented. For the tuning of linguistic variables a self-configuring genetic algorithm is used. Ensemble members and the ensembling method are generated automatically with the self-configuring genetic programming algorithm that does not need preliminary adjusting. A hybridization of self-configuring genetic programming algorithms with a local search in the space of trees is fulfilled to improve their performance for fuzzy rule bases and ensembles automated design. The local search is implemented with two neighbourhood systems, three strategies of tree scanning (欽渴ull欽? 欽洪ncomplete欽?and 欽風uncated欽? and two ways of movement between adjacent trees (transition by the first improvement and the steepest descent). The performance of all developed memetic algorithms is estimated on a representative set of test problems of the function approximation as well as on real-world classification problems. The numerical experiment results show the competitiveness of the approach proposed.

## Differential Evolution and Brain Storm Optimization

June 26, 2015(Friday) 15:50-17:30 Room 311AB

## Differential Evolution with Novel Local Search Operation for Large Scale Optimization Problems

*Changshou Deng, Xiaogang Dong, Yanlin Yang, Yucheng Tan and Xujie Tan*

**Abstract.** Many real-world optimization problems have a large number of decision variables. In order to enhance the ability of DE for these problems, a novel local search operation was proposed. This operation combines orthogonal crossover and opposition-based learning strategy. During the evolution of DE, one individual was randomly chosen to undergo this operation. Thus it does not need much computing time, but can improve the search ability of DE. The performance of the proposed method is compared with two other competitive algorithms with benchmark problems. The compared results show the new method's effectiveness and efficiency.

## Research on Network Coding Optimization Using Differential Evolution Based on Simulated Annealing

*Liying Zhang, Xinjian Zhuo and Xinchao Zhao*

**Abstract.** Network coding can reduce the data transmission time and improves the throughput and transmission efficiency. However, network coding technique increases the complexity and overhead of network because of extra coding operation for information from different links. Therefore, network coding optimization problem becomes more and more important. In this paper, a differential evolution algorithm based on simulated annealing (SDE) is proposed to solve the network coding optimization problem. SDE introduces individual acceptance mechanism based on simulated annealing into canonical differential evolution algorithm. SDE finds out the optimal solution and keeps the population diversity during the process of evolution and avoids falling into local optimum as far as possible. Simulation experiments show that SDE can improve the local optimum of DE and finds network coding scheme with less coding edges.

## An Adaptive Brainstorming Optimization Algorithm for Multiobjective Optimization Problems

*Xiaoping Guo, Yali Wu, Lixia Xie, Shi Cheng and Jing Xin*

**Abstract.** Brain Storm Optimization (BSO) algorithm is a new swarm intelligence method that arising from the process of human beings problem solving. It has been well validated and applied in solving the single objective problem. In order to extend the wide applications of BSO algorithm, a modified Self-adaptive Multiobjective Brain Storm Optimiza- tion (SMOBSO) algorithm is proposed in this paper. Instead of the k- means clustering of the traditional algorithm, the algorithm adopts the simple clustering operation to increase the searching speed. At the same time, the open probability is introduced to avoid the algorithm trapping into local optimum, and an adaptive mutation method is used to give an uneven distribution on solutions. The proposed algorithm is tested on five benchmark functions; and the simulation results showed that the modified algorithm increase the diversity as well as the convergence successfully. The conclusions could be made that the SMOBSO algorithm is an effective BSO variant for multiobjective optimization problems.

## Enhanced Brain Storm Optimization Algorithm for Wireless Sensor Networks Deployment

*Junfeng Chen, Shi Cheng, Yang Chen, Yingjuan Xie and Yuhui Shi*

**Abstract.** Brain storm optimization is a young and promising swarm intelligence algorithm, which simulates the human brainstorming process. The convergent operation and divergent operation are two basic operators of the brain storm optimization. The  $k$  means clustering is utilized in the original brain storm optimization, which needs to define the  $k$  value before the search. To adaptively change the number of clusters during the search, a modified Affinity Propagation (AP) clustering method and an enhanced creating strategy are proposed on account of the structure information of single or multiple clusters. In addition, the modified brain storm optimization is applied to optimize the dynamic deployments of two different wireless sensor networks (WSN). Experimental results show that the proposed algorithm achieves satisfactory results and guarantees a high coverage rate.

## Random Grouping Brain Storm Optimization Algorithm with a New Dynamically Changing Step Size

*Zijian Cao, Yuhui Shi, Xiaofeng Rong, Baolong Liu, Zhiqiang Du and Bo Yang*

**Abstract.** Finding the global optima of a complex real-world problem has become much more challenging task for evolutionary computation and swarm intelligence. Brain storm optimization (BSO) is a swarm intelligence algorithm inspired by human being 欽機 behavior of brainstorming for solving global optimization problems. In this paper, we propose a Random Grouping BSO algorithm termed RGBSO by improving the creating operation of the original BSO. To reduce the load of parameter settings and balance exploration and exploitation at different searching generations, the proposed RGBSO adopts a new dynamic step-size parameter control strategy in the idea generation step. Moreover, to decrease the time complexity of the original BSO algorithm, the improved RGBSO replaces the clustering method with a random grouping strategy. To examine the effectiveness of the proposed algorithm, it is tested on 14 benchmark functions of CEC2005. Experimental results show that RGBSO is an effective method to optimize complex shifted and rotated functions, and performs significantly better than the original BSO algorithm.

## Biogeography Based Optimization and Other Biology Based Optimization

June 26, 2015(Friday) 15:50-17:50 Room 302

## Biogeography Optimization Algorithm for DC motor PID Control

*Hongwei Mo and Lifang Xu*

**Abstract.** Biogeography optimization algorithm (BBO) is a new optimization algorithm based on biogeography. Unique migration pattern of BBO makes good habitat feature information can be widely distributed among multiple habitats, showing a diversity of solutions. It is applied to the DC motor PID control problems and compared with genetic algorithms (GA), differential evolution (DE), particle swarm optimization (PSO). Experimental results show that BBO has the ability of searching optimal solution in a small local neighborhood space. The output of PID control system of DC motor optimized under BBO has no overshoot, no steady-state error and has the shortest system dynamic

response time.

## Biogeography Based Optimization for Tuning FLC Controller of PMSM

*Salam Waley, Chengxiong Mao and Nasseer K. Bachache*

**Abstract.** In this paper we embody the simulation of the Fuzzy Logic Controller. The controller governs the speed of a permanent magnet synchronous motor PMSM, which is employed in an elevator with different loads. This work aims to obtain the optimal parameters of FLC. Biogeography-Based-Optimization (BBO) is a new intelligent technique for optimization; it can be used to tune the parameters in different fields. The main contribution of this work is to show the ability of BBO to design the parameters of FLC by shaping the triangle memberships of the two inputs and the output. The results show the optimal controller (BBO-FLC) compared with the other controllers designed by genetic algorithm (GA). GA is a powerful method that has been found to solve the optimization problems. The implementation of the BBO algorithm has been done by M-file/MATLAB. The complete mathematical model of PMSM system has carried out using SIMULINK/MATLAB. The calculation of fitnesses function can be done by SIMULINK, and it linked with M-file/MATLAB to complete all steps of BBO. The results show the excellent performance of BBO-FLC compared with the GA-FLC and PI controller; also, the proposed method was very fast and needed only a few iterations.

## Enhancing the Performance of Biogeography-Based Optimization in Discrete Domain

*Qingzheng Xu, Na Wang, Jianhang Zhang and Xiang Gu*

**Abstract.** Oppositional Biogeography-Based Optimization using the Current Optimum (COOBBO) has been recently developed to solve combinatorial problems and outperforms other heuristic algorithms. The objective of this paper is mainly to ascertain various modified methods which can significantly enhance the performance and efficiency of COOBBO algorithm. The improvement measures include crossover approach, local optimization approach and greedy approach. Experiment results illustrate that, the combination model of 欽洪nverover crossover + 2-opt local optimization + all greedy欽?may be the best choice of all when considering both the overall algorithm performance and computation overhead.

## Motor Imagery Electroencephalograph Classification Based on Optimized Support Vector Machine By Magnetic Bacteria Optimization Algorithm

*Hongwei Mo and Yanyan Zhao*

**Abstract.** In this paper, an analysis method of electroencephalograph(EEG) based on the motor imagery is proposed. Butterworth band-pass filter and artifact removal technique are combined to extract the feature of frequency band of ERD/ERS. Common spatial pattern(CSP) is used to extract feature vector. Support Vector Machine(SVM) is used for signal classification of motor imagery EEG. To improve classification performance, the parameters of SVM are optimized by a new bio-inspired method called Magnetic Bacteria Optimization Algorithm (MBOA). Experimental results show that MBOA has good performance on the problem of SVM optimization and obtain good classification results on EEG signals.

## Co-Operation of Biology-Related Algorithms for Constrained Multiobjective Optimization

*Shakhnaz Akhmedova and Eugene Semenkin*

**Abstract.** A modification of the self-tuning meta-heuristic, called Co-Operation of Biology Related Algorithms for multiobjective optimization problems (COBRA-m) is introduced. Its basic idea consists of a cooperative work of five well-known bionic algorithms such as Particle Swarm Optimization, Wolf Pack Search, the Firefly Algorithm, the Cuckoo Search Algorithm and the Bat Algorithm with the use of Pareto optimality theory. The performance of the mentioned algorithms as well as COBRA-m on the set of benchmark functions is reported. It was established that the proposed approach COBRA-m has performed either comparably or better than its component bionic algorithms. Then the method COBRA-m is modified for solving constrained multiobjective optimization problems. The proposed algorithm is first validated against a subset of test functions, and then applied to known multiobjective design problems such as welded beam design and disc brake design. Simulation results suggest that the proposed algorithm works effectively.

## Adaptive Cuckoo Search Algorithm with Two-Parent Crossover for Solving Optimization Problems

*Ong Pauline, Zarita Zainuddin, Chee Kiong Sia and Badrul Aisham Md Zain*

**Abstract.** Cuckoo search algorithm (CSA) experiences an upsurge in popularity since its invention due to its effectiveness in solving optimization problems. In this paper, a new CSA was proposed, in which the two-parent crossover operator was integrated in order to alleviate the deficiency of lack of information exchange. In addition, an adaptive step size strategy was introduced. The resultant algorithm was validated on optimizing benchmarking functions and a real-world problem. The experimental analysis highlighted the faster convergence ability of the proposed algorithm to the optimal solution.

## Scheduling, Path Planning and Automation Control

June 26, 2015(Friday) 15:50-17:50 Room 303

## Service Based Packets Scheduling for QoS of Mixed Mobile Ttraffic in Wireless Network

*Zin Win Aye and Myat Thida Mon*

**Abstract.** Nowadays, a number of mobile users who use various mobile traffics are increasing rapidly in wireless environment. There are many researches concerning with traffic scheduling methods in order to have efficient Quality of Services (QoS) mechanisms for mobile users in Wireless Local Area Network (WLAN). The optimal traffic scheduling of mobile networks for various mixed traffic application is a challenging problem. Therefore, in this paper, a framework with a new scheduling method in WLAN, a two-step traffic scheduling method is proposed to satisfy efficient some QoS parameters: throughput, fairness and delay for mixed applications such as real time and non real time traffic in multicast and unicast applications. In the first step, service based scheduling adaptively balances between unicast and multicast applications and in the second step, compound scheduling combines Proportional Fair (PF) for non-real time traffic (NRT) and Delay Threshold (DT) Scheduling for real time traffic (RT)

## Network-centric approach to real-time train scheduling in large-scale railway systems

*Alexander Belousov, Peter Skobelev and Maksim Stepanov*

**Abstract.** Railway transport development leads to a rapid increase of passenger and cargo traffic. Train dispatcher often unable to cope with increasing traffic volume. So there is a great need in intelligent real-time systems of railway traffic control. We propose a network-centric approach to creating the system of real-time train scheduling on the basis of multi-agent technologies. The architecture of the network-centric multi-agent system consisting of base planning subsystems is described. Subsystem interaction protocols and protocols of agent interaction within each subsystem are presented. The example of schedule planning is presented. Productive characteristics of the developed system are presented. Good quality of train schedule planning and system performance is shown.

## An Event-driven based Multiple Scenario Approach for Dynamic and Uncertain UAV Mission Planning

*Ke Shang, Liangjun Ke, Zuren Feng and Stephen Karungaru*

**Abstract.** In this paper, a Dynamic and Uncertain Unmanned Aerial Vehicle Mission Planning(DUUMP) is considered. New targets reveal stochastically during the mission execution and the surveillance benefit of each target is a random variable. To deal with this problem, an Event-driven based Multiple Scenario Approach(MSA) is developed.Experiment studies show that the Event-driven based MSA can solve the DUUMP effectively and efficiently with quick system responsiveness and high quality solution, which shows its practical value for real world applications.

## An Improvement of Shipping Schedule Services: Focusing on Service Provider A in Korea

*Jae Un Jung, Hyun Soo Kim, Hyung Rim Choi and Chang Hyun Park*

**Abstract.** In the shipping industry, there are commercial information providers who collect and advertise shipping schedules by global region between merchant shippers to attract cargo and forwarders to find tonnage. The service providers perform most jobs for data (shipping schedules) gathering and processing by hand. In addition, they are also challenged to extend the range of schedule collection

and provision to both on- and off-line sites in terms of service quality and diversity. For these issues, we carried out a project to improve the existing business process of the service provider A (fictitious name) in Korea. Our research case introduces a significant commercial information service specialized in the shipping and logistics industries which is ordinary in the field but new in the realm of research. Also compared to the previous process, we found that our applications developed by the existing S/W technology improved the work efficiency by 25% and diversified revenue models with stability.

## **Robotic Rehabilitation of Lower Limbs "Reproduction of Human Physiological Movements"**

*Mohamed Amine Mamou and Nadia Saadia*

**Abstract.** Robotic devices are particularly useful applications in the field of functional rehabilitation following neurological injury such as the spinal cord and stroke which lead to motor impairments. Different rehabilitation devices members are under study to assist therapists in their work. In this paper we propose to reproduce human walking movements on a robotic rehabilitation chair of lower limbs, produced in the laboratory (LRPE). To do, we apply real walking signals on developed control law for this purpose. This law using kinematic model based on neural networks Feed forward neural network (FFNN). Reproduction actual walking movement made from OpenSim database, is open-source software allows users to That Develop, analyze, and visualize models of the musculoskeletal system, to generate dynamic simulations of movement, and compare with data base's movement. Proposed control law provides a high performance and fast convergence with Extremely Low error, and offers optimal reproduction of movement during human walking, and a secure rehabilitation.

## **Achievment of a myoelectric clamp provided by an optical shifting control for upper limb amputations**

*Ibrahim Sofiane Benchabane and Nadia Saadia*

**Abstract.** The prehension is a complex biomechanical process; it involves nearly 200 muscles and a large number of joint and bones. Replicate this process is a complex and challenging technology. Nevertheless, it is possible to target apart of this process in order to develop systems to provide a degree of autonomy to people with handicap linked to an amputation of the hand, and the muscles of the forearm are still functional. This paper is about the design of a prototype myoelectric clamp, which can grasp and hold a wide range of usual objects. So the system is activated by EMG stimulations and relays on force and slip feedback to achieve the grasping task. In this work we show the feasibility of a low cost and efficient clamp that can maintain objects by avoiding accidental falls or damages caused by unregulated force applied over the grasped item.

## **Ant Colony Optimization and Artificial Bee Colony Algorithms**

June 27, 2015(Saturday) 08:00-09:40 Room 311AB

## **Multi-Colony Ant Algorithm Using a Sociometry-Based Network and Its Application**

*Sheng Liu and Xiaoming You*

**Abstract.** In this paper, the social fabric approach is weaved into multi-behavior based multi-colony ant colony system(MBMC-ACS) to construct pheromone diffusion model. According to the propagation characteristics of knowledge in the social fabric, the Cobb-Dauglas production function is introduced to describe the increase of pheromone caused by pheromone diffusion. The pheromone diffused inter-colonies based on sociometry-based networks can simulate the knowledge evolution mechanism in organizational learning network, which allows the algorithm to avoid premature convergence and stagnation problems. The experimental results for TSP show the validity of this algorithm.

## **A Hybrid Multi-Cell Tracking Approach with Level Set Evolution and Ant Colony Optimization**

*Dongmei Jiang, Benlian Xu and Long Ge*

**Abstract.** In this paper, we propose a hybrid multi-cell tracking approach to accurately and jointly estimate the state and its contour of each cell. Our approach consists of level set evolution and ant colony optimization, representing, respectively, the deterministic and stochastic methods for cell tracking. Firstly, birth ants are directly distributed into the regions depicted by raw curves achieved by the traditional level set evolution. Then, the ants move towards potential regions based on the pheromone deposited by ants and the gradient information of current image. Finally, the resulting

pheromone field is embedded in the variational level set to drive the evolution of cell curve to yield an accurate one and correspond cell position estimate. The experiment results show that our method could automatically track multi-cell and achieve an accurate contour estimation of each cell.

### **Ant algorithm modification for multi-version software building**

*Margarita V. Karaseva, Igor V. Kovalev, Pavel V. Zelenkov and Dmitry I. Kovalev*

**Abstract.** The multi-version software and problem of its building as an optimization problem are considered. The ant algorithm as a way to solve the problem of multi-version software building is presented. The results of the standard and modified ant algorithms are given and compared.

### **An Artificial Bee Colony Algorithm with History-Driven Scout Bees Phase**

*Xin Zhang and Zhou Wu*

**Abstract.** The scout bees phase of artificial bee colony (ABC) algorithm emulates a random restart and cannot make sure the quality of the solution generated. Thus, we propose to use the entire search history to improve the quality of regenerated solutions, called history-driven scout bee ABC (HdABC). The proposed algorithm has been tested on a set of 28 test functions. Experimental results show that ABC cannot significantly outperforms HdABC on all functions; while HdABC significantly outperforms ABC in most test cases. Moreover, when the number of restarts increases, the performance of HdABC improves.

### **Multiobjective RFID Network Planning by Artificial Bee Colony Algorithm with Genetic Operators**

*Milan Tuba, Nebojsa Bacanin and Marko Beko*

**Abstract.** This paper introduces genetically inspired artificial bee colony algorithm adapted for solving multiobjective radio frequency identification (RFID) network planning problem, which is a well-known hard optimization problem. Artificial bee colony swarm intelligence metaheuristic was successfully applied to a wide range of similar problems. In our proposed implementation, we incorporated genetic operators into the basic artificial bee colony algorithm to enhance the intensification process in the late iterations. Such improved version was previously tested and proved to be better than the basic variant of the artificial bee colony algorithm. In the practical experiments, we tested our proposed approach on six benchmark instances used in the literature, with clustered and random tag sets. In comparative analysis with other state-of-the-art approaches our proposed algorithm exhibited superior performance and potential for further improvements.

### **Multi-objective Optimization**

June 27, 2015(Saturday) 08:00-09:40 Room 302

### **Cooperative Multi-Objective Genetic Algorithm with Parallel Implementation**

*Christina Brester and Eugene Semenkin*

**Abstract.** In this paper we introduce the multi-agent heuristic procedure to solve multi-objective optimization problems. To diminish the drawbacks of the evolutionary search, an island model is used to involve various genetic algorithms which are based on different concepts (NSGA-II, SPEA2, and PICEA-g). The main benefit of our proposal is that it does not require additional experiments to expose the most appropriate algorithm for the problem considered. For most of the test problems the effectiveness of the developed algorithmic scheme is comparable with (or even better than) the performance of its component which provides the best results separately. Owing to the parallel work of island model components we have managed to decrease computational time significantly (approximately by a factor of 2.7).

### **The Initialization of Evolutionary Multiobjective Optimization Algorithms**

*Mohammad Hamdan and Osamah Qudah*

**Abstract.** Evolutionary algorithms are the most widely used meta-heuristics for solving multi objective optimization problems, and since all of these algorithms are population based, such as NSGAII, there are a set of factors that affect the final outcomes of these algorithms such as selection criteria, crossover, mutation and fitness evaluation. Unfortunately, little research sheds light at how to generate the initial population. The common method is to generate the initial population randomly.



In this work, a set of initialization methods were examined such as, Latin hypercube sampling (LHS), Quasi-Random sampling and stratified sampling. Nonetheless. We also propose a modified version of Latin Hypercube sampling method called (Quasi\_LHS) that uses Quasi random numbers as a backbone in its body. Furthermore, we propose a modified version of Stratified sampling method that uses Quasi-Random numbers to represent the intervals. For our research, a set of well known multi objective optimization problems were used in order to evaluate our initial population strategies using NSGAI algorithm. The results show that the proposed initialization methods (Quasi\_LHS) and Quasi-based Stratified improved to some extent the quality of final results of the experiments.

## A New Multi-swarm Multi-objective Particle Swarm Optimization Based Power and Supply Voltage Unbalance Optimization of Three-Phase Submerged Arc Furnace

*Yanxia Sun and Zenghui Wang*

**Abstract.** To improve the production ability of a three-phase submerged arc furnace (SAF), it is necessary to maximize the power input; and it needs to minimize the supply voltage unbalances to reduce the side effect to the power grids. In this paper, maximizing the power input and minimizing the supply voltage unbalances based on a proposed multi-swarm multi-objective particle swarm optimization algorithm are the focus. It is necessary to have objective functions when an optimization algorithm is applied. However, it is difficult to get the mathematic model of a three-phase submerged arc furnace according to its mechanisms because the system is complex and there are many disturbances. The neural networks (NN) have been applied since its ability can be used as an arbitrary function approximation mechanism based on the observed data. Based on the Pareto front, a multi-swarm multi-objective particle swarm optimization is described, which can be used to optimize the NN model of the three-phase SAF. The simulation results showed the efficiency of the proposed method.

## Cultural Particle Swarm Optimization algorithms for Interval Multi-objective Problems

*Yinan Guo*

**Abstract.** Traditional dominant comparison never fits for the interval multi-objective optimization problems. The particle swarm optimization for solving these problems cannot adaptively adjust the key parameters and easily falls into premature. So a novel multi-objective cultural particle optimization algorithm is proposed. Its strength are: (i)The possibility degree is introduced to construct a novel dominant relationship so as to rationally measure the uncertainty of particles; (ii)The grid 鈥櫢verage degree is defined based on topological knowledge and used to measure the uniformity of non-dominant solutions instead of the crowding distance. (iii)The key flight parameters are adaptively adjusted and the local or global best are selected in terms of the knowledge. Simulation results indicate that the proposed algorithms coverage to the Pareto front uniformly and the uncertainty of non-dominant solutions is less. Furthermore, the knowledge plays a rational impact on balancing exploration and exploitation.

## Multi-Objective Particle Swarm Optimization Algorithm Based on Comprehensive Optimization Strategies

*Huan Luo, Minyou Chen and Tingjing Ke*

**Abstract.** Multi-objective particle swarm optimization algorithm based on comprehensive optimization strategies (MOPSO-COS) is proposed in this paper to deal with the problems of premature convergence and poor diversity. The velocity updating mode is modified by incorporating the information of the global second best particle to promote information flowing among particles. In order to improve the convergence accuracy and diversity, some effective strategies, such as chaotic mutation 鈥櫢ternal archiving with dynamic grid method 鈥櫢lection strategy based on a temporary population and so on, are introduced into MOPSO-COS. Theoretical analysis of MOPSO-COS is carried out including convergence and time complexity. Performance tests are conducted with ZDT test functions. Simulation results show that MOPSO-COS can improve the convergence accuracy and diversity of Pareto optimal solutions simultaneously, and particles can escape from local optimum point effectively.

## Swarm Interaction Behavior

June 27, 2015(Saturday) 08:00-09:40 Room 303

## Established Routine of Swarm Monitoring Systems Functioning

*Alexey Ivutin, Eugene Larkin and Vladislav Kotov*

**Abstract.** Questions of simulation of established conditions of swarm automatic monitoring systems, which include number of assemblies and blocks been operated according to a local cyclic program are considered. Sample cyclic program, which provides switches on/o board equipment for monitoring is formed. Simplification of sample cyclic program is obtained. With use of semi-Markov matrix, which circumscribe sample cyclic program, densities of times of active and passive states of equipment is obtained. Formulae for evaluation of probabilities of active and passive states of pre-determined quantity from common number of swarm monitoring units are received.

## A Gamified Online Forum Inspiring Group Intelligence Distillation for Policy Making

*Shueh-Cheng Hu and I-Ching Chen*

**Abstract.** Public affair administrators around the globe show increasing interests in seeking the public opinions and insights into critical issues through Internet. The public collective intelligence could be distilled via the deliberative processes in various online forums. To successfully serve as a source of group intelligence, an online forum needs active participation and contributions from its visitors. However, just like common information systems, most online forum systems were designed without consideration of motivating users. This article presents the gamification process of an open-sourced online forum system. The gamified JForum embeds several game mechanisms motivating visitors to participate and contribute more actively, which facilitates forming a resource of productive consensus.

## The Web as an infrastructure for knowledge management: Lessons learnt

*Benel Aurélien and Zaher Hedi*

**Abstract.** Research works, whether they aim at building a ‘Semantic Web’ or a ‘Social Semantic Web’, consider as a prerequisite that the ideal architecture for managing knowledge would be the Web. Indeed, one can only admire how the CERN internal hypertext scaled out to a world wide level never seen before for this kind of applications. However, current knowledge structures and related algorithms cause new kind of architectural issues. About these issues faced by both communities, we would like to bring out three lessons learnt, three steps in setting up a scalable infrastructure. We will focus on a typical case of knowledge management but with a higher than usual volume of data. Starting with SPARQL, a commonly used Semantic Web technology, we will see the benefits of the REST architecture and the MapReduce design pattern.

## Ontology Based Fusion Engine for Interaction with an Intelligent Assistance Robot

*Nadia Djaid, Nadia Saadia and Amar Ramdane-Cherif*

**Abstract.** Every human continuously interacts with his environment and its entities. To interact with the environment, humans use language and physical expression to understand the events and be understood. These communication methods are natural features acquired at birth, with a few exceptions. Unfortunately, some people face interaction difficulties because of disabilities or illnesses. To remedy to these problems, researchers have been designing assistance robots which can imitate human interaction using multiple modalities. To do so, the robot must be able to interact with humans using natural methods used by people such as speech, gestures, eye movements, etc. The robot must be able to understand and execute the commands issued by the user through the different modalities. To do so, we propose a smart system that will use a knowledge base to achieve the three tasks of “sensing-understanding-acting” in an ambient environment.

## Using extensible metadata definitions to create a vendor-independent SIEM system

*Kai-Oliver Detken, Dirk Scheuermann and Bastian Hellmann*

**Abstract.** The threat of cyber-attacks grows up, as one can see by several negative security news and reports [8]. Today there are many security components (e.g. anti-virus-system, firewall, and IDS) available to protect enterprise networks; unfortunately, they work independently from each other. But many attacks can only be recognized if logs and events of different security components are combined and correlated with each other. Existing specifications of the Trusted Computing Group (TCG) already provide a standardized protocol for metadata collection and exchange named IF-MAP.

This protocol is very useful for network security applications and for the correlation of different metadata in one common database. That circumstance again is very suitable for Security Information and Event Management (SIEM) systems. In this paper we present a SIEM architecture developed during a research project called SIMU. Additionally, we introduce a new kind of metadata that can be helpful for domains that are not covered by the existing TCG specifications. Therefore, a metadata model with unique data types has been designed for higher flexibility. For the realization two different extensions are discussed in this paper: a new feature model or an additional service identifier.

## Fuzzy Methods and Data Mining

June 27, 2015(Saturday) 10:00-11:40 Room 311AB

### Interval-valued intuitionistic fuzzy prioritized ordered weighted averaging operator and its application in threat assessment

*Wu Hua and Su Xiugin*

**Abstract.** The threat assessment of aerial targets is the basic method for improving the ability of air defense system to deal with multiple objects in complex environment. Considering both the uncertain and imprecise information and prioritization relationship of attributes, we propose an interval-valued intuitionistic fuzzy prioritized ordered weighted averaging (IVIF-POWA) operator-based threat assessment model. The contribution of this paper is twofold: 1) An IVIFPOWA operator is proposed, which expresses the imprecise and uncertain information with more suitable interval-valued intuitionistic fuzzy sets. 2) This work proposes a simple yet effective threat assessment model based on IVIF-POWA operator. Its efficiency and effectiveness are validated by comparing it with some popular operators in a numerical example.

### Application of Fuzzy Set FScom in the Evaluation of Water Quality Level

*Yongxi Lv and Zhenghua Pan*

**Abstract.** Water quality level evaluation problem is an important content in water resource quality research. Based on fuzzy set FSCOM theory with three kinds of negation, water quality level fuzzy comprehensive evaluation is studied. Taking Beijing Beiyunhe Jiuxian bridge section water quality fuzzy comprehensive evaluation as example, according to the given instance and the Surface Water Environmental Quality Standard, analyses three kinds of different negative sets and their relationships and determines all membership functions in water quality evaluation. Finally gives the water quality evaluation and puts forward general steps and method of fuzzy set FSCOM comprehensive evaluation application in practical problems. The paper shows that it is effective to use fuzzy set FSCOM theory to solve practical comprehensive evaluation problems.

### A Novel Algorithm for Finding Overlapping Communities in Networks Based on Label Propagation

*Bingyu Liu, Cuirong Wang, Cong Wang and Yiran Wang*

**Abstract.** Community discovery in Social network is one of the hot spots. In real networks, some nodes belong to several different communities. Overlapping community discovery has been more and more popular. Label propagation algorithm has been proven to be an effective method for complex network community discovery, this algorithm has the characteristics of simple and fast. For the poor stability problem of Label propagation algorithm, this article proposes a stable overlapping communities discovery method based on the label propagation algorithm: SALPA. At the beginning of the method, introduce the influence of nodes, which is used to measure the influence of nodes, select the most influential nodes as the core nodes, in the propagating stage, when there are more than one label with the same degree of membership, select the connectivity larger than the threshold. The method has been carried out in three real networks and two big synthetic networks. Compared with the classical algorithm, experiment results demonstrate the effectiveness, stability and computational speed of the method have been improved.

### Optimizing Production and Distribution Problem for Agricultural Products with Type-2 Fuzzy Variables

*Xuejie Bai and Lijun Xu*

**Abstract.** This paper focuses on generating the optimal solutions of the production and distribution for agricultural products under fuzzy environment, where the crop yield is characterized by type-2

fuzzy variable with known type-2 possibility distributions. In order to formulate the problem within the framework of the credibility optimization, we employ the possibility value-at-risk (VaR) reduction method to the type-2 fuzzy yield, and then reformulate the multi-fold fuzzy production and distribution problem as the chance constrained programming model. On the basis of the critical value formula for possibility value-at-risk reduced fuzzy variable, original fuzzy production and distribution model is converted into its equivalent parametric mixed integer programming form, which can be solved by general-purpose software. Numerical experiment is implemented to highlight the application of the fuzzy production and distribution model as well as the effectiveness of the solution method.

## Improving OCR-Degraded Arabic Text Retrieval through an Enhanced Orthographic Query Expansion Model

*Tarek Elghazaly*

**Abstract.** This paper introduces an Enhanced Orthographic Query Expansion Model for improving Text Retrieval of Arabic Text resulting from the Optical Character Recognition (OCR) process. The proposed model starts with checking the query word through two word based a word based error synthesizing sub-models then in a character N-Gram simulation sub-model. The model is flexible either to get the corrected word once it finds it from the early stages (in case of highest performance is needed) or to check all possibilities from all sub-models (in case of highest expansion is needed). The 1st word based sub-model that has manual word alignment (degraded & original pairs) alone has high precision and recall but with some limitations that may affect recall (in case of connected multi-words as OCR output). The second words based sub-model provides high precession (less than the 1st one) but also with higher recall. The last sub-model which is a character N-gram one, provides low precision but high recall. The output of the proposed orthographic query expansion model is the original query extended with the expected degraded words taken from the OCR errors simulation model. The proposed model gave a higher precision (97.5%) than all previous ones with keeping the highest previous recall numbers.

## Information Security and Structural Damage Detection

June 27, 2015(Saturday) 10:00-12:00 Room 302

## Negative Survey-based Privacy Protection of Cloud Data

*Ran Liu and Shanyu Tang*

**Abstract.** Cloud platforms usually need to collect privacy data from a large number of users. Although the existing methods of privacy protection for cloud data can protect users' privacy data to a certain degree, there is plenty of room for improvement in efficiency and degree of privacy protection. Negative survey spired by Artificial Immune System (AIS) collects each user's unreal privacy information to protect users' privacy. This study focuses on the accuracy of the reconstructed positive survey from negative survey, which is one of the key problems in the Negative Survey-based privacy protection of cloud data.

## Bird Mating Optimizer in Structural Damage Identification

*H. Li, J.K. Liu and Z.R. Lu*

**Abstract.** In this paper, a structural damage detection approach based on bird mating optimizer (BMO) is proposed. Local damage is represented by a perturbation in the elemental stiffness parameter of the structural finite element model. The damage parameters are determined by minimizing the error derived from modal data, and natural frequency and modal assurance criteria (MAC) of mode shape is employed to formulate the objective function. The BMO algorithm is adopted to optimize the objective and optimum set of stiffness reduction parameters are predicted. The results show that the BMO can identify the perturbation of the stiffness parameters effectively even under measurement noise.

## Structural Damage Detection and Moving Force Identification Based on Firefly Algorithm

*Chudong Pan and Ling Yu*

**Abstract.** Based on firefly algorithm (FA), a structural damage detection (SDD) and moving force identification (MFI) method is proposed in this paper. The basic principle of FA is introduced, some key parameters, such as light intensity, attractiveness, and rules of attraction are defined. The moving forces-induced responses of damage structures are defined as a function of both damage factors

and moving forces. By minimizing the difference between the real and calculated responses with given damage factors and moving forces, the identified problem is transformed into a constrained optimization problem and then it can be hopefully solved by the FA. In order to assess the accuracy and the feasibility of the proposed method, a three-span continuous beam subjected to moving forces is taken as an example for numerical simulations. The illustrated results show that the method can simultaneously identify the structural damages and moving forces with a good accuracy and better robustness to noise.

## Mutual Authentication Protocol based on Smart Card and Combined Secret Key Encryption

*Guifen Zhao*

**Abstract.** A mutual authentication scheme and secret key exchange based on combined secret key method is proposed. Use hardware including smart card, encryption cards or encryption machine to perform encryption and decryption. Hash function, symmetric algorithm and combined secret key method are applied at client and server. The authentication security is guaranteed due to the properties of hash function, combined secret key method and one-time mutual authentication token generation method. Mutual authentication based on smart card and one-time combined secret key can avoid guessing attack and replay attack. The mutual authentication method can be applied to cloud based application systems to realize mutual authentication and enhance security.

## Security Challenges & Mitigations for a NFC- enabled Attendance System

*Manmeet Mahinderjit Singh, Nurul Hashimah Ahamed Hassain Malim, Mohd Heikal Husin, Boon Chew Cheah, Wei Sheng Tan, Chiang Wei Kam and Chiang Wei Kam*

**Abstract.** Most of the universities or colleges, the lecturer has to take the attendance of the students manually by circulating a paper for them to register their names or calling the names. To date, there are various types of attendance systems that are applying different technologies such as biometrics, tokens and sensors such as RFID. The latest is by applying near-field communication (NFC), a sensor within the smartphone has been used as a mean for recording attendances. The aim of this paper is to list out the possible security attacks against NFC (Near Field Communication) enabled systems by focusing on a student-based attendance system. A brief overview over NFC technology and discussion on various security attacks against NFC in different media is presented. Overall, an attendance system is compromised mainly by tag swapping, tag cloning and manipulation of data occurring on the NFC device and operational server.

## Framework to Secure Data Access in Cloud Environment

*Rachna Jain, Dr. Sushila Madan and Dr. Bindu Garg*

**Abstract.** Cloud computing is the key powerhouse in numerous organizations due to shifting of their data to the cloud environment. According to IDC survey, Security was ranked and observed first utmost issue of cloud computing. As a result, protection required to secure data is directly proportional to the value of the data. The major handicap of first level of security where cryptography can help cloud computing i.e secure storage is that we cannot outsource the processing of the data without decryption. In this paper, a novel framework to secure data access in cloud environment is implemented. Here security is addressed for securing transaction in such a way that transaction should be encrypted and decrypted by data owners only. Server performs equality, addition and subtraction on encrypted data without decryption. Moreover, access should be provided to the users as per their access rights. Security is enhanced by utilizing the concept of multicloud.

## Combinatorial Optimization and Constrained Optimization

June 27, 2015(Saturday) 10:00-12:00 Room 303

## Using Discrete PSO Algorithm to Evolve Multi-Player Games on Spatial Structure Environment

*Xiaoyang Wang, Lei Zhang, Xiaorong Du and Yunlin Sun*

**Abstract.** Mechanisms promoting the evolution of cooperation in two-player, two-strategy evolutionary games have been discussed in great detail over the past decades. Understanding the effects of repeated interactions in multi-player social dilemma game is a formidable challenge. This paper presents and investigates the application of co-evolutionary training techniques based on discrete particle swarm

optimization (PSO) to evolve cooperation for the n-player iterated prisoner dilemma (IPD) game and n-player iterated snowdrift game (ISD) in spatial environment. Our simulation experiments reveal that, the length of history record, the cost-to-benefit ratio and group size are important factors in determining the cooperation ratio in repeated interactions.

## A Hybrid Algorithm based on Tabu Search and Chemical Reaction Optimization for 0-1 Knapsack Problem

*Chaokun Yan, Siqi Gao, Zhigang Hu and Huimin Luo*

**Abstract.** The 0-1 knapsack problem (01KP) is a well-known NP-complete problem in combinatorial optimization problems. There exist different approaches employed to solve the problem such as brute force, dynamic programming, branch and bound, etc. In this paper, a hybrid algorithm CROTS (Chemical Reaction Optimization combined with Tabu Search) is proposed to address the issue. One of the four elementary reaction of CRO is performed first, and after that tabu search is employed to search for the neighbors of the optimum solution in the population. The experimental results show that CROTS owns better performance in comparison with GA and the original CRO.

## A new Physarum-based hybrid optimization algorithm for solving 0/1 Knapsack problem

*Shi Chen and Chao Gao*

**Abstract.** As a typical NP-complete problem, 0/1 Knapsack Problem (KP), has been widely applied in many domains for solving practical problems. Although ant colony optimization (ACO) algorithms can obtain approximate solutions to 0/1 KP, there exist some shortcomings such as the low convergence rate, premature convergence and weak robustness. In order to get rid of the above-mentioned shortcomings, this paper proposes a new kind of Physarum-based hybrid optimization algorithm, denoted as PM-ACO, based on the critical paths reserved by Physarum-inspired mathematical (PM) model. By releasing additional pheromone to items that are on the important pipelines of PM model, PM-ACO algorithms can enhance item pheromone matrix and realize a positive feedback process of updating item pheromone. The experimental results in two different datasets show that PM-ACO algorithms have a stronger robustness and a higher convergence rate compared with traditional ACO algorithms.

## A Discrete Ecogeography-Based Optimization Algorithm for University Course Timetabling

*Bei Zhang, Min-Xia Zhang and Neng Qian*

**Abstract.** Ecogeography-based optimization (EBO) is an enhanced version of biogeography-based optimization (BBO) algorithm borrowing ideas from island biogeographic evolution for global optimization. The paper proposes a discrete EBO algorithm for university course timetabling problem (UCTP). We first present the mathematical model of UCTP, and then design specified global and local migration operators for the problem. Computational experiment shows that the proposed algorithm exhibits a promising performance on a set of test problem instances.

## A Dynamic Penalty Function for Constrained Optimization

*Chengyong Si, Jianqiang Shen, Xuan Zou, Yashuai Duo, Lei Wang and Qidi Wu*

**Abstract.** Penalty function methods have been widely used for handling constraints, but it still a challenge about how to set the penalty parameter effectively though many related methods have been proposed. In this paper, the penalty parameter is firstly analyzed systematically by introducing four rules. Based on this analysis, a new Dynamic Penalty Function (DyPF) is proposed by adjusting penalty parameter in three different situations during the evolution (i.e., the infeasible situation, the semi-feasible situation, and the feasible situation). The experiments are designed to verify the effectiveness of our newly proposed DyPF. The results show that DyPF presents a better overall performance than other five dynamic or adaptive state-of-the-art methods in the community of constrained evolutionary optimization.

## A New Physarum Network Based Genetic Algorithm for Bandwidth-delay Constrained Least-cost Multicast Routing

*Mingxin Liang, Chao Gao, Yuxin Liu, Li Tao and Zili Zhang*

**Abstract.** Bandwidth-delay constrained least-cost multicast routing is a typical NP-complete problem. Although some swarm-based intelligent algorithms (e.g., genetic algorithm (GA)) are proposed to solve this problem, the shortcomings of local search affect the computational effectiveness. Taking the ability of building a robust network of network model (PN), a new hybrid algorithm, network-based genetic

algorithm (named as PNGA), is proposed in this paper. In PNGA, an updating strategy based on PN is used for improving the crossover operator of traditional GA, in which the same parts of parent chromosomes are reserved and the new offspring by the Physarum network model is generated. In order to estimate the effectiveness of our proposed optimized strategy, some typical genetic algorithms and the proposed PNGA are compared for solving multicast routing. The experiments show that PNGA has more efficient than original GA. More importantly, the PNGA is more robustness that is very important for solving the multicast routing problem.

## Particle Swarm Optimization (II)

June 27, 2015(Saturday) 13:30-15:10 Room 311AB

### A Population-based Clustering Technique Using Particle Swarm Optimization and k-means

*Ben Niu*

**Abstract.** Population-based clustering techniques, which attempt to integrate particle swarm optimizers (PSOs) with K-Means, have been proposed in the literature. However, the performance of these hybrid clustering methods have not been extensively analyzed and compared with other competitive clustering algorithms. In the paper, five existing PSOs, which have shown promising performance for continuous function optimization, are hybridized separately with K-Means, leading to five PSO-KM-based clustering methods. Numeric experiments on nine real-life datasets show that, in the context of numeric data clustering, there exist no significant performance differences among these PSOs, though they often show significantly different search abilities in the context of numeric function optimization. These PSO-KM-based clustering techniques obtain better and more stable solutions than some individual-based counterparts, but at the cost of higher time complexity. To alleviate the above issue, some potential improvements are empirically discussed.

### A Novel Boundary Based Multiobjective Particle Swarm Optimization

*Fushan Li, Shufang Xie and Qingjian Ni*

**Abstract.** A novel boundary based multiobjective particle swarm optimization is presented in this paper. The proposed multiobjective optimization algorithm searches the border of the objective space unlike other current proposals to look for the Pareto solution set to solve such problems. In addition, we apply the proposed method to other particle swarm optimization variants, which indicates the strategy is highly applicatory. The proposed approach is validated using several classic test functions, and the experiment results show efficiency in the convergence performance and the distribution of the Pareto optimal solutions.

### A Novel Control Approach: Combination of Self-tuning PID and PSO-based ESO

*Yanchun Chang, Feng Pan, Junyi Shu, Weixing Li and Qi Gao*

**Abstract.** This study focuses on the steady speed control of brushless DC motor with load torque disturbance from the cam and spring mechanism. Due to the nonlinearity and complexity of the load torque, the control system proposed in this paper is divided into the inner-loop compensator, which is to feed-forward compensate the disturbance, and the outer-loop controller. The inner-loop compensator uses a nonlinear extended state observer (ESO) to compensate the actual system as a nominal model, and the outer-loop pole assignment self-tuning PID controller is used to stabilize the nonlinear nominal model. Since a set of suitable nonlinear ESO parameters are difficult to get normally, particle swarm optimization (PSO) is employed to optimize the observer. The simulation results with high precision verify the effectiveness of the proposed control system.

### A Novel Particle Swarm Optimization for Portfolio Optimization based on Random Population Topology Strategies

*Xushan Yin, Qingjian Ni and Yuqing Zhai*

**Abstract.** The problem of portfolio selection in the field of financial engineering has received more attention in recent years and many portfolio selection models has been proposed in succession. To solve a generalized Markowitz mean-variance portfolio selection model, this paper proposed four improved particle swarm optimization algorithms (RTWPSO-AD, RTWPSO-D, DRWTPSO-AD, DRWTPSO-D) based on the strategies of Random Population Topology. We abstract the topology of particle swarm

optimization (PSO) into an undirected connected graph which can be generated randomly according to a predetermined degree. The topology changes during the evolution when Dynamic Population Topology strategy is adopted. By setting the degree, we can control the communication mechanisms in the evolutionary period, enhancing the solving performance of PSO algorithms. The generalized portfolio selection model is classified as a quadratic mixed-integer programming model for which no computational efficient algorithms have been proposed. We employ the proposed four algorithms to solve the model and compare the performance of them with the classic PSO variant. The computational results demonstrate that the population topologies of PSO have direct impacts on the information sharing among particles, thus improve the performance of PSO obviously. In particular, the proposed DRTWPSO-D shows an extraordinary performance in most set of test data, providing an effective solution for the portfolio optimization problem.

## Directional Analysis of Slope Stability using a Real Example

*Zhe-Ping Shen and Walter Chen*

**Abstract.** PSO is a powerful but rarely used tool in slope stability analysis until very recently. Despite its simplicity, PSO can be integrated with existing program effortlessly and improves the performance and accuracy of the resulting analysis. In this study, a real landslide site was selected as an example. The problem slope was represented as a digital elevation model using laser scanning, and the model was cut in parallel lines 45 degrees to the North by a custom program. The resulting 19 profiles were inputted to the STABL program for stability analysis using a PSO scripting program. The results showed that the computed factor of safety varied from profile to profile, but PSO improved the results consistently for all profiles. A comparison was made with the previous study in which the slope was cut in the South-North direction. Both studies showed that the directional analysis of slope stability is an important topic for future research.

## Machine Learning

June 27, 2015(Saturday) 13:30-15:10 Room 302

## Clustering Time-Evolving Data Using an Efficient Differential Evolution

*Gang Chen and Wenjian Luo*

**Abstract.** The previous evolutionary clustering methods for time-evolving data usually adopt the temporal smoothness framework, which controls the balance between temporal noise and true concept drift of clusters. They, however, have two major drawbacks: (1) assuming a fixed number of clusters over time; (2) the penalty term may reduce the accuracy of the clustering. In this paper, a Multimodal Evolutionary Clustering (MEC) based on Differential Evolution (DE) is presented to cope with these problems. With an existing chromosome representation of the ACDE, the MEC automatically determines the cluster number at each time step. Moreover, instead of adopting the temporal smoothness framework, we try to deal with the problem from view of the multimodal optimization. That is, the species-based DE (SDE) for multimodal optimization is adopted in the MEC. Thus the MEC is a hybrid of the ACDE and the SDE, and designed for time-evolving data clustering. Experimental evaluation demonstrates the MEC achieves good results.

## Machine learning interpretation of conventional well logs in crystalline rocks

*Ahmed Amara Konaté, Heping Pan, Muhammad Adnan Khalid, Gang Li, Chengxiang Deng, Jie Huai Yang and Sinan Fang*

**Abstract.** The identification of lithologies is a crucial task in continental scientific drilling research. In fact, in complex geological situations such as crystalline rocks, more complex nonlinear functional behaviors exist in well log interpretation/classification purposes; thus posing challenges in accurate identification of lithology using geophysical log data in the context of crystalline rocks. The aim of this work is to explore the capability of k-nearest neighbors classifier and to demonstrate its performance in comparison with other classifiers in the context of crystalline rocks. The results show that best classifier was neural network followed by support vector machine and k-nearest neighbors. These intelligence machine learning methods appear to be promising in recognizing lithology and can be a very useful tool to facilitate the task of geophysicists allowing them to quickly get the nature of all the geological units during exploration phase.



## Instance Selection Approach for Self-Configuring Hybrid Fuzzy Evolutionary Algorithm for Imbalanced Datasets

*Vladimir Stanovov, Eugene Semenkin and Olga Semenkina*

**Abstract.** We propose an instance selection technique with subsample balancing for an evolutionary classification algorithm. The technique creates subsamples of the training sample in a way to guide the learning process towards problematic areas of the search space. For unbalanced datasets, the number of instances of different classes is artificially balanced to get better classification results. We apply this technique to a self-configured hybrid evolutionary fuzzy classification algorithm. We performed tests on 4 datasets to evaluate the accuracy as well as other classification quality measures for different parameters of the active instance selection procedure. The results shown by our algorithm are comparable or even better than other algorithms on the same classification problems.

## Multi-objective Differential Evolution Algorithm for Multi-label Feature Selection in Classification

*Yong Zhang, Dun-Wei Gong and Miao Rong*

**Abstract.** Multi-label feature selection is a multi-objective optimization problem in nature, which has two conflicting objectives, i.e., the classification performance and the number of features. However, most of existing approaches treat the task as a single objective problem. In order to meet different requirements of decision-makers in real-world applications, this paper presents an effective multi-objective differential evolution for multi-label feature selection. The proposed algorithm applies the ideas of efficient non-dominated sort, the crowding distance and the Pareto dominance relationship to differential evolution to find a Pareto solution set. The proposed algorithm was applied to several multi-label classification problems, and experimental results show it can obtain better performance than two conventional methods.

## River Network Optimization using Machine Learning

*M Saravanan, Aarthi Sridhar, K. Nikhil Bharadwaj, S.Mohanavalli and V. Srividhya*

**Abstract.** Lack of potable water is a perennial problem in the day-to-day life of mankind around the world. The demand-supply variations have been on an increasing trend for so many years in different developing countries. To address this prevailing issue is the need of the hour for the society and the relevant government agencies. In this paper, as an explorative approach, we address this predominant issue in the form of an alternate solution which re-routes the course of the natural water sources, like rivers, through those areas, where the water supply is minimal in comparison with the demand, in a cost-effective and highly beneficial manner. Our analysis and discussions are more prone to Indian scenario where India is one of the worst affected fast developing countries for the water crisis. This involves the consideration of the physical, ecological and social characteristics of the lands on the route that fall under the course of the river and also the regions dependent on its flow. In order to understand and predict the optimized new flow paths to divert the water sources, we have employed Machine Learning algorithms like Multiple Regression and Multi-Swarm Optimization techniques. For selecting the most needed re-route, we have also considered the areas that are prone to droughts, and unite the re-routed water with the original course of the river, finally, draining into the sea, for the sustainable development. The proposed methodology is experimented by analyzing the flow areas (river basins) of river Mahanadi in India, one of the considerably important projects cited many times without any real implementation. The results are validated with the help of a study conducted earlier by the National Water Development Agency (NWDA), Government of India, in 2012.

## Blind Source Separation and Natural Language Processing

June 27, 2015(Saturday) 13:30-14:50 Room 303

## Underdetermined blind speech signal separation method based on the improved shortest path method

*Shuping Lv, Chuci Liu, Cheng Zhang and Jieao Wen*

**Abstract.** Underdetermined blind speech signal separation is a widespread case of blind source separation. Underdetermined blind signal separation is the case that the number of sensors is less than the number of sources. A two-step method is used to solve the underdetermined blind speech signal separation, but it has some shortcomings that are weak noise defense, bad signal sparsity, et al. This paper focuses on the study of sparse signals. Then we proposed a smoothing method to improve the shortest path method. The improved shortest path method can remove the false peaks potential

function and enhance the accuracy of the mixing matrix estimation. At last, we gained the accurate estimation of the sources by the improved shortest path method.

## Text Classification Based on Paragraph Distributed Representation and Extreme Learning Machine

*Li Zeng and Zili Li*

**Abstract.** This paper implements a semi-supervised text classification method by integrating Paragraph Distributed Representation (PDR) with Extreme Learning Machine (ELM) training algorithm. The proposed Paragraph Distributed Representation-Extreme Learning Machine hybrid classification approach is named as PDR-ELM. Paragraph Distributed Representation is a recently proposed feature selection method based on neural network language model, while Extreme Learning Machine is well known as its high performance in classification. We propose PDR-ELM hybrid classification approach with the objective to minimize the training time and raise the classification accuracy meanwhile. We conduct experiments on a real research paper datasets crawled from Web of Science (WOS). Results show that the proposed PDR-ELM can achieve an accuracy of 81.01% and a training time of 5.1324 seconds on the datasets.

## Morphological Rules of Bangla Repetition Words for UNL Based Machine Translation

*Md. Nawab Yousuf Ali, Golam Sorwar, Ashok Toru Roy, Md. Anik Islam and Md. Shamsujjoha*

**Abstract.** This paper develops new morphological rules suitable for Bangla repetition words to be incorporated into an interlingua representation called Universal Networking Language (UNL). The proposed rules are to be used to combine verb roots and their inflexions to produce words which are then combined with other similar types of words to generate repetition words. This paper outlines the format of morphological rules for different types of repetition words that come from verb roots based on the framework of UNL provided by the UNL centre of the Universal Networking Digital Language (UNDL) Foundation.

## An Enhanced Rule Based Arabic Morphological Analyzer Based on Proposed Assessment Criteria

*Abdelmawgoud Maabid, Tarek Elghazaly and Mervat Gheith*

**Abstract.** Morphological analysis is a vital part of natural language processing applications, there are no definitive standards for evaluating and benchmarking Arabic morphological systems. This paper proposes assessment criteria for evaluating Arabic morphological systems by scrutinizing the input, output and architectural design to enables researchers to evaluate and fairly compare Arabic morphology systems. By scoring some state of the art Arabic morphological analyzers based on the proposed criteria; the accuracy scores showed that the best algorithm failed to achieve a reliable rate. Hence, this paper introduced an enhanced algorithm for resolving the inflected Arabic word, identifies its root, finds its pattern and POS tagging that will reduce the search time considerably and to free up the deficiencies identified by this assessment criteria. The proposed model uses semantic rules of the Arabic language on top of a hybrid sub-model based on two existing algorithms (Al-Khalil and An Improved Arabic morphology analyzer IAMA rules).

## Multi-Agent Systems and Swarm Robotics

June 27, 2015(Saturday) 15:30-17:30 Room 311AB

## A Fleet of Chemical Plume Tracers with the Distributed Architecture Built upon DaNI Robots

*David Oswald, Henry Lin, Xiaolian Mao, Wei Li, Linwei Niu and Xiaosu Chen*

**Abstract.** This paper presents a fleet of chemical plume tracers with the distributed architecture developed at California State University, Bakersfield (CSUB). Each chemical plume tracer built upon a DaNI robot integrates multiple sensors, including a wind sensor, chemical sensors, a wireless router, and a network camera. The DaNI robot is an advanced platform embedded with a single control board (sbRIO-9632), consisting of a 400 MHz industrial processor, a 2M gate Xilinx Spartan FPGA, and a variety of I/Os. In order demonstrate the feasibility of the designed chemical plume tracers, the experiments on moth-inspired plume tracing are conducted under the turbulent airflow environment. This fleet of chemical plume tracers is a powerful tool for investigating algorithms for the tracking and

mapping of chemical plumes via swarm intelligence.

## Hierarchical Self-Organization for Task-Oriented Swarm Robotics

*Yuquan Leng, Cen Yu, Wei Zhang, Yang Zhang, Xu He and Weijia Zhou*

**Abstract.** The problems of diversity of tasks and non-structural environment have been put in front of robotic development, on the other hand, we urgently hope they consume low cost and have high reliability, so the method of multi-cooperation is wildly used. Then we would get the swarm robotics social system with the individual growing. In this paper, we proposed hierarchical organizational model to definite social order during task decomposition; then, we design the method of behavior generation based on proposition/transition Petri networks, which would assist the system to construct combined behavior using the sample individual behavior to solve a variety of tasks.

## Power-law Distribution of Long-term Experimental Data in Swarm Robotics

*Farshad Arvin, Abdolrahman Attar, Ali Emre Turgut and Shigang Yue*

**Abstract.** Bio-inspired aggregation is one of the most fundamental behaviours that has been studied in swarm robotic for more than two decades. Biology revealed that the environmental characteristics are very important factors in aggregation of social insects and other animals. In this paper, we study the effects of different environmental factors such as size and texture of aggregation cues using real robots. In addition, we propose a mathematical model to predict the behaviour of the aggregation during an experiment.

## Effect of the Emergent Structures in the Improvement of the Performance of the Cognitive Agents

*Abdelhak Chatty, Philippe Gaussier, Ilhem Kallel and Adel M. Alimi*

**Abstract.** This paper tries to analyze the positive effect of the emergent structures in the objects' aggregation task which is performed by a cognitive multi-agent system (CMAS). Indeed, these structures allow improving overall performance of the system by the optimization of the planning time and satisfaction level of the cognitive agents. A series of simulations enables us to discuss our system.

## Long Term Electricity Demand Forecasting with Multi-Agent-Based Model

*Jian Zhang, Zhaoguang Hu, Yuhui Zhou and Wei Duan*

**Abstract.** Electricity demand and economic growth are closely correlated. Electricity is an important means of production and subsistence and plays an important role in the national economy system. Accurate electricity demand forecasting results could provide the basis for the power grid planning and construction and therefore has important social and economic benefits. In this paper, a long-term electricity demand forecasting model that contains six kinds of Agent is proposed based on multi-agent technology. The model is validated by the electricity consumption data of 2011-2014. Then the industry-wide electricity demand forecasting results from 2015 to 2025 are obtained. Through case study, the results change affected by economic policy is studied. The results show that the electricity demand will increase under loose monetary policy.

## Multi-Agent Organization for Hierarchy Dynamic Evolution

*Lu Wang, Qingshan Li, Yishuai Lin and Hua Chu*

**Abstract.** With increasingly dynamic operating environment and user requirements, software adopts a unified strategy to achieve the different levels of evolution, a fact which reduces the flexibility and efficiency. So, in this paper, a method with agent technology is proposed to support the hierarchy evolution of both the function and service levels. Precisely, a multi-agent organization is proposed to separate the calculation and collaboration logics of software which are corresponding to the different levels of evolution. To achieve the function-level evolution, an adaptive agent model with knowledge reasoning provides the software an ability to dynamically modify the calculation logics. With the adjustment of the collaboration logics, the multi-agent organization can make it convenient for the software to deal with the service-level evolution. Finally, a case study of air defense simulation system and some test metrics indicates that the proposed multi-agent organization can effectively support the hierarchy evolution.

## Segmentation and Detection System

June 27, 2015(Saturday) 15:30-17:30 Room 302

### Portrait Image Segmentation based on Improved Grabcut Algorithm

*Li Shuai, Zheng Xiaohui, Chen Xianjun and Zhan Yongsong*

**Abstract.** Traditional computer portrait caricature system mainly take the method that exaggerate and deform real images directly, that lead the facial image background also been deformed when exaggerate facial image. If in pretreatment stage, we segmented the characters and background of the input image, and then do the subsequent processing, the problem may be solved. But for better portrait caricature effects, we need an excellent segmentation algorithm. So, we propose an improved Grabcut image segmentation algorithm and use it to extract the prospect character image for exaggeration and deformation. In practical application, we separate deform and exaggerate the foreground characters image with TPS method, then fuse it with the original or new background picture, get the final image. Application proves, the method solves the background deformation problem well, and improves the quality and rate of image segmen-tation, caricature synthesis effect reality and natural.

### A Multiple Moving Targets Edge Detection Algorithm Based on Sparse Matrix Block Operation

*Kun Zhang and Cuirong Wang*

**Abstract.** A multiple moving targets edge detection algorithm based on sparse matrix block operation is proposed in this paper. The algorithm uses background subtraction algorithm to obtain the foreground image contains multiple moving targets. After getting the ideal foreground image, active contour model is used for edge detection. Here, we improved the active contour model by introducing the sparse matrix block operation. Through the quad-tree decomposition of the foreground image, the proposed algorithm uses the sparse matrix block operation to calculate the corresponding regional seed position of multiple moving targets. Finally, it executes the active contour model in parallel to complete the edge detection. Experimental results show that edge detection of the algorithm similar to the human visual judgment, and the introduction of sparse matrix block operation to calculate regional seed for active contour model reduces the time, improves the convergence of the profile curve and edge detection accuracy.

### Robust Corner Detection Based on Bilateral Filter in Direct Curvature Scale Space

*Bin Liao, Jungang Xu, Huiying Sun and Hong Chen*

**Abstract.** In traditional Curvature Scale Space (CSS) corner detection algorithms, Gaussian filter is used to remove noise existing in canny edge detection results. Unfortunately, Gaussian filter will reduce the precision of corner detection. In this paper, a new method of robust corner detection based on bilateral filter in direct curvature scale space is proposed. In this method, bilateral filter is adopted to reduce image noise and keep image details. Instead of curvature scale space, direct curvature scale space is applied to reduce the computational complexity of the algorithm. Meanwhile, multi-scale curvature product with certain threshold is used to strengthen the corner detection. Experimental results show that our proposed method can improve the performance of corner detection in both accuracy and efficiency, and which can also gain more stable corners at the same time.

### An Infrared Thermal Detection System

*Zahira Ousaadi and Nadia Saadia*

**Abstract.** Anybody whose temperature differs from absolute zero (0K) emits and absorbs electromagnetic radiation coming from, one hand, the physico-chemical nature and on the other hand, the action of intrinsic mechanisms of vibrational energies of the molecules. In this paper, we propose a robot that exploits this characteristic to detect and to track a thermal source in its environment. The system consists of a mobile platform having mounted a thermal detection device using thermopiles that is controlled by a computer via a graphical user interface.

### Economic Load Dispatch of Power System Using Genetic Algorithm with Valve Point Effect

*Olurotimi Awodiji and Komla Folly*

**Abstract.** This paper presents the solution of economic load dispatch problem using quadratic cost

functions with valve point effect by means of Genetic Algorithm (GA). GA technique is particularly useful for optimization problems with non-convex, discontinuous and non-differentiable solution. In this paper, three methods of GA are used: namely the Micro Genetic Algorithm (MGA), Classical Genetic Algorithm (GA) and Multipopulation (MPGA). The three methods were tested and validated on the Nigerian Grid system made of four thermal power plants and three hydro power stations. The simulation results with and without losses considered are compared. It is shown that the MPGA gives better results in term of minimized production cost than both MGA and GA. However, the MGA is faster in finding a quick feasible solution as a result of its small population size. The results demonstrate the applicability of the three techniques for solving economic load dispatch problem in power system operations.

## FDM-MC:A Fault Diagnosis Model of the Minimum Diagnosis Cost in the System Area Network

*Jie Huang and Lin Chen*

**Abstract.** There are many problems in the fault diagnosis of system area network which facing enormous challenges. These problems are mainly due to the fact that network fault is often conditionally dependent on many factors, which are usually dependent on complex association relationship. Non-linear mapping may exists between symptoms and causes of network fault, and the same network fault often has different symptoms at different time, while one symptom can be the result of several network faults. Because there is a lot of correlative information in the network, how to construct the model of fault diagnosis is a challenging topic. In this paper, we firstly provided the description of the diagnosis costs, and then we proposed the model based on the condition of dependent diagnosis actions and the model based on the condition of dependent faults. Through a series of theoretical support, we have seen that our diagnostic model produces expected cost of diagnosis that are close to the optimal result and the lower than the simple planners for a domain of troubleshooting.

## Other Applications

June 27, 2015(Saturday) 15:30-17:30 Room 303

## An Efficient Design of a Reversible Fault Tolerant $n$ -to- $2^n$ Sequence Counter Using Nano Meter MOS Transistors

*Md. Shamsujjoha, Shirin Nahar Sathi, Golam Sorwar, Fahmida Hossain, Md. Nawab Yousuf Ali and Hafiz Md. Hasan Babu*

**Abstract.** This paper proposes an efficient reversible synthesis for the  $n$ -to- $2^n$  sequence counter, where  $n \geq 2$  and  $n \in N$ . The proposed circuits are designed using only reversible fault tolerant gates. Thus, the entire circuit inherently becomes fault tolerant. In addition, an algorithm to design the  $n$ -to- $2^n$  reversible fault tolerant sequence counter based on fault tolerant J-K flip-flops has been presented. The functional verification of the proposed circuit is completed through the simulation results. Moreover, the comparative results show that the proposed method performs much better and is much more scalable than the existing approaches.

## Transfer of large volume data over Internet with parallel data links and SDN

*Sergey Khoruzhnikov, Vladimir Grudin, Andrey Shevel, Oleg Sadov and Arsen Kairkanov*

**Abstract.** The transfer of large volume data over computer network is important and unavoidable operation in the past, now and in any feasible future. There are a number of methods/tools to transfer the data over computer global network (Internet). In this paper the transfer of data over Internet is discussed. Several free of charge utilities to transfer the data are analyzed here. The most important architecture features are emphasized and suggested idea to add SDN Openflow protocol technique for fine tuning the data transfer over several parallel data links.

## Gauging the Politeness in Virtual Commercial Contexts Based on Patrons' Collective Perceptions

*I-Ching Chen and Shueh-Cheng Hu*

**Abstract.** Politeness constantly plays a significant role in commercial contexts. In contrast to its importance, politeness-related issues in fast-growing virtual commercial contexts received rare attention. This article reports a work developing an instrument for gauging degree of politeness in online storefronts. The instrument's reliability and validity were confirmed through analyzing

empirical data, which distilled collective perceptions of 282 sampled patrons. A second-order confirmatory factor analysis revealed that online consumers' tendency in paying relative more attention to their rights being respected and gaining useful information while they are assessing online retailers' politeness. Using the instrument, people can measure the degree of politeness in online retailers.

## Research and Implementation of Parameters Optimization Simulation Environment for Hydrological Models

*Jiuyuan Huo*

**Abstract.** For the Hydrological models' complexity, more model parameters, and most parameters are unpredictable as well as errors of observation data in river basin will lead to lots of errors and uncertainties in Hydrological model parameter calibration, Hydrological modeling and forecasting. Therefore, we developed a unified integrated simulation environment of parameter estimation for Hydrological models in Heihe river basin to support the implementation the processes of simulation operation, parameter optimization, parameter evaluation, analysis and simulation results visualization of Hydrological models in Heihe river basin. By using long-term monitoring measured data, we validated the hydrologic models' parameters estimation integrated simulation environment in Xinanjiang Hydrological model. The results showed that research in this paper would reduce complex workload of data collection and program development, and significantly improve accuracy and efficiency for model simulation.

## Discovering Traffic Outlier Causal Relationship Based on Anomalous DAG

*Lei Xing, Wenjun Wang, Guixiang Xue, Hao Yu, Xiaotong Chi and Weidi Dai*

**Abstract.** The increasing availability of large-scale trajectory data provides us more opportunities for traffic pattern analysis. Nowadays, outlier causal relationship among traffic anomalies has attracted a lot of attention in the research of traffic anomaly detection. In this paper, we propose a model of constructing anomalous directed acyclic graph (DAG) which is based on spatial-temporal density to detect outlier causal relationship in traffic. To the best of our knowledge, the graph theory of DAG is firstly used in this area and the algorithm with strong pruning is proved to have lower time complexity. Moreover, the multi-causes analysis helps reflect the causal relationship more precisely. The advantages and strengths are validated by experiments using large-scale taxi GPS data in the urban area.

## Pre-scaling Anisotropic Orthogonal Procrustes Analysis based on Gradient Descent over Matrix Manifold

*Peng Zhang, Zhou Sun, Chunbo Fan and Yi Ding*

**Abstract.** This paper proposes a pre-scaling extension of the Orthogonal Procrustes Analysis (OPA), where anisotropic scaling occurs before rigid motion. We propose an efficient algorithm to solve this problem based on gradient descent method over matrix manifold. We show that the proposed algorithm is monotonically convergent and provide an acceleration procedure. Its performance is validated through a series of numerical simulations.

## Neural Networks and Machine Learning

June 26, 2015(Friday) 13:30-15:10 Room 311C

## The Effective Neural Network Implementation of The Secret Sharing Scheme With The Use of Matrix Projections on FPGA

*Nikolay I. Chervyakov, Mikhail G. Babenko, Nikolay N. Kuchеров and Anastasiia I. Garianina*

**Abstract.** In this paper neural network implementation of the modified secret sharing scheme based on a matrix projection is offered. Transition from a finite simple Galois field to a complex field allows to reduce by 16 times memory size, necessary for storage of the precalculated constants. Implementation of the modified secret sharing scheme based on a matrix projection with use of the neural network of a finite ring for execution of modular arithmetical addition and multiplication operations in a finite field allows to save on average 30% of the device area and increases the speed of scheme's work on average by 17%.

## A ROP Optimization Approach Based on Improved BP Neural Network and PSO

*Jinan Duan, Jinhai Zhao, Li Xiao, Chuanshu Yang and Changsheng Li*

**Abstract.** Effective optimization of ROP (Rate of Penetration) is a crucial part of successful well drilling process. Due to the penetration complexities and the formation heterogeneity, traditional way such as ROP equations and regression analysis are confined by their limitations in the drilling prediction. Intelligent methods like ANN and PSO become powerful tools to obtain the optimized parameters with the accumulation of the geology data and drilling logs. This paper presents a ROP optimization approach based on improved BP neural network and PSO algorithm. The main idea is, first, to build prediction model of the target well from well logs using BP neural network, and then obtain the optimized well operating parameters by applying PSO algorithm. During the modelling process, the traditional BP training algorithm is improved by introducing momentum factor. Penalty function is also introduced for the constraints fulfillment. We collect and analyze the well log of the No.104 well in Yuanba, China. The experiment results show that the proposed approach is able to effectively utilize the engineering data to provide effective ROP prediction and optimize well drilling parameters.

## Structure Determination of A Generalized ADALINE Neural Network For Application in System Identification of Linear Systems

*Wenle Zhang*

**Abstract.** This paper presents a structure determination method of a GADALINE based neural network used for linear system identification and parameter estimation. In GADALINE linear system identification, the past input data are used as its input and the past output data are also used as its input in the form of feedback because in such a linear system, the current system output is dependent on past outputs and on both the current and past inputs. The structure determination is then to determine how many past inputs should be included as its input and how many past output should be fed-back as its input also. The measured data set can then be used to train the GADALINE and during training, the performance error can be used to determine the network structure in our method just as the Final Prediction Error used in Akaike 欽樾 criterion. One advantage of the method is its simplicity. Simulation results show that the proposed method provides satisfactory performance.

## Technical Indicators for Forex Forecasting: A Preliminary Study

*Yoke Leng Yong, David Ngo and Yunli Lee*

**Abstract.** Traders and economists are often at odds with regards to the approach taken towards Forex financial market forecasting. Methods originating from the Artificial Intelligence (AI) area of study have been used extensively throughout the years in predicting the trading pattern as it is deemed to be robust enough to handle the uncertainty associated with Forex trading time series data. Herein this paper, the effects of different input types, in particular: close price as well as various technical indicators derived from the close price are investigated to determine its effects on the Forex trend predicted by an intelligent machine learning module.

## A New Disagreement Measure for Characterization of Classification Problems

*Yulia Ledeneva, Rene Arnulfo Garcia Hernandez and Alexander Gelbukh*

**Abstract.** Robert P.W. Duin, Elzbieta Pekalska and David M.J. Tax proposed the characterization of classification problems by classifier disagreement. They showed that it is possible to use a standard set of supervised classification problems for constructing a rule that allows deciding about the similarity of new problems to the existing ones. The classifier disagreement could be used to group classification problems in a way which could help to select the appropriate tools for solving new problems. Duin et al proposed a dissimilarity measure between two problems taking into account only the full disagreement matrices. They used a measure of the disagreement based on the coincidence of the classifier output however the correctness was not considered. In this work, we propose a new measure of disagreement which takes into account the correctness of classification result. To calculate the disagreement each object is analyzed to verify if it was classified correctly or incorrectly by the classifiers. We use this new disagreement measure to calculate the dissimilarity between two problems. Some experiments were done and the results were compared against Duin 欽樾 et al results.

## Fuzzy Systems and Evolutionary Computation

June 26, 2015(Friday) 15:50-17:10 Room 311C

## Fuzzy Concepts in Formal Context

*Luodan Meng and Keyun Qin*

**Abstract.** Formal concept analysis (FCA) provides a theoretical framework for learning hierarchies of knowledge clusters. This paper is devoted to the study of the fuzzy concept in FCA. We propose a fuzzy relation on the universe to characterize the similarity of the objects. Based on fuzzy rough set model, we present a kind of approximation operators to characterize the fuzzy concept and its accuracy degree in FCA. The basic properties of these operators are investigated.

## A Self-configuring Metaheuristic for Control of Multi-Strategy Evolutionary Search

*Evgenii Sopov*

**Abstract.** There exists a great variety of evolutionary algorithms (EAs) that represent different search strategies for many classes of optimization problems. Real-world problems may combine several optimization features that are not known beforehand, thus there is no information about what EA to choose and which EA settings to apply. This study presents a novel metaheuristic for designing a multi-strategy genetic algorithm (GA) based on a hybrid of the island model, cooperative and competitive coevolution schemes. The approach controls interactions of GAs and leads to the self-configuring solving of problems with a priori unknown structure. Two examples of implementations of the approach for multi-objective and non-stationary optimization are discussed. The results of numerical experiments for benchmark problems from CEC competitions are presented. The proposed approach has demonstrated efficiency comparable with other well-studied techniques. And it does not require the participation of the human-expert, because it operates in an automated, self-configuring way.

## Fuzzy Clustering-Based Quantitative Association Rules Mining in Multidimensional Data Set

*Jining Jia and Yongzai Lu*

**Abstract.** In order to solve the problem of mining quantitative association rules, an algorithm named Fuzzy Pattern Fusion based on Competitive Agglomeration (FPF-CA) is developed in this paper. The proposed algorithm is based on the superior functionalities of Fuzzy Pattern Fusion (FPF) for mining quantitative association rules and Competitive Agglomeration (CA) for finding the optimal number of clusters. The popular data set of UCI machine learning repository is used to demonstrate the feasibility of the FPF-CA algorithm. The simulation experiment results show that the proposed algorithm can efficiently mine quantitative association rules according to the actual data distribution.

## The Application of Fuzzy Pattern Fusion Based on Competitive Agglomeration in Coal-fired Boiler Operation Optimization

*Jining Jia and Yongzai Lu*

**Abstract.** In order to solve the coal-fired boiler operation optimization problem with multiple main controllable parameters, a fuzzy pattern fusion based on competitive agglomeration (FPF-CA) algorithm is developed and applied in this paper. A simplified mathematical model for coal-fired boiler systems is applied in terms of both historical operational and thermal efficiency data under different load conditions. The FPF-CA algorithm can be applied to perform information fusion in terms of combining fuzzy clusters of some quantitative attributes with generated quantitative association rules. The historical data collected from a 130/2.82-M circulating fluidized bed (CFB) boiler being installed in a production scale thermal power plant is used to specifically analyze, and the simulation experiment results show the application of FPF-CA algorithm is a decision oriented intelligent technology and may provide an efficient results for coal-fired boiler operation optimization in thermal power plant.

## Multimedia Information Processing

June 27, 2015(Saturday) 08:00-09:40 Room 311C

## An Intelligent Media Delivery Prototype System with Low Response Time

*Hou Jinzhong, Luo Tiejian, Wang Zhu and Li Xiaoqi*

**Abstract.** Streaming media has been increasing in the Internet as a popular form of content. However, the streaming media delivery between server and client browser still has problems to be solved, such as the poor processing efficiency in dealing with large concurrent access and the high usage of bandwidth.



In particular, large scale video site usually has a large number of distributed server nodes. It is of great importance for the system to respond to users' request rapidly by choosing the proper video source for users and handling resource cache problem properly. To solve the above problems in streaming media delivery, this paper proposes a content delivery solution. The system consists of several nodes that differ in role function, and streaming media content is stored in these nodes. Users will get an optimized response, and the system selects the nearest node that has the requested video according to logical distance intellectually. The selected node will provide video stream for users. In addition, the system is equipped with a high performance content indexing and searching mechanism. The index is able to retrieve users' requested resource rapidly and therefore guarantees a good performance in selecting nodes.

## An Approach to Integrating Emotion in Dialogue Management

*Xiaobu Yuan*

**Abstract.** Presented in this paper is a method for the construction of emotion-enabled embodied (conversational) agents. By using a modified POMDP model, this method allows dialogue management not only to include emotion as part of the observation of user's actions, but also to take system's response time into consideration when updating belief states. Consequently, a novel algorithm is created to direct conversation in different contextual control modes, whose dynamic changes further provide hints for emotion animation with facial expressions and voice tunes. Experiment results demonstrate that the integration of emotion in dialogue management makes embodied agents more appealing and yields much better performance in human/computer interaction.

## A Novel Wavelet Transform - Empirical Mode Decomposition based Sample Entropy and SVD Approach for Acoustic Signal Fault Diagnosis

*Jiejunyi Liang and Zhixin Yang*

**Abstract.** An advanced and accurate intelligent fault diagnosis system plays an important role in reducing the maintenance cost of modern industry. However, a robust and efficient approach which can serve the purpose of detecting incipient faults still remains unachievable due to weak signals' small amplitudes, and also low signal-to-noise ratios (SNR). One way to overcome the problem is to adopt acoustic signal because of its inherent characteristic in terms of high sensitive to early stage faults. Nonetheless, it also suffers from low SNR and results in high computational cost. Aiming to solve the aforesaid problems, a novel wavelet transform - empirical mode decomposition (WT-EMD) based Sample Entropy (SampEn) and singular value decomposition (SVD) approach is proposed. By exerting wavelet analysis on the intrinsic mode functions (IMFs), the end effects, which decreases the accuracy of EMD, is significantly alleviated and the SNR is greatly improved. Furthermore, SampEn and SVD, which function as health indicators, not only help to reduce the computational cost and enhance the SNR but also indicate both irregular and periodic faults adequately.

## Single Image Dehazing based on Improved Dark Channel Prior

*Taimei Zhang and Youguang Chen*

**Abstract.** The sky region of restored images often appears serious noise and color distortion using classical dark channel prior algorithm. To address this issue, we propose an improved dark channel prior algorithm which recognizes the sky regions in hazy image by gradient threshold combined with the absolute value of the difference of atmospheric light and dark channel. And then we estimate the transmission in sky and non-sky regions separately. At last, we enhance the brightness and contrast of results. Experimental results show that our restored images are more natural and smooth in sky regions.

## Rotation Invariant Texture Analysis based on Co-occurrence Matrix and Tsallis Distribution

*Mateus Habermann, Felipe Campos and Elcio Shiguemori*

**Abstract.** This article addressed some extensions of a texture classifier invariant to rotations. Originally, that classifier is an improvement of the seminal Haralick's paper in a sense that the former is rotation invariant due to a circular kernel, which encompasses two concentric circles with different radii and then the co-occurrence matrix is formed. It is not considered only pixels falling exactly on the circle, but also others in its vicinity according to a Gaussian scattering. Firstly, 6 attributes are computed from each of the 18 texture patterns, after that texture patterns are rotated and a correct classification, considering Euclidian distance, is sought. The present paper assesses the performance

of the afore-mentioned approach with some alterations: Tsallis rather than Gaussian distribution; addition of noise to rotated images before classification; and Principal Components Analysis during the extraction of features.

## Other Applications

June 27, 2015(Saturday) 10:00-12:00 Room 311C

### An Access Point Trajectory Tracking Method by the Weight Update

*Lin Chen, Guilin Cai and Yun Lan*

**Abstract.** In recent years, wireless access technology is quite popular for being convenient, fast and flexible. However, due to the openness of wireless network, this technology is also faced with a number of security challenges, one of which is how to deal with the unauthorized access point effectively. As we all know, the unauthorized access point leads to not only increasing interference between signals induced by the fierce competition of wireless channel resources, but also data leakage resulting in "wireless phishing". In response to these security threats, much importance has been put on the research of unauthorized access point location and trajectory tracking. This paper firstly proposes an optimization model of wireless signal propagation. Then an access point location and tracking method called APL-T is put forward, which supports three-dimensional location based on the weight update improving the location accuracy effectively and raises the trajectory tracking of the access point in the light of the three-dimensional location. Finally, the experimental results show that APL-T has high accuracy and can meet practical requirements.

### Urban Principal Traffic Flow Analysis Based on Taxi Trajectories Mining

*Bing Zhu*

**Abstract.** The understanding of urban traffic pattern can benefit the urban operation a lot, including the traffic forecasting, traffic jam resolution, emergency response and future infrastructure planning. In modern cities, thousands of taxicabs equipped with GPS can be considered as a large number of ubiquitous mobile probes traversing and sensing in the urban area, whose trajectories will bring great insight into the urban traffic management. Thus, in this paper we investigate the urban traffic pattern based on the taxi trajectories, especially the principal Origin-Destination traffic flow (OD flow) extraction. Focusing on the picking-up and dropping-off events, the issue is solved by a spatiotemporal density-based clustering method. The OD flow analysis is formulated as a 4-D node clustering problem and the relative distance function between two OD flows is defined, including a clustering preference factor which is adjustable according to the observation scale favor. Finally, we conduct the method on the taxi trajectory dataset generated by 28,000 taxicabs in Beijing from May 1st to May 30th, 2009 to evaluate its performance and interpret some underlying insights of the time-resolved results.

### Simulation with input uncertainties using stochastic Petri nets

*Sérgio Galdino and Francisco Monte*

**Abstract.** Simulation with input uncertainties using stochastic Petri nets (SPN) takes into account the effects of uncertainties in exponential transition rates when calculating performance indices. The proposed simulation method, using interval arithmetic, allows the computing with simultaneous influence of uncertainties and variabilities of parameters. A case study is presented for processing uncertainty from stochastic Petri nets models. Interval SPN simulation do not compute the reachability graph, but follows the proposed Monte Carlo interval style simulation.

### Strategies for Improving the Profitability of a Korean Unit Train Operator: A System Dynamics Approach

*Jae Un Jung and Hyun Soo Kim*

**Abstract.** A unit train (UT) has been developed primarily in countries that have wide or long territories, to move freight quickly over long distances. In South Korea, UTs have contributed to the facilitation of the overland export/import logistics for the last decade. However, UT operators in South Korea, which is a small country surrounded by North Korea and bodies of water, suffer from low profit-ability when competing with trucking companies because of diverse reasons that they cannot control. On this account, this research aims to develop business strategies for improving the profitability of a Korean UT operator. We analyzed both the revenues and expenses of a representative operator in

Korea, and found simple but meaningful financial circular causality, using the system dynamics methodology. Thus, we presented and scientifically reinterpreted two strategies that might be acceptable alternatives: the internalization of shuttle carriers and the securing of more freight.

## Mathematics wall: Enriching mathematics education through AI

*Somnuk Phon-Amnuaisuk, Saiful Omar, Thien Wan Au and Rudy Ramlie*

**Abstract.** We present the progress of our ongoing research titled Mathematics Wall which aims to create an interactive problem solving environment where the system intelligently interacts with users. In its full glory, the wall shall provide answers and useful explanations to the problem-solving process using artificial intelligence (AI) techniques. In this report, we discuss the following components: the digital ink segmentation task, the symbol recognition task, the structural analysis task, the mathematics expression recognition, the valuation of the mathematics expressions and finally present the results. We then present and discuss the design decisions of the whole framework and subsequently, the implementation of the prototypes. Finally, future work on the explanation facility is discussed.

## Short Term Load Forecasting Based on Hybrid ANN and PSO

*Komla Folly and Ellen Shezi*

**Abstract.** Short term load forecasting (STLF) is the prediction of electrical load for a period that ranges from one hour to a week. The main objectives of the (STLF) are to predict future load for the generation scheduling at power stations; assess the security of the power system as well as for timely dispatching of electrical power. The traditional load forecasting tools utilize time series models which extrapolate historical load data to predict the future loads. These tools assume a static load series and retain normal distribution characteristics. Due to their inability to adapt to changing environments and load characteristics, they often lead to large forecasting errors. In an effort to reduce the forecasting error, hybrid artificial neural network (ANN) and particle swarm optimization (PSO) is used in this paper. It is shown that the hybridization of ANN and PSO gives better results compared to the standard ANN with back propagation.

## Index (a=abstract c=chair cc=cochair)

Akhmedova, Shakhnaz, 23, 26, 40a, 46a  
 Ali, Md. Nawab Yousuf, 33, 35, 59a, 62a  
 Arita, Takaya, 23, 40a  
 Arvin, Farshad, 33, 60a  
 Attar, Abdolrahman, 33, 60a  
 Au, Thien Wan, 39, 68a  
 Aurélien, Benel, 29, 51a  
 Awodiji, Olurotimi, 34, 61a  
 Aye, Zin Win, 26, 47a

Babenko, Mikhail G., 36, 63a  
 Babu, Hafiz Md. Hasan, 35, 62a  
 Bacanin, Nebojsa, 28, 49a  
 Bachache, Nasseer K., 26, 46a  
 Bai, Xuejie, 30, 52a  
 Beko, Marko, 28, 49a  
 Belousov, Alexander, 27, 47a  
 Benchabane, Ibrahim Sofiane, 27, 48a  
 Bharadwaj, K. Nikhil, 32, 58a  
 Bhondekar, Amol, 23, 40a  
 Bohez, Erik L.J., 25, 43a  
 Brester, Christina, 28, 49a  
 Burakov, Sergey, 23, 40a

Cai, Guilin, 38, 67a  
 Campos, Felipe, 38, 66a  
 Cao, Zijian, 25, 45a  
 Chang, Yanchun, 32, 56a  
 Chatty, Abdelhak, 34, 60a  
 Cheah, Boon Chew, 30, 54a  
 Chen, Gang, 32, 57a  
 Chen, Hong, 34, 61a  
 Chen, I-Ching, 29, 35, 51a, 62a  
 Chen, Jian, 24, 42a  
 Chen, Junfeng, 24c, 25, 45a  
 Chen, Lin, 34, 38, 38c, 62a, 67a  
 Chen, Minyou, 29, 50a  
 Chen, Shi, 31, 55a  
 Chen, Walter, 32, 57a  
 Chen, Xiaosu, 33, 59a  
 Chen, Yang, 25, 45a

Chen, Youguang, 38, 66a  
 Chen, Zepeng, 24, 41a  
 Cheng, Shi, 25, 45a  
 Chervyakov, Nikolay I., 36, 63a  
 Chi, Xiaotong, 35, 63a  
 Choi, Hyung Rim, 27, 47a  
 Chu, Hua, 34, 60a  
 Cui, Chaoyuan, 23, 40a

Dai, Weidi, 35, 63a  
 Deng, Changshou, 25, 44a  
 Deng, Chengxiang, 32, 57a  
 Detken, Kai-Oliver, 29, 51a  
 Ding, Yi, 35, 63a  
 Djaid, Nadia, 29, 51a  
 Dong, Xiaogang, 25, 44a  
 Du, Xiaorong, 31, 54a  
 Du, Zhiqiang, 25, 45a  
 Duan, Jinan, 36, 63a  
 Duan, Wei, 34, 60a  
 Duo, Yashuai, 31, 55a

Elghazaly, Tarek, 30, 33, 53a, 59a

Fan, Chunbo, 35, 63a  
 Fang, Sinan, 32, 57a  
 Feng, Tinghao, 23, 40a  
 Feng, Zuren, 27, 47a  
 Folly, Komla, 34, 34c, 39, 61a, 68a

Galdino, Sérgio, 38, 67a  
 Galvez-Tomida, Akemi, 23, 41a  
 Gao, Chao, 23, 31, 40a, 55a  
 Gao, Qi, 32, 56a  
 Gao, Siqi, 31, 55a  
 Garg, Dr. Bindu, 30, 54a  
 Garianina, Anastasiia I., 36, 63a  
 Gaussier, Philippe, 34, 60a  
 Ge, Long, 28, 48a  
 Gelbukh, Alexander, 36, 64a  
 Gheith, Mervat, 33, 59a  
 Gong, Dun-Wei, 32, 58a

Grudin, Vladimir, 35, 62a  
 Gu, Xiang, 26, 46a  
 Guo, Tiande, 25, 44a  
 Guo, Xiaoping, 25, 45a  
 Guo, Yinan, 29, 50a  
  
 Habermann, Mateus, 38, 66a  
 Hamdan, Mohammad, 28, 28c, 49a  
 Han, Congying, 25, 44a  
 Han, Fei, 24, 42a  
 Han, Xiangshuai, 24, 41a  
 He, Xu, 33, 60a  
 Hedi, Zaher, 29, 51a  
 Hellmann, Bastian, 29, 51a  
 Hernandez, Rene Arnulfo Garcia, 36, 64a  
 Hossain, Fahmida, 35, 62a  
 Hu, Shueh-Cheng, 29, 35, 51a, 62a  
 Hu, Zhaoguang, 34, 60a  
 Hu, Zhigang, 31, 55a  
 Hua, Wu, 29, 52a  
 Huang, Jie, 34, 62a  
 Huo, Jiuyuan, 35, 63a  
 Husin, Mohd Heikal, 30, 54a  
  
 Iglesias, Andres, 23, 23c, 41a  
 Islam, Md. Anik, 33, 59a  
 Ivutin, Alexey, 29, 51a  
  
 Jain, Rachna, 30, 54a  
 Jia, Jining, 36c, 37, 65a  
 Jiang, Dongmei, 28, 48a  
 Jin, Dexin, 23, 40a  
 Jinzhong, Hou, 38, 65a  
 Jung, Jae Un, 27, 39, 47a, 67a  
  
 Kairkanov, Arsen, 35, 62a  
 Kallel, Ilhem, 34, 60a  
 Kam, Chiang Wei, 30, 54a  
 Karaseva, Margarita V., 28, 49a  
 Karungaru, Stephen, 27, 47a  
 Kaur, Rishemjit, 23, 40a  
 Kazadi, Sanza, 23, 40a  
 Ke, Liangjun, 26c, 27, 47a  
 Ke, Tingjing, 29, 50a  
 Khalid, Muhammad Adnan, 32, 57a  
  
 Khoruzhnikov, Sergey, 35, 62a  
 Kielarova, Somlak, 25, 43a  
 Kim, Hyun Soo, 27, 39, 47a, 67a  
 Konaté, Ahmed Amara, 32, 57a  
 Kotov, Vladislav, 29, 51a  
 Kovalev, Dmitry I., 28, 49a  
 Kovalev, Igor V., 28, 49a  
 Kuchеров, Nikolay N., 36, 63a  
 Kumar, Ritesh, 23, 40a  
  
 Lan, Yun, 38, 67a  
 Larkin, Eugene, 29, 29c, 51a  
 Ledeneva, Yulia, 36, 64a  
 Lee, Yunli, 36, 64a  
 Leng, Yuquan, 33, 60a  
 Li, Changsheng, 36, 63a  
 Li, Fushan, 31, 56a  
 Li, Gang, 32, 57a  
 Li, H., 30, 53a  
 Li, Jinlong, 24, 43a  
 Li, Peiyao, 23, 40a  
 Li, Qingshan, 34, 60a  
 Li, Wei, 33, 59a  
 Li, Weixing, 32, 56a  
 Li, Zili, 33, 59a  
 Liang, Jiejunyi, 38, 66a  
 Liang, Mingxin, 23, 31, 40a, 55a  
 Liao, Bin, 34, 61a  
 Lin, Henry, 33, 59a  
 Lin, Yishuai, 34, 60a  
 Liu, Baolong, 25, 45a  
 Liu, Bingyu, 30, 52a  
 Liu, Chuci, 33, 58a  
 Liu, J.K., 30, 53a  
 Liu, Qing, 24, 42a  
 Liu, Ran, 30, 53a  
 Liu, Sheng, 28, 48a  
 Liu, Xiao, 25, 44a  
 Liu, Yuxin, 23, 31, 40a, 55a  
 Lu, Guanzhou, 24, 43a  
 Lu, Yongzai, 37, 65a  
 Lu, Z.R., 30, 53a  
 Luo, Huan, 29, 50a  
 Luo, Huimin, 31, 55a

- Luo, Wenjian, 32, 32c, 57a  
 Lv, Shuping, 33, 58a  
 Lv, Yongxi, 30, 52a
- M.Alimi, Adel, 34, 60a  
 Maabid, Abdelmawgoud, 33, 59a  
 Madan, Dr. Sushila, 30, 54a  
 Malim, Nurul Hashimah Ahamed Hassain, 30, 54a  
 Mamou, Mohamed Amine, 27, 48a  
 Mao, Chengxiong, 26, 46a  
 Mao, Xiaoqian, 33, 59a  
 Meng, Luodan, 36, 65a  
 Mo, Hongwei, 26, 26c, 33c, 45, 46a  
 Mon, Myat Thida, 26, 47a  
 Monte, Francisco, 38, 67a
- Ngo, David, 36, 64a  
 Ni, Qingjian, 31, 32, 56a  
 Niu, Ben, 31, 31c, 56a  
 Niu, Linwei, 33, 59a
- Omar, Saiful, 39, 68a  
 Oswald, David, 33, 59a  
 Ousaadi, Zahira, 34, 61a
- Pan, Chudong, 30, 53a  
 Pan, Feng, 24, 32, 42a, 56a  
 Pan, Heping, 32, 57a  
 Pan, Zhenghua, 30, 52a  
 Park, Chang Hyun, 27, 47a  
 Pauline, Ong, 26, 47a  
 Phon-Amnuaisuk, Somnuk, 39, 68a  
 Pongcharoen, Pupong, 24, 42a  
 Prapujphongphet, Prapasson, 25, 43a
- Qian, Neng, 31, 55a  
 Qin, Keyun, 36, 65a  
 Qudah, Osamah, 28, 49a
- Ramdane-Cherif, Amar, 29, 51a  
 Ramlie, Rudy, 39, 68a  
 Ren, Xuemei, 24, 42a  
 Rong, Miao, 32, 58a  
 Rong, Xiaofeng, 25, 45a
- Roy, Ashok Toru, 33, 59a
- S.Mohanavalli, 32, 58a  
 Saadia, Nadia, 27, 29, 34, 48a, 51a, 61a  
 Sadov, Oleg, 35, 62a  
 Saravanan, M, 32, 58a  
 Sathi, Shirin Nahar, 35, 62a  
 Scheuermann, Dirk, 29, 51a  
 Semenkin, Eugene, 23, 25, 26, 28, 32, 40a, 44a, 46a, 49a, 58a  
 Semenkina, Maria, 23, 25, 40a, 44a  
 Semenkina, Olga, 32, 58a  
 Shamsujjoha, Md., 33, 35, 35c, 59a, 62a  
 Shang, Ke, 27, 47a  
 Shen, Aili, 24, 43a  
 Shen, Jianqiang, 31, 55a  
 Shen, Yuanxia, 24, 42a  
 Shen, Zhe-Ping, 32, 57a  
 Shevel, Andrey, 35, 62a  
 Shezi, Ellen, 39, 68a  
 Shi, Yuhui, 25, 25c, 45a  
 Shiguemori, Elcio, 38, 66a  
 Shu, Junyi, 32, 56a  
 Shuai, Li, 34, 61a  
 Si, Chengyong, 31, 55a  
 Sia, Chee Kiong, 26, 47a  
 Singh, Manmeet Mahinderjit, 30, 54a  
 Skobelev, Peter, 27, 47a  
 Song, Liangtu, 23, 40a  
 Sopov, Evgenii, 23, 37, 40a, 65a  
 Sorwar, Golam, 33, 35, 59a, 62a  
 Sridhar, Aarthi, 32, 58a  
 Srividhya, V., 32, 58a  
 Stanovov, Vladimir, 32, 58a  
 Stepanov, Maksim, 27, 47a  
 Suganthan, Ponnuthurai Nagaratnam, 24c  
 Sun, Huiying, 34, 61a  
 Sun, Yanxia, 29, 50a  
 Sun, Yunlin, 31, 54a  
 Sun, Zhou, 35, 63a  
 Suzuki, Reiji, 23, 40a
- Tan, Wei Sheng, 30, 54a  
 Tan, Xujie, 25, 44a

Tan, Yucheng, 25, 44a  
Tang, Shanyu, 30, 53a  
Tao, Li, 23, 31, 40a, 55a  
Tiejian, Luo, 38, 65a  
Tuba, Milan, 28, 29c, 49a  
Turgut, Ali Emre, 33, 60a

Vitayasak, Srisatja, 24, 42a

Waley, Salam, 26, 46a  
Wang, Cong, 30, 52a  
Wang, Cuirong, 30, 34, 52a, 61a  
Wang, Frank Xuyan, 24, 43a  
Wang, Lei, 31, 55a  
Wang, Lu, 34, 60a  
Wang, Na, 26, 46a  
Wang, Wenjun, 35, 63a  
Wang, Xiaoyan, 24, 42a  
Wang, Xiaoyang, 31, 31c, 54a  
Wang, Yiran, 30, 52a  
Wang, Zenghui, 29, 50a  
Wei, Linna, 24, 42a  
Wen, Jieao, 33, 58a  
Wu, Qidi, 31, 55a  
Wu, Yali, 25, 45a  
Wu, Zhou, 28, 49a

Xianjun, Chen, 34, 61a  
Xiao, Li, 36, 63a  
Xiaohui, Zheng, 34, 61a  
Xiaoqi, Li, 38, 65a  
Xie, Lixia, 25, 45a  
Xie, Qilian, 23, 40a  
Xie, Shufang, 31, 56a  
Xie, Yingjuan, 25, 45a  
Xin, Jing, 24, 25, 41a, 45a  
Xing, Lei, 35, 63a  
Xiuqin, Su, 29, 52a  
Xu, Benlian, 28, 28c, 48a  
Xu, Jungang, 34, 61a  
Xu, Lifang, 26, 45a  
Xu, Lijun, 30, 52a  
Xu, Qingzheng, 26, 46a  
Xue, Guixiang, 35, 63a

Yakimov, Igor, 23, 40a  
Yan, Chaokun, 31, 55a  
Yan, Cuicui, 24, 41a  
Yang, Bo, 25, 45a  
Yang, Chuanshu, 36, 63a  
Yang, Jie Huai, 32, 57a  
Yang, Yanlin, 25, 44a  
Yang, Zhixin, 38, 66a  
Yin, Xushan, 32, 56a  
Yong, Yoke Leng, 36, 64a  
Yongsong, Zhan, 34, 61a  
You, Xiaoming, 28, 48a  
Yousuf Ali, Md. Nawab, 33c  
Yu, Cen, 33, 60a  
Yu, Hao, 35, 63a  
Yu, Ling, 24, 30, 30c, 41a, 53a  
Yuan, Xiaobu, 38, 38c, 66a  
Yue, Shigang, 33, 60a

Zain, Badrul Aisham Md, 26, 47a  
Zainuddin, Zarita, 26, 47a  
Zaloga, Alexandr, 23, 40a  
Zelenkov, Pavel V., 28, 49a  
Zeng, Chuanhua, 24, 42a  
Zeng, Li, 33, 59a  
Zhai, Yuqing, 32, 56a  
Zhang, Bei, 31, 55a  
Zhang, Cheng, 33, 58a  
Zhang, Jian, 34, 60a  
Zhang, Jianhang, 26, 46a  
Zhang, Kun, 34, 61a  
Zhang, Lei, 31, 54a  
Zhang, Liying, 25, 44a  
Zhang, Min-Xia, 31, 55a  
Zhang, Peng, 35, 63a  
Zhang, Taimei, 38, 66a  
Zhang, Wei, 33, 60a  
Zhang, Wenle, 36, 36c, 64a  
Zhang, Xiaoming, 23, 40a  
Zhang, Xin, 28, 49a  
Zhang, Yang, 33, 60a  
Zhang, Yong, 32, 58a  
Zhang, Zili, 23, 31, 40a, 55a  
Zhao, Guifen, 30, 54a

Zhao, Jinhai, 36, 63a  
Zhao, Xinchao, 25, 44a  
Zhao, Yanyan, 26, 46a  
Zhou, Weijia, 33, 60a  
Zhou, Yuhui, 34, 60a  
Zhu, Bing, 38, 67a  
Zhu, Wang, 38, 65a  
Zhu, Yilin, 24, 42a  
Zhuo, Xinjian, 25, 44a  
Zou, Xuan, 31, 55a





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