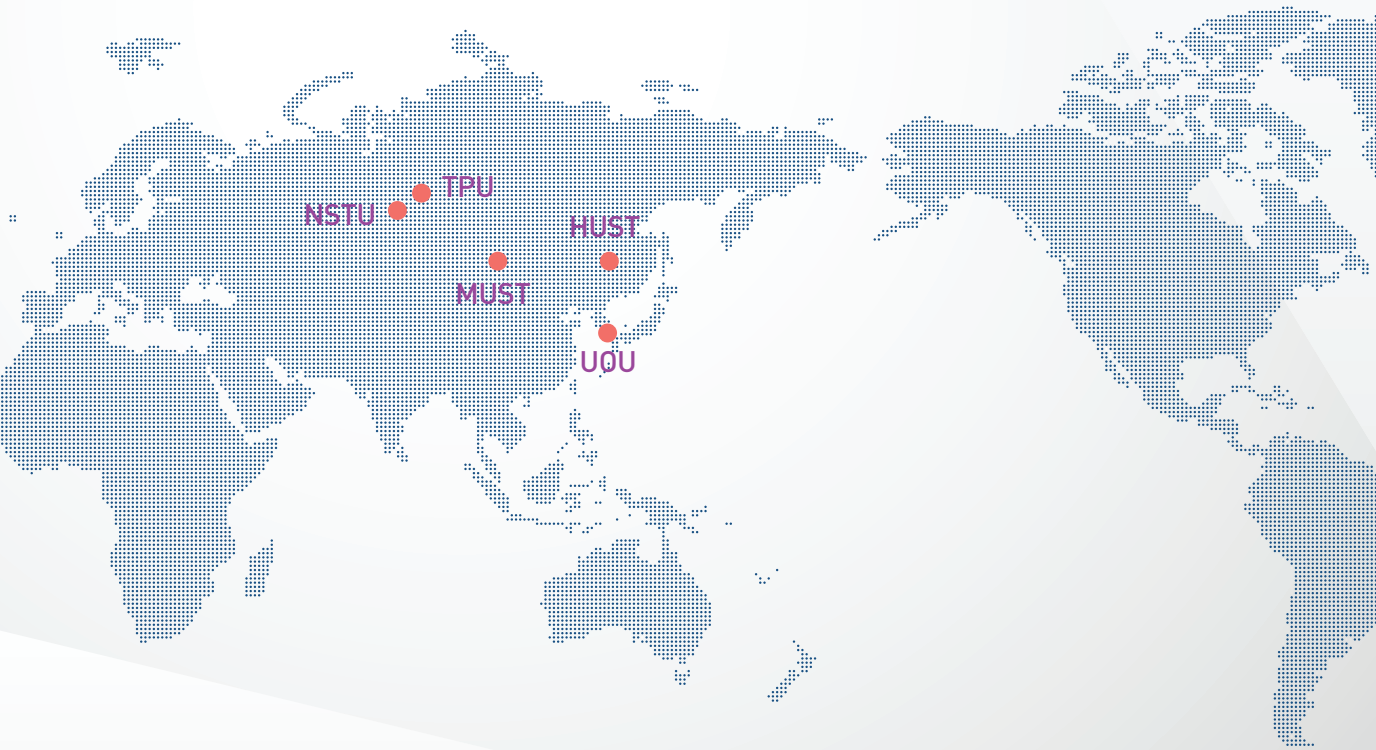
IFOST

2017 The 12th IFOST (International Forum on Strategic Technology)

May 31 ~ June 2, 2017
University of Ulsan,
Ulsan, Korea



울산대학교
UNIVERSITY OF ULSAN

Contents

I. Opening Message

Good morning, friends, colleagues, and distinguished guests!

As General Chair of IFOST-2017, I'm so honored and pleased to declare the opening of IFOST-2017 with all the participants here in Ulsan where the IFOST headquarters is located. On behalf of IFOST headquarters, I'd like to express special thanks to all the directors of the member universities for encouraging and helping their colleagues to participate in this forum, all the special speakers invited for plenary talks and invited talks, and last but not least all the members of the organizing committee and technical program committee who have made tremendous efforts to organize this forum.

Since the 1st forum held in Ulsan, Korea in 2006, IFOST has finally reached the 12th meeting with 5 member institutions from 4 nations. In the meantime, the forum has played a great role of gathering researchers and policy-makers together and encouraging them to exchange their ideas and experiences on strategic technologies. This year our forum is being held with 167 participants and 165 selected papers and three plenary talks and four invited talks to be presented by distinguished specialists in their relevant fields.

Speaking of the venue, Ulsan is the 7th largest city in Korea in population but is the industrial capital of Korea which has a variety of leading industries like shipbuilding, motorcar making, chemical engineering, etc. This forum especially prepared the field tour to Hyundai Heavy Industries which is the world-largest shipbuilding company and also the founder of the University of Ulsan and some sightseeing nearby. Please enjoy the forum and the beauty of the city as much as you can.

Dear colleagues! Let me wrap up my message wishing that IFOST-2017 will be a great success sharing creative ideas and friendships.

Once again, I am really grateful to all the participants for taking such a long journey to this forum and I wish you the best of luck for the whole period of your stay in Ulsan. Thank you so much!

Chi-Mo Park
General Chair of IFOST-2017
Professor, Ph.D., Dean of
College of Engineering,
University of Ulsan, Korea

II. Technical Program Overview

It is a great pleasure to introduce the program of IFOST-2017, the 12th International Forum on Strategic Technology. First of all, we truly appreciate the volunteer contributions from the program committee members and anonymous reviewers.

IFOST-2017 received 194 paper submissions from 11 different countries all over the world. After the review process, 90 qualified papers have been selected to be presented in 16 regular sessions. In addition to the oral presentations, 75 research work will be presented in 3 poster sessions.

The program also includes plenary talks and invited talks. We are pleased to present an opening plenary talk by CEO Kwanghean An, Hyundai Global Service, a plenary talk by Prof. W. Hardt, TU Chemnitz and a plenary talk by Prof. Man-soo Choi, Seoul National University. We also have four invited talks by Prof. Tae-hyun Bae from Nanyang Technological University (NTU) in Singapore, Prof. Zhu Han from University of Houston in USA, Prof. Jang, Joon-ik from Sogang University in South Korea, and Prof. Dhananjay Singh from Hankuk University of Foreign Studies in South Korea.

We thank all participants joining the conference and truly hope you find big inspiration from the technical discussion and interactions with your leading academic scientists, research scholars and engineers.

Hope you enjoy your stay in Ulsan, Korea!

In-Soo Koo
Organizing Secretary of IFOST-2017
Professor, Ph.D., Vice Dean of
College of Engineering,
University of Ulsan, Korea

III. Forum Committees

Organizing committee

General Chair

Chi-Mo Park (University of Ulsan, Korea)

General Co-Chairs

Kee-Ho Kim (University of Ulsan, Korea)

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Dorjderem Byambasuren (Mongolian University of Science and Technology, Mongolia)

Yulia Falkovich (Tomsk Polytechnic University, Russia)

Jiyong Jin (Harbin University of Science and Technology, China)

Ik-Keun Yoo (University of Ulsan, Korea)

Ki-Ryoung Kwon (Pukyong National University ,Korea)

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Myung-Kyun Kim (University of Ulsan, Korea)

Kang-Hyun Jo (University of Ulsan, Korea)

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Kyeong-Bae Kim (University of Ulsan, Korea)

Ji-Hyun Kim (University of Ulsan, Korea)

Jung-Wook Kim (University of Ulsan, Korea)

Technical Program Committee

Section Chairs

Jin-Chun Kim (University of Ulsan, Korea)
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Sang-Wook Lee (University of Ulsan, Korea)
Hong-Hee Lee (University of Ulsan, Korea)
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Hyeon-Cheol Kim (University of Ulsan, Korea)
Byeong-Kyu Lee (University of Ulsan, Korea)
Jin-Suk Chun (University of Ulsan, Korea)

Paper Reviewers

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Igor Sukhanov (Novosibirsk State Technical University, Russia)
Vladimir Timofeev (Novosibirsk State Technical University, Russia)
Olga Lenivtseva (Novosibirsk State Technical University, Russia)
Iuliia Maliutina (Novosibirsk State Technical University, Russia)
Yury V Morozov (Novosibirsk State Technical University, Russia)
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Myung-Kyun Kim (University of Ulsan, Korea)
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Xu Huanyan (Harbin University of Science and Technology, China)
Ling Weng (Harbin University of Science and Technology, China)
Xiaogang Wu (Harbin University of Science and Technology, China)
Lv Yanling (Harbin University of Science and Technology, China)
Tungalagtamir B. (Mongolian University of Science and Technology, Mongolia)
Batzolboo Bataa (Mongolian University of Science and Technology, Mongolia)
Khuder A. (Mongolian University of Science and Technology, Mongolia)
Naranbaatar D. (Mongolian University of Science and Technology, Mongolia)
Ganbat Danaa (Mongolian University of Science and Technology, Mongolia)
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Purevdorj Nyamsuren (Mongolian University of Science and Technology, Mongolia)
Munkhtsetseg O. (Mongolian University of Science and Technology, Mongolia)
Ganbat Tumen-Ulzii (Mongolian University of Science and Technology, Mongolia)

IV. Histroy of IFOST

No.	Period	Venue	Remarks
1	Oct. 18 ~ 20, 2006	1st IFOST, UOU(Korea): 58 participants, 120 papers	Members: NSTU, TPU, UOU, MUST, HUST, HCMUT, HUT
2	Oct. 03 ~ 05, 2007	2nd IFOST, MUST(Mongolia): 250 participants , 170 papers	
3	Jun. 23 ~ 29, 2008	3rd IFOST, NSTU/TPU(Russia): 204 participants , 207 papers	1st HQ: established in UOU on Nov. 27, 2008
4	Oct. 21 ~ 23, 2009	4th IFOST, HUT(Vietnam): 290participants, 275 papers	
5	Oct. 13 ~ 15, 2010	5th IFOST, UOU(Korea): 132 participants, 310 papers	Withdrawal: HUT(Vietnam) on Dec. 10, 2010
6	Aug. 22 ~ 24, 2011	6th IFOST, HUST(China): 267 participants , 310 papers	Join: UGM(Indonesia) on Nov. 21, 2011
7	Sep. 18 ~ 21, 2012	7th IFOST, TPU(Russia): 197 participants, 377 papers	Join: CUET(Bangladesh) on May. 17, 2012 Withdrawal: HCMUT(Vietnam) on Sep. 25, 2012
8	Jun. 28~Jul. 01, 2013	8th IFOST, MUST(Mongolia): 350 participants, 231 papers	2nd HQ: UOU reelected for 4 years from Jul. 1, 2013~2017
9	Oct. 21 ~ 23, 2014	9th IFOST, CUET(Bangladesh): 190 participants, 293 papers	
10	Jun. 03 ~ 05, 2015	10th IFOST, UGM(Indonesia): 114 participants, 131 papers	
11	Jun. 01 ~ 03, 2016	11th IFOST, NSTU(Russia): 327 participants, 413 papers	Withdrawal: UGM(Indonesia) on May 10, 2016 / UTP(Korea)
12	May 31~Jun. 02, 2017	12th IFOST, UOU(Korea): 167 participants, 165 papers	3rd HQ: to be elected

V. Forum Schedule

May 30(Tue), 2017

Time	Events	Place
10:00 ~	Move to hotel, check-in & registration	Hotel Shilla Stay Ulsan (1F)
12:00~14:00	Lunch*	Hotel Shilla Stay Ulsan (2F)
18:00~20:00	Dinner*	Hotel Shilla Stay Ulsan (2F)

* Registration fee does not include lunch and dinner on May 30, so please make a reservation if you want to have meals in the hotel.

May 31(Wed), 2017

Time \ Room	Room 113(1F)	Room 114(1F)	Room 219(2F)	Room 203(2F)	Room 201(2F)	Place
08:30 ~ 09:30	Registration (Koreans)					Industry-University Cooperation Hall (Lobby, 1F)
09:30 ~ 10:00	Opening ceremony					Industry-University Cooperation Hall (Room 120, 1F)
10:00 ~ 10:40	Plenary talk 1					
10:40 ~ 10:50	Coffee break					Industry-University Cooperation Hall (Lobby, 1F)
10:50 ~ 11:30	Plenary talk 2					Industry-University Cooperation Hall (Room 120, 1F)
11:30 ~ 12:00	Group photo					In front of Industry-University Cooperation Hall
12:00 ~ 13:20	Lunch					International Hall (Lobby, 1F)
13:20 ~ 15:00	Session S1-1	Session S2-1	Session S3-1	Session S5-1	Session S6-1	Industry-University Cooperation Hall (1F, 2F)
15:00 ~ 15:15	Coffee break					Industry-University Cooperation Hall (Lobby, 1F)
15:15 ~ 15:55	Plenary talk 3					Industry-University Cooperation Hall (Room 120, 1F)
16:00 ~ 18:00	Invited talk 1 Session S1-2	Invited talk 2 Session S2-2	Session S3-2	Session S4-1		Industry-University Cooperation Hall (1F, 2F)
18:10 ~ 18:40	Move to welcome party place					School bus
19:00 ~ 22:00	Welcome party					Mokhwa Wedding Hall (5F)

※ Please check 'VII. Sessions of Forum' for the detailed schedule of each session.

June 1(Thu), 2017

Time \ Room	Room 113(1F)	Room 114(1F)	Room 219(2F)	Room 203(2F)	Room 201(2F)	Place
09:00 ~ 10:40	Session S1-3	Invited talk 3 Session S2-3	Session S3-3		Invited talk 4 Session S6-2	Industry-University Cooperation Hall (1F, 2F)
10:40 ~ 11:00	Coffee break					Industry-University Cooperation Hall (Lobby, 1F)
11:00 ~ 12:20	Session S1-4	Session S2-4		Session S4-2		Industry-University Cooperation Hall (1F)
12:20 ~ 13:30	Lunch					International Hall (Lobby, 1F)
14:00 ~ 15:10	Poster session 1					Industry-University Cooperation Hall (Lobby, 1F)
14:30 ~ 16:30	IFOST-2017 board-of-directors meeting					Building of College of Engineering (Conference Room, 3F)
15:10 ~ 15:30	Coffee break					Industry-University Cooperation Hall (Lobby, 1F)
15:30 ~ 16:40	Poster session 2					
16:40 ~ 17:00	Coffee break					
17:00 ~ 18:00	Poster session 3					
18:10 ~ 18:40	Move to closing ceremony place					School bus
19:00 ~ 22:00	Closing ceremony					Hotel Shilla Stay Ulsan (2F)

※ Please check 'VII. Sessions of Forum' for the detailed schedule of each session.

June 2(Fri), 2017

Time	Events	Place
08:30 ~ 09:00	Check-out	Hotel Shilla Stay Ulsan (1F)
09:00 ~	Move to KTX Ulsan station (Non-participants in Technical tour)	Hotel Shilla Stay Ulsan (1F)
09:00 ~ 14:30	Technical tour (HYUNDAI Heavy Industries and Daewangam Park)	School bus
14:30 ~	Move to KTX Ulsan station	Hotel Shilla Stay Ulsan (1F)

VI. Forum Information

Floor plan of Industry-University Cooperation Hall

1st Floor

2nd Floor

Campus map

▪ Engineering

01 Chemical Engineering
02 Mechanical & Aerospace Engineering
03 College of Engineering(3F, IFOST HQ)
07 Electronic & Computer Engineering
18 Material & Industrial Engineering
23 Civil & Environmental Engineering
27 Navel Architecture & Oceanic Engineering Laboratory I
30 Factory Laboratory
41 Navel Architecture & Oceanic Engineering
42 Navel Architecture & Oceanic Engineering Laboratory II

▪ Natural Science

08 College of Natural Science
19 Basic Science Laboratory
37 College of Human Ecology

▪ Architecture/Arts

06 Plastic Arts Hall
28/29 College of Arts
44 College of Architecture

▪ Humanities / Social Science Business Adminstration

14 College of Humanities
15 College of Social Science
24 College of Business Administration

▪ Administration / Campus Facility

05 LINC Hall
09 University Center
16 Asan Library I
26 Main Administration Building / University HQ
34 Botanic Garden
35 Industry-University Cooperation Hall (IFOST-2017)
40 Asan Library II
43 International Hall (Lunch)

▪ Sports Facility

12 Gymnasium
39 Asan Sports Center

Wi-Fi ID & password

Wi-Fi network	ID	Password
UOU-WLAN	ifost2017	ifost2017

Bus timetable (Campus ↔ Hotel)

Please wait at the place below at least 10 minutes before departure.

Route	Date	Departure time	Place
Hotel → Campus	May 31~ June 1	08:30	Hotel Shilla Stay Ulsan (1F)
Campus → Hotel	May 31~ June 1	18:10	Industry-University Cooperation Hall (1F)

Social program

Opening ceremony

Date: Wednesday, May 31, 2017

Time: 09:30 ~ 10:00 / Place: International Conference Room (1F)

All registered participants are cordially invited to join and celebrate the opening of IFOST-2017.

Welcome party

Date: Wednesday, May 31, 2017

Time: 19:00 ~ / Place: Mokhwa Wedding Hall (5F)

We hope that all participants will have a chance to mingle with the others to promote friendship and mutual exchange through the Welcome Party. Delicious food will be served along with a special welcome performance. It is included in the regular registration.

IFOST-2017 board-of-directors meeting

Date: Thursday, June 1, 2017

Time: 14:30 ~ 16:30 / Place: Building of College of Engineering (3F, Conference Room)

Participants: Directors of the member universities

Closing ceremony

Date: Thursday, June 1, 2017

Time: 19:00 ~ / Place: Hotel Shilla Stay (2F)

We hope that all participants will have an opportunity to maintain a close relationship through the Closing ceremony. The Closing ceremony is served as a standing dinner with delicious food.

Technical tour

Date: Friday, June 2, 2017

Time: 09:00 ~ 14:30 / Place: HYUNDAI Heavy Industries and Daewangam Park

HYUNDAI Heavy Industries

Hyundai Heavy industries possesses an unprecedented record in the world history of shipbuilding as it built two oil tankers with a capacity of 260,000 tons as soon as it constructed a dockyard. It is the world largest shipbuilding company and has constructed approximately 1,800 large ships so far. The company's gigantic facilities, including the world's largest dock with capacity of one million tons and a gantry crane with capacity of 900 tons, are truly jaw-dropping.

Daewangam Park

The pine grove around Daewangam Rock consist of approximately 15,000 large pine trees with 100 years of history, creating a magnificent scene. Visitors can enjoy the fresh green scent of the pine trees while walking on the trail in the grove.

Venue and accommodation

Venue

Ulsan is located along the southeast coast in S. Korea. Its population is 1,160,000.

Ulsan is 1,060㎢ in area and is a city that accounts for 15.2% of industrial output in S. Korea (one of four production cities in Asia). Ulsan has the leading industrial cluster for the automotive, shipbuilding, and petrochemical industries. Ulsan ranks first in the automotive and shipbuilding industries, and second in the petrochemical industry in terms of production in S. Korea. In addition, Ulsan is a city with beautiful mountains and clean, clear rivers beside a deep blue sea. Ulsan has been renovated as an eco-friendly city where development and preservation have existed in harmony for about 40 years.

Accommodation

Shilla Stay Ulsan Hotel, which is just about 8km away from the University of Ulsan.

This is located in the city center with shops, restaurants, pubs, within walking distance of 10 minutes. Business twin rooms will cost around USD 90 (KRW 100,000) per night for two persons and a single room will cost around USD 75 (KRW 85,000) per night including breakfast. For more informaion on the recommended accommodation, please visit http://www.shillastay.com/ulsan/index.do

VII. Sessions of Forum

Oral sessions

- **Instructions for oral presentations:** Please arrive at the session hall 10 minutes eariler before starting time, in case some authors are not able to make presentations on time. 15 minutes will be given to each presentation including 2-3 minutes of Q&A.
- **Devices provided by the IFOST-2017 organizers:** Laptops (with MS-office & Adobe reader), Projectors & screen, Laser sticks.
- **Materials provided by the presenters:** PowerPoint or PDF files

Section 1 "New materials and nanotechnologies"

Session S1-1(13:20 ~ 15:00, May 31), Room 113
Chair: Prof. Jin-Chun Kim

S1-1-1	Preparation and Characterization of PVDF/Nano-Ag Composites with Enhanced Dielectric Property by Ling Weng, Hongxia Li, Xiaorui Zhang and Lizhu Liu	41
S1-1-2	Temperature-Dependent Structural, Optical, and Thermoelectric Properties in V2O5 Thin Films by M. Kang and S. Kim	41
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S1-1-5	Optimal Experimental Conditions of STS316L Metal Products Produced by Selective Laser Sintering by Jin-Chun Kim	42
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S1-1-7	First-Principles Modeling of Hofmann-Type MOF for Drug Delivery by Bikash Mandal, Yuan Yuan Li, Jin Suk Chung and Sung Gu Kang	43

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S1-3-4	A Study on Effects of Different Ambient Conditions on Properties of Cu Particle and Cu Nanofluid Synthesized by Electrical Explosion of Wire by Jin-Chun Kim	46
S1-3-5	Photo-Enhanced Selective Hydrogenation of Nitroarenes Using Pt/ZnO Catalyst by Yen-linh Thi Ngo, Linlin Wang, Eui Jung Kim and Doan Van Thuan	46
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Section 3 "Mechanical engineering, robotics, and automation"

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Chair: Prof. Kyoungsik Chang

Session S3-2(16:00 ~ 18:00, May 31), Room 219
Chair: Prof. Kyoung-Kwan Ahn

Session S3-3(09:00 ~ 10:40, June 1), Room 219 Chair: Prof. Sang-Wook Lee		
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S5-1-2	Damage Analysis of Reinforced Concrete Structures of Precast Buildings by Duinkherjav Yagaanbuyant	67
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S5-1-4	Creation of Digital Terrain Models from Satellite Imagery and LIDAR Data for Large Scale Topographic Maps by Javzandulam Bataa	68
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Section 6 "Applied engineering"

Poster sessions

Instructions for poster presentations: The size of the poster board is 100cm (width) × 180cm (length). You need to prepare your poster within this size and attach it on the poster board in your session room at least 10 minutes before the session starts. It is responsibility of the presenter to remove his/her poster after the session finishes.

Poster Session - 1 (14:00~15:10, June 1), Industry-University Cooperation Hall(Lobby, 1F)
Chair: Dr. Young-Doo Lee and Dr. Vu-Van Hiep

P1-1	ICT Competency Level of Teacher in the MUST by Ariunaa Khashkhuu	75
P1-2	Evaluation of Wireless Sensor Network Reliability with use of Reliability Bounds Cumulative Updating by Denis Migov	75
P1-3	Efficient Dynamic Algorithms for GTS Allocation of Wireless Sensor Network in Rail Communications by Erdenebayar Lamjav, Khishigjargal Gonchigsumlaa, Otgonbayar Bataa and Young-il Kim	75
P1-4	Full-Duplex Half-Duplex Transmission Mode Switching Schedule in Cognitive Radio Networks with Energy Harvesting by Hoan Tran-nhut-khai and Insoo Koo	76
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P1-6	A Cognitive Radio-Based Early Warning System to Mitigate the Damages of Flash Floods by Saeed Ahmed, YoungDoo Lee and Insoo Koo	76
P1-7	A Node Distribution Scheme for Maximizing Network Lifetime in Wireless Sensor Networks by Thi-Nga Dao and Seokhoon Yoon	77
P1-8	Accurate Multi-Bit Hard Decision Combination for Cooperative Spectrum Sensing in Cognitive Radio Networks by Hurmat Ali Shah and Insoo Koo	77
P1-9	Reliable Bearings Fault Diagnosis of Induction Motor Using Envelope Spectrum Analysis and Support Vector Machines by M M Manjurul Islam, Wasim Ahmed and Jong–Myon Kim	77
P1-10	Green Submarine: Context-Aware Automatic Reactor App by Seong-Hoon Jeong, Byung-Gul Kim, Won-Chan Jang and Jae-Hak J. Bae	78
P1-11	Possibility of Cellular IoT Based on LTE Networks by Buyankhishig Ulziinyam, Erdenebayar Lamjav, Otgonbayar Bataa and Khishigjargal Gonchigsumlaa	78

Poster Session - 2 (15:30~16:40, June 1), Industry-University Cooperation Hall (Lobby, 1F)
Chair: Prof. Jin-Chun Kim

Poster Session - 3 (17:00~18:00, June 1), Industry-University Cooperation Hall (Lobby, 1F)
Chair: Prof. Vladimir V. Shakhov

VIII. Plenary Talks

Plenary talk 1

Time: 10:00 ~ 10:40, May 31, 2017
Place: Industry-University Cooperation Hall (Room 120, 1F)
Title: The Development of Korean Shipbuilding Industry
Presenter: Kwang-hean An, CEO of Hyundai Global Service

Plenary talk 2

Time: 10:50 ~ 11:30, May 31, 2017
Place: Industry-University Cooperation Hall (Room 120, 1F)
Title: Industry 4.0 in Germany – Challenges and Chances
Presenter: Prof. W. Hardt, TU Chemnitz, Germany

Biography

- 1991 Diploma degree in Computer Science, Univ. of Paderborn, Germany
- 1996 Dr.-rer. nat. degree in Computer Science, Univ. of Paderborn, Germany
- 2000 PD Dr.-Irer. nat., Habilitation entitled Integration von Verzögerungszeit-Invarianz in den Entwurf eingebetteter Systeme. Univ. of Paderborn, Germany
- 2000-2002 Chair of the Computer Science and Process Laboratory, University of Paderborn, Germany
- 2002-2003 Chair (procuration) of the Operating Systems Department of faculty for Elektrotechnik / Informatik, University of Kassel, Germany
- since 2003 Chair of the Computer Engineering Department of the faculty for Computer Science, Technische Universität Chemnitz, Germany
- since 2006 Dean of the Faculty for Computer Science, Technische Universität Chemnitz, Germany
- since 2006 Scientific Director of Computing Center of Technische Universität Chemnitz, Germany

Plenary talk 3

Time: 15:15 ~ 15:55, May 31, 2017

Place: Industry-University Cooperation Hall (Room 120, 1F)

Title: Three Dimensional Nanostructures and Their Applications to Energy and Sensor Devices

Presenter: Prof. Mansoo Choi, Seoul National University, South Korea

Biography

Prof. Mansoo Choi has served as a Professor of the Department of Mechanical and Aerospace Engineering, Seoul National University, South Korea, since 1991, and a Director of Global Frontier Center of Multiscale Energy Systems since 2011. He has been an Editor-in-Chief of Journal of Aerosol science since 2004, and a President of International Aerosol Research Assembly since 2014. He received his bachelor degree in Mechanical Engineering from Seoul National University, in 1980, master degree in Mechanical Engineering from Seoul National University, in 1982, and Ph.D. in Mechanical Engineering from University of California, Berkeley, in 1987. He has published 191 refereed scientific papers, and delivered 54 invited talks. His research interests focus on nanoparticle synthesis and patterning, aerosol science, solar and fuel cells, and sensors. He was a Director of National Creative Research Initiatives (CRI) Center for Nano Particle Control, South Korea, 1997-2011. He has been a member of the Korean Academy of Science and Technology since 2014 and National Academy Engineering of Korea since 2011. He won the Kyung-Am Prize in Arts & Sciences from Kyung-Am Foundation, 100 Outstanding Research Award among nationally supported studies from the Ministry of Science, ICT and Future Planning, and Achievement Award from Korean Society of Mechanical Engineers (KSME), 2010.

IX. Invited Talks

Invited Talk 1

Date: Wednesday, May 31, 2017

Time: 16:00 ~ 18:00 / Place: Industry-University Cooperation Hall, Room 113 at the session S1-2

Title: Selective enhancement of optical nonlinearity in two-dimensional organic-inorganic iodide pervoskites

Presenter: Jang Joon Ik (Ph.D. in Physics)

Affiliation: Assistant professor in the Department of Physics of Sogang University, Seoul, South Korea

Talk summary

Reducing thd dimensionality of three-dimensional(3D) hybrid metal halide perovskites can improve their optoelectronic properties. In this talk I show that the third-order optical nonlinearity, n2, of hybrid lead iodide perovskites is enhanced in the two-dimensional (2D) Ruddlesden-Popper series, (CH3(CH2)3NH3)2(CH3NH3)n-1PbnI3n+1 (n = 1-4), where the layer number (n) is engineered for bandgap tuning from Eg = 1.60 eV (n = ∞; bulk) to 2.40 eV (n = 1). Despite the unfavorable relation, n2 ∝ Eg-4, strong quantum confinement causes these wide-bandgap 2D perovskites to exhibit four times stronger third harmonic generation at mid-infrared when compared with the 3D counterpart, (CH3NH3)PbI3. The corresponding n2 values of the 2D perovskites indeed outshine conventional semiconductors having bandgaps larger than 1.0 eV. Surprisingly, however, the impact of dimensional reduction on two-photon absorption, which is the Kramers-Kronig conjugate of n2, is rather insignificant as demonstrated by broadband two-photon spectroscopy. The concomitant increase of bandgap and optical nonlinearity is truly remarkable in these novel perovskites, where the former increases the laser-induced damage threshold for high-power nonlinear optical applications.

Biography

Joon Jang completed his B. S.in Physics from Yonsei University, Seoul, South Korea in 1994. He receivedhis Ph.D. in Physics from the University of Illinois at Urbana-Champaign in 2005. His thesis work involves modeling relaxation kinetics of excitons in Cu2O based on time-and space-resolved spectroscopy. Dr. Jang was a postdoctoral research associate at Northwestern University from 2005 to 2010. He was an assistant professor of Physics at the State University of New York (SUNY) at Binghamton from 2010 to 2017. Recently, he joined the Physics Department at Sogang University. Prof. Jang has worked on optical and electronic properties of various materials with a special emphasis on fundamental exciton physics and nonlinear optical materials for ~20years. He has published ~70publications on the subject. As a sole editor, he published the book "New Developments in Photon and Materials Research" in 2013, which updates a series articles on contemporary optical and materials sciences and engineering across multidisciplinary fields.

Invited Talk 2

Date: Wednesday, May 31, 2017

Time: 16:00 ~ 18:00 / Place: Industry-University Cooperation Hall, Room 114 at the session S2-2

Title: Case Study of Big Data Analysis for Smart Grid

Presenter: Prof. Zhu Han, ECE Department and CS Department, University of Houston

Talk summary

The advent of big data offers unprecedented opportunities for data-driven discovery and decision-making in virtually every area of human endeavor. In this talk, we zoom in to the applications of smart grid, which refers to the next generation electrical power grid that aims to provide reliable, efficient, secure, and quality energy generation/distribution/consumption using modern information, communications, and electronics technology. We further zoom in to study two specific cases. First, supported by local utility companies through electric power analytics consortium, we analyze real smart meter big data for load profiling and smart pricing. We employ techniques such as Bayesian nonparametric learning, sublinear algorithm, and deep learning. Second, we investigate how to solve Security-constrained Optimal Power Flow (SCOPF) Problem, through sparse optimization and alternating direction method of multipliers (ADMM). Finally, other research activities of our group will also be briefly described.

Biography

Zhu Han received the B.S. degree in electronic engineering from Tsinghua University, in 1997, and the M.S. and Ph.D. degrees in electrical engineering from the University of Maryland, College Park, in 1999 and 2003, respectively. From 2000 to 2002, he was an R&D Engineer of JDSU, Germantown, Maryland. From 2003 to 2006, he was a Research Associate at the University of Maryland. From 2006 to 2008, he was an assistant professor in Boise State University, Idaho. Currently, he is a full Professor in Electrical and Computer Engineering Department as well as Computer Science Department at University of Houston, Texas. His research interests include security, wireless resource allocation and management, wireless communications and networking, game theory, and wireless multimedia. Dr. Han is an NSF CAREER award recipient 2010. Dr. Han has several IEEE conference best paper awards, and winner of 2011 IEEE Fred W. Ellersick Prize, 2015 EURASIP Best Paper Award for the Journal on Advances in Signal Processing and 2016 IEEE Leonard G. Abraham Prize in the field of Communications Systems (Best Paper Award for IEEE Journal on Selected Areas on Communications). Dr. Han has been IEEE fellow since 2014 and IEEE Distinguished Lecturer since 2015.

Invited Talk 3

Date: Thursday, June 1, 2017

Time: 09:00 ~ 10:40 / Place: Industry-University Cooperation Hall, Room 114 at the session S2-3

Title: Sensing Communication Technologies for Smart City Services

Presenter: Dhananjay Singh, Ph.D., SMIEEE

Affiliation: Director of ReSENSE Labs, Chairperson of Global Division of IT Senior Members of IEEE & ACM, USA CTO of MtoV Inc., Daejeon South Korea, Assistant Professor in the Dept. of Electronics Engineering Hankuk (Korea) University of Foreign Studies, Seoul, Republic of Korea

Talk summary

Sensing communication is a new concept of computing technology which is fast emerging as a successful extension to existing Internet in an embedded devices. Researchers have visualized interconnections of billions of smart embedded devices to change the way of life. There are several Internet-of-Things (IoT) and M-2-M initiatives going on to the development of the sensing technologies for smart city services especially in machine-to-real-world and machine-to-humans. The resultant of the sensing communication objects are to utilized embedded technologies to monitor, control for the comfortable and secure human life.

In this talks, I would like to introduce a proposed distributed internet architecture model based on sensing communication services, which is based on hierarchical peer-to-peer networks an embedded 6LoWPAN devicesand physical interconnections between objects and attributes to access the location. Finally, I will present real-time test-bed and simulation scenarios for the smart city applications such as women safety services, connected vehicles, global healthcare monitoring and military services especially for intelligent security management system.

Biography

Prof. (Dr.) Dhananjay Singh is the Director of ReSENSE Laboratory, an Assistant Professor with the Department of Electronics Engineering, and the Chairperson of the Division of Global IT, Hankuk University of Foreign Studies, Yongin, South Korea, since 2012. He has published 100+ refereed scientific papers, served 100+ TPC membership, and delivered 50+ invited talks into the major IEEE conferences/workshop. His research interests focus on the design, analysis, and implementation of algorithms/protocols for large-scale data set to solve real-world problems spec. Future Internet Architecture for Smart City and IoT services. He is a Senior Member of the ACM and IEEE Society. He was a Post-Doctoral Researcher and a Senior Member of Engineering Staff of Future Internet Architecture with the National Institute of Mathematical Sciences, and Electronics and Telecommunication Research Institute, Daejeon, South Korea, from 2010 to 2012. He has won Five times best paper awards from the IEEE conferences and two times fellowship award from APAN meeting for Singapore and Manila, Philippines. He received the B.Tech. degree in computer science and engineering from Veer Bahadur Singh Purvanchal University, Jaunpur, India, in 2003, the M. Tech. degree in wireless communication and computing from the Indian Institute of Information Technology, Allahabad, India, in 2006, and the Ph.D. degree in ubiquitous IT from Dongseo University, Busan, South Korea, in 2010.

Invited Talk 4

Date: Thursday, June 1, 2017

Time: 09:00 ~ 10:40 / Place: Industry-University Cooperation Hall, Room 201 at the session S6-2

Title: Engineered Nanoporous Materials for Advanced Gas Separations

Presenter: Tae-hyun Bae Ph.D.

Affiliation: Assistant Professor in School of Chemical and Biomedical Engineering, Nanyang Technological University (NTU), Singapore

Talk summary

The development of cost-effective gas separation processes is critical to reducing energy consumption in chemical industries as well as producing clean energy that causes minimal environmental problems. For example, CO_2 separation processes are widely used in many energy and environmental technologies such as CO_2 capture in power plants, hydrogen purification, biogas recovery and natural gas treatment. Gas separation can also be employed for the management of other greenhouse gases including SF_6 and chlorofluorocarbon (CFC). While current gas separation processes including absorptions and distillations that consume a large amount of energy are too costly for widespread applications in above-mentioned areas, adsorptive gas separation utilizing nanoporous adsorbents has demonstrated a potential toward reducing cost and improving performance. In my work, various nanoporous materials including zeolites, metal-organic frameworks and amine-appended sorbents were synthesized and evaluated for potential application in CO_2 separations and SF_6 recovery. Meanwhile, membrane technology has also been considered as an energy-efficient alternative to current energy-intensive gas separation methods. One way to synthesize high-performance membrane, which is also technically viable, is via incorporation of porous material that can selectively transport targeted molecules into polymer matrices. My research group have explored various combinations of nanoporous materials and polymers to design mixed-matrix membranes for applications in clean energy production.

Biography

Tae-Hyun Bae received his B.S. (1999), M.S. (2001), and Ph.D. (2006) degrees at school of biological resources and materials engineering at Seoul National University in Korea after studying polymeric membranes and their processes for water treatments. He earned his second Ph.D. (2010) in chemical engineering at Georgia Institute of Technology under the supervision of Prof. Christopher W. Jones and Prof. Sankar Nair. His research at Georgia Tech was focused on engineering nanoporous materials for applications in gas separation membranes. He worked as a postdoctoral fellow in Jeffrey Long's research group at chemistry department of UC Berkeley, where he performed research on CO_2 capture with metal-organic frameworks and other porous materials. Now he is an assistant professor of chemical engineering at Nanyang Technological University. He has an expertise in nanoporous materials including zeolites, porous organic polymers and metal-organic frameworks for application in energy-efficient molecular separations. His research accomplishments have been published in many high impact journals including *Chem. Rev., J. Am. Chem. Soc., Angew. Chem. Int. Ed., Energy Environ. Sci., ChemSusChem, and Chem. Commun.,* and cited numerous times as highlighted in the CV (total citations 〉4000, citations per paper 〉120 from Web of Science). Since 2014, he has served as the cluster leader for membrane fabrication at Singapore Membrane Technology Center, one of the largest membrane research centers in the world.

X. Paper Abstracts

Section 1 New materials and nano-technologies

[S1-1-1] Preparation and Characterization of PVDF/Nano-Ag Composites with Enhanced Dielectric Property

Ling Weng, Hongxia Li, Xiaorui Zhang and Lizhu Liu
Harbin University of Science and Technology, China

Abstract

With the development of electronic integration technology, a dielectric material with high dielectric constant and low dielectric loss were widely demand. In this paper, a composite which use polyvinylidene fluoride (PVDF) as matrix and nano-Ag synthesized by ethylene glycol reduction method as reinforcing filler was prepared. The microstructure and properties, includes phase formation, thermal stability and electrical properties were tested and the effects of Ag nanoparticles on the dielectric property of the PVDF/Ag composite were investigated. Results showed that most of nano-Ag were rod-like, and it was uniformly dispersed in PVDF matrix. XRD spectrum indicated that the addition of nano-Ag changed the crystal formation of PVDF from multiphase coexistence to mainly β-phase occurrence, which had a strong piezoelectric properties and increased the thermal stability of the composite film. Dielectric constant of composite films with 20wt% nano-Ag exhibited 14 when the test frequency was 100Hz, which was 55% higher than that of pure PVDF, while the dielectric loss of PVDF/Ag composite was just as similar as it.

[S1-1-2] Temperature-dependent Structural, Optical, and Thermoelectric Properties in V2O5 thin Films

Manil Kang and SoK WonKim
University of Ulsan, Korea

Abstract

V2O5 thin films grown at room temperature and 500 °C were confirmed to exhibit amorphous and crystalline structures, respectively. The metal-insulator transition (MIT) in crystalline V2O5 thin films below and above transition temperature (Tc) was investigated using spectroscopic ellipsometry (SE) and x-ray diffraction (XRD) and was confirmed by measurement of the resistance with temperature. The SE and XRD results showed that the V2O5 film undergoes an MIT without a SPT near 280 °C. The lattice distortion induced by oxygen vacancy formation was observed above 598 K, and a phase transformation, indicating a variation of chemical composition, developed at 773 K. The resistivity (or electrical conductivity) of the film decreased significantly at 513 K. The resistivity and Seebeck coefficient of the film showed a characteristic of the insulating or semiconducting state, and the behaviors changed above 513 K. In the temperature range from 513 to 633 K, the power factor changed significantly with a striking peak at 573 K. Our results demonstrated that the MIT in V2O5 film is not caused by the phase transformation due to the excessive emission of oxygen. Thus, It was concluded that the MIT in V2O5 film occurs as a result of the lattice distortion induced by the formation of vanadyl-oxygen vacancies.

[S1-1-3] Study of Sintering of the Translucent Cubic Zirconia Ceramics

Paygin Vladimir, Dvilis Edgar, Khasanov Oleg and Lyamina Galina
Tomsk Polytechnic University, Russia

Abstract

The sintering kinetics of the commercial ZrO2 – 10 mol.% Y2O3 nanopowder has been investigated by the high temperature dilatometry. The studied samples were compacted as by the static uniaxial pressing so by the non-cavitation ultrasonic compaction of dry nano powder. The aracteristic temperatures of intensive shrinkage during the sintering process have been determined. The apparent activation energy and the coefficient of thermal expansion have been calculated.

[S1-1-4] Cu/Sn Solid-Liquid Interface IMC Growth and Evolution by Dipping Method

Zuozhu Yin and Fenglian Sun
Harbin University of Science and Technology , China

Abstract

The Cu/Sn solid-liquid interfacial IMCs are obtained under different dipping temperature and time by dipping method. The results show that Cu/Sn solid-liquid interface Cu6Sn5 layer growth index has a mutation, the mutation time is 40s, the time growth index is 0.08 in 10-40s, the time growth index is 0.30 in 40-190s. Cu6Sn5 grain coarsening index is constant within 10-190s, it is 0.13. The index of Cu6Sn5 grain coarsening is different from predecessors' results (Cu6Sn5 grain coarsening index for 1/3), this is due to the growth of Cu6Sn5 grain grows at expense of its near small grain to reduce the surface Gibbs free energy, its morphology changes from regular shape to irregular shape. It obtained the relationship between the time of initial formed Cu3Sn phase and the dipping temperature in 240℃-280℃.

[S1-1-5] Optimal Experimental Conditions of STS316L Metal Products Produced by Selective Laser Sintering

W. J. Kim, Jin-Hyung Kim, N. M. Thuyet and Jin-Chun Kim
University of Ulsan, Korea

Abstract

Selective laser sintering is known as an easy process to manufacture the complex shape products. In this research, the 4 types laser patterns (offset-filling, chess-board, stripe, and meander), two laser power (100W, 160W), two laser speed (1000mm/s, 1600mm/s) was used to produce 3mm3cubicsamples. Sphericaltype powder of STS316L was used as the initial material for SLS, powder bed fusion (PBF) process. Microstructural changes with laser parameters were observed by OM and FE-SEM. The relative density was changed with laser parameters. Under 160W-1600mm/s-meander pattern, the PFBed sample had the highest relative density of about 6.92g/cm3.

[S1-1-6] Facile Synthesis of Nitrogen, Sulphur and Phosphorous Ternary-Doped Reduced Graphene Oxide for Capacitive Performance

Mahima Khandelwal, Byeongsu Kim, Yuanyuan Li and Jin SuK Chung
University of Ulsan, Korea

Abstract

we have developed a facile route for the synthesis of tri-doped (N, S and P) reduced graphene oxide (rGO) under mild experiment conditions. The reduction was performed under varied pH conditions. The

N, S and P doped rGO was characterized by various spectroscopic and microscopic techniques. Further, the effect of pH has been systematically analyzed by recording the change in amount of dopant(s), bonding configuration of heteroatoms, morphology, structure and electrochemical performance. The tri-doped (N, S and P) rGO synthesized under acidic pH conditions yielded crumpled and wrinkled morphology with the high specific capacitance (Cs),while under basic pH conditions it exhibited agglomerated structure with the decrease in Cs value.

[S1-1-7] First-Principles Modeling of Hofmann-Type MOF for Drug Delivery

Bikash Mandal, Yuanyuan Li,
Jin Suk Chung and Sung Gu Kang
University of Ulsan, Korea

Abstract

In this work we have studied stability, electronic structure and application of Hofmann-type [1-5] Metal Organic Framework (MOF) by using the state of the art of theoretical calculations. We have considered different types of d8 metal ions as well as various magnetic metal ions such as Cr, Mn etc. in order to explore their effect on electronic structure in detail for this particular MOF. Our calculation reveals that formation of Hofmann-type MOF is energetically favorable for each combination of d8 metal ion and magnetic metal ion. As the size of d8 metal ion decreases, formation energy increases. Magnetic metal ions induce very interesting effect on the structural, energetic, electronic and magnetic properties of this particular MOF. The bimetallic Hofmann MOF is generally planar in nature, but we have found some twisted configuration as a ground state for the particular MOF, consisting of (Ni, Mn) and (Ni, Co). Remarkably twisting angle at magnetic metal ion is quite larger than of d8 metal center, which generally prefer square planer geometry. The overall results imply that the d8 metal center sacrifices it's planarity to provide favorable twisted alignment of ligand atoms around the magnetic metal ion, resulting energetically most stable configuration. The electronic properties of Hofmann-type MOFs are also quite interesting because all the systems possess dispersionless valence band top (VBT) in their down-spin state, which is localized on magnetic metal center and originated from dz 2 orbital of the magnetic metal ion, but the conduction band minimum (CBM) is spread out over the whole sheet. That means the charge carries are spatially separated, which is one of the most important criteria for creating potentially promising solar cell.

In Hofmann MOF, the magnetic metal ions are four co-ordinated, but usually they prefer to attain octahedral geometry. That's why Hofmann MOFs are highly reactive towards ligands. Therefore, these MOFs form three dimensional structure by linking MOF planes through bidentade ligand such as pyrazine, bipyridine etc. These three dimensional cross-linked structures contain a channel for small molecules. Many scientist already studied CO2 and CS2 absorption ability of Hofmann MOF [6-11]. In this work we have studied drug capturing abilities of Hofmann-type MOF. We have considered two different drug molecules such as fluracil and naicine inside two different MOFs consisting of (Ni, Fe), which are cross-linked by pyrazine and bi-pyridine. Our result reveals that the drug capturing ability highly depends on the size of the drug molecule – if the size of the drug molecules well suited in the pore of MOF, then the binding energy becomes quite high. The magnetic effect on binding energy of the drug molecules is not quite clear, but still it is not neligible. The most important parameter is the flexibility of MOFs – if the cross-linking ligand is flexible enough to provide space as well as suitable arrangement for the drug molecules, then drug capturing ability will be very high.

[S1-2-1] Enhanced Anticorrosive Property of Epoxy Resin Coating by Graphene

Xu Han, Xiao-Rui Zhang, Jia-Wen Zhang, Huan-Yan Xu and Li-Zhu Liu
Harbin University of Science and Technology, China

Abstract

Graphene-based epoxy resin coating has been regarded as a promising kind of anticorrosive materials and thus attracted more and more attention. In this work, graphene oxide (GO) was firstly prepared from natural flake graphite by Hummer's method and then reduced by Vitamin C to obtain reduced graphene oxide (rGO). The characterizations of GO and rGO were implemented by transmission electron microscopy (TEM) and Raman spectrum (Raman). Then, the hardness, thickness, and electrochemical and anticorrosive properties of graphene-based epoxy resin coating with 0.6 wt.% graphene content (GEP-06) were analyzed using blank epoxy coating as the comparison. The results indicated that GEP-06 exhibited more excellent electrochemical and anticorrosive properties and would be a competitive candidate as anticorrosive material.

[S1-2-2] Synthesis and Characterization of Ni Particles

Tsermaa Galya[1], Ali Roshanghias[2] and Herbert Ipser[2]
[1]Mongolian University of Science and Technology, Mongolia [2]Vienna University, Austria

Abstract

The current study focuses on the synthesis and characterization of Ni particles. Synthesis of Ni particle was done using chemical reduction and Nickel chloride (NiCl2) was chosen as a source of Ni ions. Particles were synthesized by the reduction of Ni ions at pH~12. X-ray diffraction was used to identify the structure of the synthesized Ni particles. Additionally, Scanning Electron Microscopy (SEM) was applied to characterize the size of the Ni particles; SEM images demonstrated the presence of anoparticles in the size range of 220-650 nm. Furthermore, PVP agent seems to be effective in reducing the Ni particle size to 250 nm.

[S1-2-3] Fabrication of ABS-Ni Composite Filament for 3D Printing by Using the Milling and Subsequent Extrusion Method

Minh-Thuyet Nguyen, Jin-Hyung Kim, Dong-Wan Lee and Jin-Chun Kim
University of Ulsan, Korea

Abstract

In this study, Nickel-Acrylonitrile Butadiene Styrene (Ni-ABS) composites were fabricated from ABS pellet and Ni powders with the ratio of Ni were 10 and 20wt.% by milling process. The as-fabricated ABS-Ni composite was extruded in filament form and then it was used in a 3D printer to make a real object. The result showed that this kind of material could be applied in the 3D printing field.

[S1-2-4] Graphene@CdS Attached Upconversion Metal Organic Nanocapsules for Enhanced Water Splitting

Sundaram Chandrasekaran[1], Linlin Wang[1], Lijun Sui[1], Yen Linh Thi Ngo[1], Wei An[2] and Seung Hyun Hur[1]
[1]University of Ulsan, Korea
[2]Shanghai University of Engineering Science, China

Abstract

Herein, we report a new class of upconverting ma-

terials based on graphene and CdS attached with all-in-one "smart" upconversion (UC) Silica nanocapsules with well-ordered nanostructures and enhanced UC blue fluorescence, with an aim to provide an important tool for their extensive application in solar water splitting. The 2 wt % of graphene/ SNC/ Pt(OEP)/DPA/CdS sample showed a high photocurrent of 0.124 and mA cm–2at0.7VvsAg/AgClunder1 sun power light.

[S1-2-5] Self Carbonate Doped Iron-Cerium@graphene Oxide Composite for Organic Dyes Degradation

Aniruddha Molla, Byeongsu Kim, Yuan yuan Li and Jin Suk Chung
University of Ulsan, Korea

Abstract

Graphene oxide supported carbonate doped Iron-cerium were synthesized in hydrothermal reaction with the variation of carbonate content. After successful synthesis and characterization, visible light driven photocatalytic activities were tested under 20 watts lamp for the degradation of organic dyes. Band gap and surface area were very much dependent with the variation of carbonate content and that reflects in their photocatalytic activities. It was observed that catalyst produce reactive oxygen species (ROS) that is active component for the fast degradation of dyes. The degradation of methylene blue is quantitative and repetitive also.

[S1-3-1] A Study of Ferrospheres in the Coal Fly Ash

G.Batdemberel
Mongolian University of Science and Technology, Mongolia

Abstract

The amount of silica, aluminum, calcium, potassium, magnesium, sodium, titanium and phosphorus oxides contained in power plant fly ash was determined by XRF analysis. Concentration of heavy metals in fly ash was in sequence of Pb 〉 Zn 〉 Cu 〉 Cr 〉 Ni. As results of SEM, except for porous and hollow particles, large and small microspheres were observed. These particles are classified as ferrospheres. X-ray diffraction analysis show that fly ash consists of the following crystal phases: quartz, albite, anorthite and hematite.

[S1-3-2] Purification of Carbon Nanofibers by Nitric acid

Alexander G. Bannov
Novosibirsk State Technical University, Russia

Abstract

The purification of carbon nanofibers in nitric acid solutions was carried out. The efficiency of CNF purification was determined by the value of ash content. The ash content was determined by burning of the sample. The sampling technique and thermogravimetric analysis were used for determination of ash content.

[S1-3-3] Characteristics of Some Commercial Copper Backing Shoes Using in Welding Pipe Machine

J.H. Kim[1], Minh-ThuyetNguyen[1], Jin-ChunKim[1], H.W.Park[1], J.S.Ahn[1], I.K.Park[1], H.T.Lim[1], J.S.Lee[2], G.S.Lee[2], S.S.Lee[2] and H.S.Kim[2]
[1]University of Ulsan, Korea
[2]R&D Center, Kumsung GTC Co.LTD, Korea

Abstract

Backing shoe is the most important parts in the automatic welding pipe machine. Investigation on its characteristics could help to improve working effective and reduce production cost. In this paper, some kinds of copper backing shoes using in Internal Line-Up Clamp (ILUC) machine that made in France, England and Korea was examined based on estimated the composition, mechanical properties, microstructure, as well as thermal and electrical conductivity properties.

[S1-3-4] A study on Effects of Different Ambients on Properties of Cu Particle and Cu Nanofluid Synthesized by Electrical Explosion of Wire.

Thuyet-Nguyen Minh, Jin-Hyung Kim, Hyun-Woo Park, Jae-Sung, Ahn and Jin-Chun Kim

University of Ulsan, Korea

Abstract

Copper nanoparticles and nanofluids were synthesized using electrical explosion of wire (EEW) in DI water, ethanol and acetone, respectively. X-ray diffraction (XRD) analysis showed that only pure Cu phase appears in acetone condition, but CuO and CuO2 phases could be observed in the others. The particl sizes was broadened from under 50 to 100 nm, and it seem to be that acetone is the best condition for achieving a small particles, preventing the oxidation of the obtained Cu particles and stability of the nanofluids.

[S1-3-5] Photo-Enhanced Selective Hydrogenation of Nitroarenes Using Pt/ZnO Catalyst

Yen-Linh Thi Ngo[1], Linlin Wang[1], Eui Jung Kim[1] and Doan Van Thuan[2]

[1]University of Ulsan, Korea

[2]Leibniz Institute for Catalysis, Germany

Abstract

Pt-ZnO hybrid catalysts were synthesized via a facile wet chemical method for use in the photoenhanced selective hydrogenation of nitroarenes. The Pt-ZnO hybrid exhibited a good catalytic performance under UV irradiation. The reaction rate constant for the reduction of o-nitroaniline was significantly increased from 0.068 min-1 for dark reaction to 0.575 min-1 for UV-enhanced reaction. This resulted from the increased photo-excited electron transport from ZnO to Pt interface, making electrons strongly perturb at the Pt surface to enhance hydrogen dissociation.

[S1-3-6] The Properties of Hydrogen Storage on K1-xMxMgH3 (M=Li,Na,Rb,orCs) Perovskite Hydrides: AFirst-Principles Study

Yuanyuan Li, Byeongsu Kim, Sunggu Kang and Jinsuk Chung

University of Ulsan, Korea

Abstract

Recently several perovskite-type hydride materials has attracted a lot of interest to explore their suitability and stability for hydrogen storage. Among these perovskite-type hydrides, AMgH3(A-alkaliel ements)has been received considerable attention. In particular, KMgH3 is one of the new promising candidates for hydrogen storage due to its light

weight and relatively low cost. Hence, we used first-principles density functional theory (DFT) calculations to investigate the structural and phase stability and electronic properties of M-doped KMgH3(M = Li, Na, Rb, or Cs) at the A-siteof hydrides.To obtain the best reaction pathway to release hydrogen, the formation enthalpies (ΔHf)in four possible dehydrogenation reactions were calculated. In addition, the strain effects on the enthalpy of formation were systematically examined. It will be useful to efficiently design the new promising perovskite-type hydridesforhydrogen storagebased on these studies.

[S1-4-1] Simulation Analysis of Electrical Field Distribution in HVDC Cable Joints

Ruimin Zhang and Peihong Zhang
Harbin University of Science and Technology, China

Abstract

Electrical field distribution in HVDC cable accessory is impacted by conductivity of insulating material. The COMSOL Multiphysics is utilized to simulate the electrical field distribution in HVDC cable joints under different nonlinear electric conductivity of insulating material, core temperature and polarity reversal time. It is found that, along with the increase of cable core temperature, the electrical field at stress cone root rises faster than it does at the shield tube end, and the maximum electrical field appears in the XLPE insulation. Along with the increase of polarity reversal time, the decreasing tendency of maximum electric field in XLPE and at shield tube end is found, but there is no obvious change of maximum electrical field at stress cone root. The nonlinear conductivity of reinforce insulation in the cable accessory is obtained by adding nano size particles to the material to reduce the activation energy and increase the electrical field dependence coefficient, which makes electrical field distribution in cable joints more uniform. Therefore, it is one important pathway to improve the reliability of HVDC cable accessory.

[S1-4-2] A study on the Crosslinking of Polyvinyl Alcohol/Lactic acid Polymer Films

Solongo Ganbold[1], Vladimir Sedlarik[2] and Petr Saha[2]
[1]Mongolian University of Science and Technology, Mongolia, [2]Tomas Bata University, Czech

Abstract

In this work, polyvinyl alcohol (PVA)/ L-lactic acid(LA) / glutaraldehyde (GAD) films were prepared by solvent casting method. Mechanical properties, degree of swelling and solubility of the prepared films were characterized. PVA/LA films crosslinked with GAD showed that 0.25 wt. % presence of GAD can ensure a sufficient crosslinking action.

[S1-4-3] Effect of Ultrasonic Assisting Spin Coated Hole Transport Layer in Organic Solar Cell

Jong-Won Yun, Se-Jeong Jang and Yong Soo Kim
University of Ulsan, Korea

Abstract

In this study, we present a new ultrasonic assisted spin-coating technique to improve contact between thin film and substrate. This technique couple the conventional spin coater with an ultrasonic generator to provide external perturbations during the coating process. The ultrasonic waves vibrate the loosely bonded molecules of coating material during the spin coating. This effect greatly reduces voids between thin film and substrate which results in an improved contact. Furthermore, we study the effect

of this process by coating the hole transport layer PEDOT: PSS on FTO substrate of organic solar. As a result, the organic solar cells fabricated by ultrasonic assisted spin-coating showed 13.3 % higher efficiency compared to the traditional spin-coating method. The results clearly show that the ultrasonic assisted spin-coating process is a simple and powerful technique which can significantly improve the spin coating technique.

[S1-4-4] Chemical Assessment Study of Bioactive Components Such as Polyphenolic and Vitamin Families from Seabuckthorn (HipPophae Rhamnoides.L) Pulp Extraction in Mongolia

Battulga.G Uuganchimeg B and
Tsatsral.I Turmunkh G
Mongolian University of Science and Technology, Mongolia

Abstract

Research study is aimed to identify ingredients and quantitation of bioactive components that will eventually allow the screening evaluation of functional medicinal herbs, specially, extract of Seabuckthorn (Hippophae rhamnoides) enhance body strengthening, immunity and inflammation and against aging. seabuckthorn is an economically and ecologically important medicinal plant comprising of species which are winter hardy, dioeciously, wind-pollinated multipurpose shrubs bearing yellow or orange berries with nitrogen-fixing ability. Objective of the study was to develop a simple, precise and accurate high performance liquid chromatography (HPLC) method, for the determination of polyphenolic compounds as flavonoids in Sea buckthorn by HPLC with C18 (100 x 4.6 mm; 5 µm) column were used. Calibration graphs plotted with five concentrations of each vitamin where linear regression coefficients R2 〉 0.9972. And limit of quantitation values were 10, 20, 30 40, 50 µg/l with DAD for vitamins B1, B2, B6, B9, and C respectively. The proposed method was successfully applied to analysis mixture of five water-soluble vitamins in pure form and in sea buckthorn, with average recovery of 98.14% to 100.96%. As current research, extracts of sea buckthorn has been shown to have a potent antioxidant activity, mainly attributed to its flavonoids and vitamin C content. Taken together, the present study demonstrates that sea buckthorn juice is the source of valuable chemical including vitamin C, micro and macronutrients, sugars and organic acids and oil, therefore sea buckthorn is the best nutritional/ medicinal source for the human and the commercialization of these individual products would be a great achievement in alternative nutritional diet sources.

Section 2

Information and communication technologies

[S2-1-1] The Method to Predict the Actions of the Person by Examining the Amount of the Alcohol in the Blood

Munkhjargal Purevdorj, Taivanjargal Dovchin and Ganbat Tsend
Mongolian University of Science and Technology, Mongolia

Abstract

Although the current Mongolian laws and regulations plays an important role to ensure the safety of the vehicle driving but the non-declining situation of the number of the traffic violations has become a problem facing to our society today. So, there is a need of the newly "intelligent system of the safety" to be used in the specific society levels in addition to the police cars, car sellers and own responsibilities of the drivers' personal approaches. By the implementation of the systems able to predict the further actions of the drivers with alcohol amounts in their bloods and transmitting the data to the police and families will help to stop the social issues such as driving while drunk.

[S2-1-2] A Gaze-Tracking System Based On Iteration Threshold

Lin lin Li, Peng Wang and Ming lei Shao
Harbin University of Science and Technology, China

Abstract

The gaze-tracking technology has a wide application prospect in the field of HCI (Human Computer Interaction), especially as the irreplaceable role in neuro-medical and human machine engineering. An algorithm for eyes location is presented in this paper based on the pupil and corneal reflection principle using threshold iterative technique. Firstly, it uses the IR features of eye to extract eye image. Secondly, image binarization is realized by improved segmentation algorithm based on iteration of threshold. This algorithm is used to locate the pupil area. Thirdly, edge detection based on Canny operator is used to obtain margin of pupil and Purkinje spot. The center of pupil and Purkinje is located by ellipse fitting. Finally, mapping relation between center of pupil and gaze spot is built by polynomial function. The gazing direction can be tracked through above steps. The simulation results acquired by software named MATLAB 2012a show that gaze direction is tracked effectively via the proposed method, and it shows the maximum errors are 7 pixels in longitude, and 9 pixels in horizontal respectively. It has wide applicability in field of human-computer interaction.

[S2-1-3] Digital Organizational Communication Targeting Hard-To-Reach Employees: A Field Study of A Digital Signage Experience

Placide Poba-Nzaou[1], Sylvestre Uwezeyemungu[2], Youssouph Coulibaly[3] and Adéromou Boris Aissi[3]
[1]Organization and Human Resource Department ESG School of Management, UQAM [2]Accounting Department University of Quebec in Trois-Rivières,
[3]University of Quebec in Montreal, Canada

Abstract

Digital signage systems (DS) are used for advertising specific content to broader or restricted audiences in public or private areas. Over the past few years, they have become ubiquitous in public or semi-public spaces; and more recently they have been adopted in enterprise premises for internal digital organizational communication. Despite digi-

tal signage systems' popularity, little is known about factors that may influence their acceptance or rejection by employees.

This research is a field study of factors that influence the acceptance or rejection of the digital signage system for internal communication in a large north-american organization with over 3000 people that are widely geographically dispersed with a substantial proportion of hard-to-reach employees. Drawing upon four complementary theoretical lenses (critical success factors, information worlds, information value, and dimensions of internal organizational communication) the analysis of DS lifecycle dynamics highlights several drawbacks of the practices that were mobilized to assess and meet the actual information needs of employees. For managers, this study provides insights on factors that would enhance employees' acceptance of a DS for internal organizational communication.

[S2-1-4] Visible Nearest Surrounder Query in Obstacle Space Based on Hybrid Index

Sun Dongpu, Wang Chong, Chen Deyun,
Gao Xueyao, Sun Xiaohua and Wang Lili
Harbin University of Science and Technology, China

Abstract

Obstructed nearest neighbor query is a kind of nearest neighbor query for the existence of obstacles, which has important application value in the field of geographic information system, spatial analysis for existing obstacles and so on. The problem of visible nearest surrounder query in obstacle space is put forward, and the related definitions are formalized. A hybrid index structure is presented, which represents and stores the data objects and obstacles with the same description method. The algorithm is proposed which deals with the visible nearest surrounder query based on the hybrid index structure. The performance of the algorithm is analyzed by using both real and synthetic datasets, and the experimental results show that the algorithm presented can deal with the visible nearest surrounder query effectively.

[S2-1-5] Secure Multi-Hop Data Transmission in Cognitive Radio Networks under Attack in the Physical Layer

SDuy-Thanh Pham, Hiep Vu-Van,
Vladimir V. Shakhov and Insoo Koo
University of Ulsan, Korea

Abstract

Cognitive radio networks (CRNs) have a short-com ing in that attackers can increase their ability to disturb secondary users (SUs). This paper focuses on jamming attacks in the physical layer, in which several attackers try to interrupt SUs by injecting the interference into their communications. Once a jammer transmits interfering signals on the channel during the defined time, all ongoing transmissions on this channel will be corrupted. It is quite difficult for SUs to protect a single-hop data transmission from jammers. So, obtaining a solution for secure multi-hop data transmission in the presence of jammers becomes a more challenging task in CRNs. This paper investigates a strategy to find the optimal route and channels for transmission between cognitive transmitters and receivers in the presence of jammers in CRNs. In this scenario, the jammers are located randomly and their jamming behavior is assumed to follow a Gaussian distribution. We provide an optimal link–channel pair allocation scheme in which the secondary transmitter (the source) selects the best relay and a suitable channel for each hop in the source-to-destination route to protect the information intended to the secondary receiver (the destination) from the jammers.

Simulation results prove the efficiency of the proposed scheme in a CR network.

[S2-1-6] EECOR: An Energy Efficient Cooperative Opportunistic Routing Protocol for Underwater Acoustic Sensor Networks

Md Arifur Rahman, YoungDoo Lee and Insoo Koo
University of Ulsan, Korea

Abstract

In this paper, we propose an energy efficient cooper ative opportunistic routing protocol (EECOR) in which the source node will first determine a forwarding relay set based on the local depth information and then, the source node will broadcast the packets for the neighboring relay nodes. In EECOR, a fuzzy logic based relay selection (FLRS) scheme is proposed to find the best possible route to forward the packets to the surface sink based on the energy consumption ratio (ECR) and the packet delivery probability (PDP) of each relay node. In the proposed scheme, the waiting time of each forwarding relay node is designed to prevent the collisions and retransmissions amongst sensor nodes while the packets are delivered to the surface sink. Consequently, the proposed scheme can increase the transmission reliability and enhance the network lifetime by consuming lower energy in packet transmission. Our simulation results are carried out in Aqua-sim an NS-2 based underwater simulator and the evaluated results reveal that EECOR performs better in terms of average packet delivery ratio with the depth based routing (DBR), the fuzzy depth-based routing (FDBR), the vector-based forwarding (VBF) and the hop-by-hop vector-based forwarding (HH-VBR).

[S2-1-7] Automated Feature Extraction for Detecting Brain Tumors in Magnetic Resonance Imaging Using a Genetic Algorithm

Md Junayed Hasan, Dileep Kumar Appana, Sohaib Muhammad and Jong–Myon Kim
University of Ulsan, Korea

Abstract

Developing an efficient automated system that can classify condition of the brain by identifying the presence of tumor can be a challenging task in medical image processing because the image and structure of the brain is very complex and have encumbrance of an expert for analysis. This paper proposes a hybrid approach with combination of Anisotropic filter (ANF) for de-noising and enhancement, genetic algorithm based multilevel thresholding (GA-MT) for segmentation and feature extraction for detecting the condition of the brain. We utilize a modified binary decomposition technique (BDT) to obtain a minimum feature vector. Finally, the feature vector is fed to support vector machines (SVM) classifier to detect abnormality. The performance of the proposed approach is evaluated using the classification accuracy, where our approach is effective with minimum accuracy of 90%.

[S2-2-1] Performance Analysis of WSN Topology for Freight Train Monitoring

Khishigjargal Gonchigsumlaa[1], Bumduuren Pumbuurei[1] and Young il Kim[2]
[1]Mongolian University of Science and Technology, Mongolia, [2]IoT Research Department, Electronics and Telecommunication Research Institute, Daejeon, Korea

Abstract

An international freight transportation of Mongo-

lianrailway is willing to increase 2.5 times in 2016 compared to 2015, in addition to the future looks significantly increase rail freight transportation. This work contributed to Mongolian and Korean joint project named WSN based monitoring railway. Before implementation of monitoring system, we tested our system in some environments. The purpose of this paper is to analyze the performance of the wireless sensor network topology for freight train monitoring using Opnet network simulation software. Our simulation results show that tree topology for chain-like topology railcar network is reasonable to use multi number of PAN coordinator for reliability of interwork.

[S2-2-2] Development Issues of ICT Sector in Mongolia

Tsetsgee Bayasgalan and Burmaa Myagmar
Department of Technology Management
School of Business Administration and Humanities
Ulaanbaatar, Mongolia

Abstract

ICT serves as a factor that defines recent global development trends and is an accelerator for the socio-economic development of the world countries, as well as being a tool which ensures human development and freedom. With the rapid development of ICT, there is a need to study updates, changes, new concepts, definitions and development indicators developed in all social sectors and said the application of these. This paper identified some suggestions for development ICT sector, in accordance with current situation of ICT sector and economy of Mongolia, and its trend.

[S2-2-3] A Multi-Objective Algorithm of Complex Product Flexible Scheduling Based on Priority Rule Sequence

Zhiqiang Xie, Yingchun Xia and Yu Xin
Harbin University of Science and Technology, China

Abstract

In recent years, many algorithms for complex prod uct flexible scheduling problem based on exact rule methods are proposed, most of them optimize only one objective. Now, we will argue a multi-objective complex product flexible scheduling algorithm with four objectives, where the time, cost, equipment load rate and key equipment load rate are used as objective functions. At first, the scheduling model based on priority rule sequence for the problem is set up. One priority rule sequence corresponds to one scheduling solution, one element of the priority rule sequence represents one method of selecting a node from available procedure set and allocating a machine to the node. Secondly, to evaluate solutions and select the optimal compromise solution in multi-objective sense, non-dominated sorting method and analytic hierarchy process approach are adopted. Finally, instance result shows that the proposed algorithm is efficient.

[S2-2-4] Secure Transmit Design for SWIPT System with Passive Eavesdropper

Pham Viet Tuan and Insoo Koo
University of Ulsan, Korea

Abstract

This paper studies a simultaneous wireless informa tion and power transfer (SWIPT) system in which a transmitter not only sends data and energy to many types of wireless users such as multiple information decoding (ID) users, multiple hybrid

power-splitting (PS) users (i.e., users with power-splitting struc ture receive both information and energy), and multiple energy harvesting (EH) user, but also secure information from a passive eavesdropper. The transmitter is equipped with multiple-antenna whereas all users and eavesdropper are assumed to be equipped with single-antenna. Since the transmitter does not know any channel state information (CSI) of the eavesdropper, the artificial noise (AN) power is maximized for masking information as well as interfering the eavesdropper as much as possible. The non-convex optimization problem is formulated to minimize the transmit power satisfying all required signal-to-interference-plus noise (SINR) and harvested energy for all users so that the remaining power for generating AN is maximized. In case of the perfect CSI, the semidefinite relaxation (SDR) technique is applied and the optimal solution is proved to be tight.

[S2-2-5] Sensor Faults Classification Using Support Vector Machine and Statistical Time-Domain Features

Sana Ullah Jan and In Soo Koo
University of Ulsan, Korea

Abstract

Sensor fault types, such as erratic fault, hard-over fault, spike fault, and stuck fault, are dealt with primarily in this work, to the best of authors' knowledge. A temperature-to-voltage converter is used to obtain the normal data of 100,000 data elements. The collected data is then divided in 100 samples, each containing of 1000 data elements. Five types of sensor faults including drift fault, hard-over fault, erratic fault, spike fault, and stuck fault, are simulated in the normal data samples. Finally, dataset containing 100 samples of each fault type as well as normal data is obtained. A support vector machine (SVM)-based classifier was used in one-versus-rest approach for multi-class data classification. The radial-basis function (RBF) kernel was used to compute the similarity between the samples. The radial-basis function width 'σ' was varied manually from 0.1 to 2, to obtain the accuracy of SVM for each case. The classifier achieved highest total accuracy at σ=0.9. The total accuracy of SVM was also observed by varying the size of training set. The highest total accuracy of 98.05% was achieved for σ=0.9 when 60 samples were used to train SVM.

[S2-3-1] Detection of Nonlinearly Distorted OFDM Signals via Generalized Approximate Message Passing

Sergey V. Zhidkov
Cifrasoft Ltd., Izhevsk, Russia

Abstract

In this paper, we propose a practical receiver for multicarrier signals subjected to a strong memoryless nonlinearity. The receiver design is based on a generalized approximate message passing (GAMP) framework, and this allows real time algorithm implementation in software or hardware with moderate complexity. We demonstrate that the proposed receiver can provide more than a 2dB gain compared with an ideal uncoded linear OFDM transmission at a BER range 10–4÷10–6 in the AWGN channel, when the OFDM signal is subjected to clipping nonlinearity and the crest-factor of the clipped waveform is only 1.9dB. Simulation results also demonstrate that the proposed receiver provides significant performance gain in frequency-selective multipath channels.

[S2-3-2] Technology Readiness Level of Information Telecommunication Sector Research in Mongolia

Oyuntungalag Yadamsuren and Enebish Jambal
Mongolian University of Science and Technology, Mongolia

Abstract

According to the Information Telecommunication /IT/ sector of Mongolia, advanced technology and its following equipments are mostly imported from foreign markets. Advantage of Mongolian market, we have the capacity for technology development and product positioning to the end user. herefore it has seen as advanced technology and its development has high value to the telecommunication sector. On the other hand, it is very important to clarify that current consumer's buying culture, education level of ICT sector, usage of the Ecommerce, target market of B2C and B2B ratio within the country. This presentation goal is to define the advanced technology readiness to the usage of consumers and retailers. herefore favourable environment condition needed for improved technological development in order to have effective technological innovation in the Telecommunication industry, hence effectiveness influence of innovative technology to business sectors. Also the infrastructure policy required to be updated for adapdation of technological innovation. Furthermore, evaluation process for any adaptation of new technology and sufficiency of innovative technology to the small and medium sized enterprises (SME) are necessary.

[S2-3-3] Malicious User Mitigation Based on Similarity Based Correlation Sensing Scheme in Cognitive Radio Network

Muhammad Sajjad Khan[1] and Insoo Koo[2]
[1]Department of Electrical Engineering,
International Islamic University, Pakistan
[2]University of Ulsan, Korea

Abstract

In cognitive radio network (CRN) Spectrum sensing plays a vital role. Spectrum sensing measures the presence or absence of primary user (PU) in the network, which measure the performance of the system. The performance of the system is highly degraded by the presence of the malicious users (MU). In this script, we have tackled spectrum sensing data falsification (SSDF) attack. In the proposed scheme we considered a correlation based method between the sensing of each user and the average value of the sensing information of others users for minimizing spectrum sensing data falsification (SSDF) attacks. In the proposed scheme, each secondary user (SU) reports fusion center (FC) with a hard decision of the sensing energy to FC to indicate the presence or absence of the PU. FC determine abnormality of the user among all by determining similarity for each SU with other SUs by following the proposed scheme and declare MU as outlier using box plot if any. Through simulation results, the most harmful class of malicious user, both opposite malicious user (OMU) and random opposite malicious users (ROMU) are demonstrated.

[S2-3-4] Automatic Collision Avoidance Control for Quadcopter Using PWM Signals

Jung Chul Lee, Ui-PilChong and Yearn-Min Kim
University of Ulsan, Korea

Abstract

In this paper we propose the efficient automatic control method for collision avoidance of the quadcopter drone. This control method explains that the user receive the signals from the quadcopter using the knob in RC controller and protect the avoidance by control information of throttle and pitch among PWM signals.

The distance measuring sensors are installed at the position of the front, back, left, right, upper, and lower sides in the drone for periodic distance measurements to predict the collisions. Drone can decide to existing obstacles using the information of distance and then protect the avoidance by transferring the signals to the flight control part after changing the received PWM signals. The simulation results showed the algorithm worked well for avoidance of drone collision through the experiments.

[S2-4-1] Telemedicine System Based on Portable Electroencephalogram Signal Acquisition Equipment

Yonghao Jing, Peng Wang and Shanshan Li
Harbin University of Science and Technology, China

Abstract

Currently, electroencephalogram equipments are expensive and bulky. In order to collect electroencephalogram signals without distortion, reduce the size of the device and meet the needs of making electroencephalogram equipments family and community, in this paper, a telemedicine system based on portable electroencephalogram signal acquisition is developed. The system uses a portable electroencephalogram acquisition device to obtain pure electroencephalogram signals. Then the electroencephalogram signals are displayed on the LCD screen and stored in the SD card. Electroencephalogram data is uploaded to the server by network communication. Personal information of patients is managed by Structured Query Language Server database on the server and patients' electroencephalogram data files are saved on the server. In order to ensure the accuracy of the data transport, buffers and hash map are used to realize of double confirm and retransmission timeout on the application layer. Doctors can download the electroencephalogram data files on doctor client. Doctors check and analyze electroencephalogram on the remote doctor client. As a return, Doctors can give diagnostic results to the server and patient. Experimental results show that the system can meet the design requirements, acquire weak electroencephalogram signals in real time, display and save the processing results, implement telemedicine. The acquisition system is easy to use and carry, and helpful to the popularity of community-based and family-based electroencephalogram diagnostic equipments.

[S2-4-2] The Data Processing and Decision Support in Healthcare Systems

Pavel Stashevsky, Irina Shvaykova and Natalya Bannova
Novosibirsk State Technical University, Russia

Abstract

The article describes the characteristics of diagnostic and management tasks solved in healthcare information systems. We propose an approach based on the use of ensemble models (variant modeling) to solve problems of decision support. The variant modeling is a method that applies the set of models

for solving one task. The models can have different structures and use different input features. Also, we propose the method called "Modeleteka" for structure store and automatically select models to solve tasks in healthcare information systems. This method allows append new models and train old from ensemble in the maintenance of information system.

[S2-4-3] Delay-Based Channel-Aware Routing Protocol for Underwater Cognitive Acoustic Networks

Huma Ghafoor[1], Insoo Koo[1] and Youngtae Noh[2]
[1]University of Ulsan, Korea
[2]Department of Computer Science and Information Engineering Inha University, Korea

Abstract

Cognitive routing for underwater ad hoc sensor networks is proposed in this paper to find a stable path between source and destination by taking into account the transmission delay. Relay selection is one of the key design factors in underwa ter cognitive acoustic networks that significantly improve network performance. For the selection of next hop relay node, the primary task of cognitive routing is to find common free channel between two communicating nodes. We perform spectrum sensing using energy detector scheme to find list of free channels. Each sensor node then exchanges beacon messages within its transmission range with local sensing results as an extra entity. The selection of relay node is determined by calculating the transmission delay; the node having minimum transmission delay is selected as the next hop node for establishing stable path between source and destination. We perform simulations vians-MIRACLE for different number of channels using Bellhop channel simulator and report significant improvement in end-to end delay in comparison with existing solution.

[S2-4-4] Revealing the Social Group Structure Using Human Encounter Traces

Cong-Binh Nguyen and Seokhoon Yoon
University of Ulsan, Korea

Abstract

Recent studies have found that a society can be divided into multiple social groups, in which the subjects in the same group have denser and stronger social links, compared to subjects from different groups. In this paper, we study a problem of detecting social group structure in a human network, through examining real-life mobility traces. In our social group detection schemes, we focus on measuring social similarity, the metric that reflects the level of social closeness between subjects. Then, clustering algorithms are used to partition the users into multiple social groups. We also present an evaluation method that are based on the natural characteristic of human friendship.

[S2-4-5] A Study on Quantum Stabilizer Codes with Length 7

Duc Manh Nguyen and Sung hwan Kim
University of Ulsan, Korea

Abstract

In this work, we are studying about the construction of quantum stabilizer code (QECC) from classical binary. First the construction of quantum stabilizer code from modified circulant matric is discussed. Then, we investigate the complete efficient encoding and decoding quantum circuit of [[7,1,3]]. QECC [[7,1,3]] that construction based on our method is a seven-qubit code that protects a one-qubit state with up to one error, which is very important for quantum information processing.

Section 3

Mechanical engineering, robotics, and automation

[S3-1-1] Research on Field Precision Spraying Operation System in Remote Monitoring

Luo Zhongming, Zeng LiLiu and ZhuofuMa Yibo
Harbin University of Science and Technology, China

Abstract

With the rapid development of agricultural mechanization in China, large-scale agricultural spraying can not meet the requirements of precision agriculture. At the same time due to crop pests or pathogen survival habits, large area spraying can not effectively remove the crop leaves under the pests or bacteria.

Therefore, this paper launched a remote monitoring field precision spraying operating system research. First of all, corn as an example of the precision spraying operation of the benefit analysis, analysis shows that the use of the system can save a lot of dosage, to prevent excessive dose of residual pollution of the environment. And then introduced the overall structure of the system, the structure of the use of wireless terminals on a number of field operations spray robot at the same time monitoring, effectively improve operational efficiency. Finally, the software of the control system is introduced. After field experiments show that the system is consistent with the results obtained by the benefit analysis, the remote monitoring field precision operation is realized.

[S3-1-2] Employability Skills of Students Majoring Mechanical Engineering

Chuluuntsetseg LKHAGVASUREN
Mongolian University of Science and Technology, Mongolia

Abstract

It is recognized that the skills of graduates from higher technical institutions is a significant factor for successful employment. In February 2017, Mongolia's population was at 3.1 million, with an unemployment rate of 8.6%. There are many job seekers who are graduates from Mongolian universities and colleges.To improve the quality of training and employment the graduates, schools need to develop training curricula which provides the necessary skills to meet the demand of the labor market. The objective of this study is to study theory of employability skills and the development of those skills in during training in higher technical institutions.

[S3-1-3] Labview FPGA Based Robot Manipulator Control

Quang Dan Le, Hee-Jun Kang and Tien Dung Le
University of Ulsan, Korea

Abstract

This paper presents hardware setup for Fara 6-DOF manipulator control using feedforward neural network based on Labview FPGA. The Labview FPGA have the high speed computation capability so that it allows multiple control loops and results in good trajectory tracking performance. Both the proposed algorithm and hardware setup were implemented to show its effectiveness.

[S3-1-4] Adaptive Tracking Control of Robot Manipulators Using Neural Network for Friction and Uncertainties Compensation

Anh Tuan Vo, Hee Jun Kang and Tien Dung Le
University of Ulsan, Korea

Abstract

In this paper, a novel controller is implemented for robot manipulators. Fuzzy adaptive sliding mode control based on a neural network is used to completely approximate frictional uncertainties and external disturbances. The simulation result shows that an estimator combining a neural network with a fuzzy system has better capability of estimating uncertainties than a fuzzy system alone. And also, the proposed controller results in less chattering, very small tracking errors and its robustness against uncertainties and external disturbances.

[S3-1-5] Transient Simulation for Heat Transfer and Pressure Drop of a Helical Heat Exchanger

Thien Tu Ngo[1], Geun Sik Lee[1]
and Nguyen Minh Phu[2]
[1]University of Ulsan, Korea
[2]Bach Khoa University, Ho Chi Minh City, Vietnam

Abstract

Numerical simulations are performed to investigate transient temperature and pressure distributions of a helical heat exchanger with aid of ANSYS FLUENT software. Present result showed unsteady temperature and pressure distribution of the helical heat exchanger and predicted the period to attain a steady state. The influences of the mass flow rate of the hot fluid on heat transfer and pressure drop are also investigated. During the transient period, the temperatures of both the hot and the cold fluid changes remarkably but pressures maintains nearly constant with respect to time. As the mass flow rate of the hot fluid increased, both the heat transfer and pressure drop were increased. Moreover, comparison between present simulation and mathematical model from previous results shows good agreements for heat transfer rate and pressure drop in the steady state condition.

[S3-1-6] A Robust Fault Diagnosis for the Robot Manipulator Using Third Order Sliding Mode Linear Observer

Van-Cuong Nguyen and Hee-Jun Kang
University of Ulsan, Korea

Abstract

This paper proposes an algorithm to estimate faults in robot manipulators by using only position measurement. The Third Order Sliding Mode linear (TOSML) observer is used for velocity estimation and unknown fault identification. The Equivalent Output Injections (EOI) of the TOSML observers is employed to identify the unknown faults in finite time without filtration. The advantage of this method is that the converging time has been reduced, and the obtained fault information can be used for fault detection, isolation as well as fault accommodation to the self-correcting failure system. Finally, the PUMA560 robot is used to demonstrate the effectiveness of proposed observer.

[S3-2-1] Comparative Study on Multivariable Control of a Drum Boiler

Ulemj Damiran[1], Caifen Fu[2] and Wen Tan[2]
Mongolian University of Science and Technology[1], Mongolia North China Electric Power University[2], China

Abstract

This paper investigates the problem of multiple controller design and its performance for a nonlinear drum boiler. This boiler model is presented in the IFAC conference on Advances in PID controllers by F.Morilla. For this Benchmark nonlinear drum boiler performance, three radically different control approaches are presented and compared: which are robust stabilization, model predictive and active disturbance rejection control. Experiment simulations show that the proposed designs achieves better performance than the reference control.

[S3-2-2] Comparative Study on Fuel Consumption for City Buses

Altantsetseg Tseveg and Bayarsuren Badarch
Mongolian University of Science and Technology, Mongolia

Abstract

The number of city bus increases as the number of car increase recent years. Although, the increase of the number of city bus has positive effect to transfer the passengers more quickly. But from the other side, emissions in the exhaust gas from bus engine and fuel consumption matters become a problem that draws attention from public transportation authorities and the people as well. Since there are many factors that affect the amount of fuel consumption and it is obvious that it also depends on an average speed of the bus and the number of the passenger.

[S3-2-3] Effect of Process Parameters on the Deformation of Nickel-Chromium Alloy Printed by Selective Laser Melting

Park Hong-Seok and Nguyen Dinh-Soni
University of Ulsan, Koreaa

Abstract

Selective laser melting (SLM) is a powder bed fusion (PBF) 3D printing method which based on layer-by-layer manufacturing technique.

The SLM allows for fabricating of complex shaped directly form 3-dimensional computer-aided design data. In this research, the cantilever shape parts with horizontal overhang section were printed to investigate the relationship between process parameter and deformation behavior. To observe the effect of process parameters in the printing, different process parameters have been used. The distortion has been analyzed with respect to process parameters. The deformation before and after removing the support section has been analyzed in term of laser power, scan speed. It shows that the dimension of printed parts before removing were smaller than CAD model and the distortion was a concave curve. They vary according to the laser power and scan speed changing. This study can be applied to achieve a better quality of nickel-chrome alloy printed by Selective Laser Melting.

[S3-2-4] Hydraulic Simulation for Valve System of Double Arm Excavator in Disaster Environment

Quang Hoan Le, Jong Woo Kim and Soon Yong Yang
University of Ulsan, Korea

Abstract

Nowadays, many hydraulic work machines have been developed for recovery work after disaster

such as earthquakes, tornado, tsunami etc. The requirement of adapting to conduct flexible work leads the development of double arm work machine based on hydraulic excavator. However, the limits of 4 DOFs arm of these machines can not satisfy the needs of complex task when rescuing the victims from the disaster site. Thus, this paper will present a development of hydraulic systems for double arm excavator in disaster environment. First, the scopes of the research and development of the machine will be introduced. Then, in the concept design, the hydraulic circuit of the arms will be proposed. The specifications of the valve system are also introduced to define the working ability of the machine. Next, the simulation of the power pack and hydraulic system are described to determine the main power system to support the large amount of actuators.

[S3-2-5] Flow Characteristics of the Automobile Muffler by Inserting the V-shape Structure

Tianjun Zhou[1], Geun Sik Lee[1]
and Jong-Hwa Jung[2]
[1]University of Ulsan, Korea
[2]Sejong Industry TM, Korea

Abstract

In order to investigate pressure drop and noise reduction of an automobile muffler, numerical simulation was performed with aid of ANSYS CFX and Virtual Lab software. In this study, three new mufflers with V-shape structures were designed and simulated in terms of the velocity distribution and pressure drop under specified range of transmission loss. Compared with the original muffler model, the three V-shape mufflers (without perforation, 4mm, and 6mm diameter perforations) can avoid the vortex in the first chamber of the muffler and decrease the pressure drop of the muffler. Among the three V-shape mufflers, the V-shape muffler with 4mm diameter perforations has the best performance of both the muffler pressure drop and noise reduction.

[S3-2-6] Heat Transfer Analysis for the Steel Plate with a Heat Source in the Preheating Process of Welding

Jun ho Go and Geun Sik Lee
University of Ulsan, Korea

Abstract

This study aims to analyze the heat transfer related with the preheating process of a steel plate before welding using electric resistance such as carbon fiber heating wire. 1-D unsteady temperature distribution was investigated on both the length direction (x-direction) of the steel plate (x=0: welding line, x=P: preheating line) and the thickness direction (z-direction) composed of the carbon fiber wire layer ($z > 0$) and the steel plate ($z < 0$). The analytical results were compared with the numerical and experimental results. The same maximum temperature was obtained for the same amount of applied heat, in spite of different optimal lengths if the steel plate length is larger than a certain length enough to dissipate heat. The thickness directional temperature distribution was also predicted due to need for selection and limitation of coating material of the carbon fiber wire. Entire length preheating for welding part is recommended due to the large temperature gradient between the heated and unheated part. Error between theoretical analysis and experimental result was 6.4% for the maximum (x=P) and 14.2% at the center-line (x=0) temperature difference. Present 1-D theoretical analysis could be used as a basic useful tool for simple and quick engineering such as selection of coating material, thickness, temperature distribution, required length and number of carbon fiber heating wire.

[S3-3-1] Effect of the Inlet Location of the Recirculating Casing Treatment on the Performance of a Turbocharger Compressor

Tianjun Zhou and Geun Sik Le
University of Ulsan, Korea

Abstract

The turbocharger can increase the engine power, decrease the engine size and reduce the exhaust pollution. It can provide a higher power performance and be friendly to the environments.

In a turbocharger compressor, the recirculating casing treatment (RCT) can improve the performance at the low mass flow rate and widen the operating range of the compressor. This study aims at investigating the performance variation of the compressor with respect to the inlet location of RCT. The RCT inlet location distance was chosen as 9.5mm, 11mm, 12.5 and 13.5mm. Results showed that at the turbocharger compressor 90,000rpm the RCT inlet location distance of 12.5mm had more uniform volute outlet pressure, higher pressure ratio and efficiency than inlet location distance other models.

[S3-3-2] Application of Fourier Polynomials for Compensation of Non-Geometric Errors in Industrial Robots

Phu-Nguyen Le and Hee-Jun Kang
University of Ulsan, Korea

Abstract

Though the kinematic parameters had been well identified, there are still existing some non-negligible non-geometric error sources such as friction, gear backlash, gear transmission, temperature variation. etc. They need to be eliminated to further improve the accuracy of the robotic system. This paper proposes a hybrid method of the robot kinematic calibration and Fourier polynomial compensation technique for enhancing robot positional accuracy. The robot kinematic parameters are identified first by using robot calibration. Then, Fourier polynomials are employed for further compensating for the robot residual position errors. Finally, a real implementation was performed with Hyundai HH220 robot and a laser tracker to demonstrate the effectiveness of the proposed method.

[S3-3-3] GPU Parallel Computing Performance of Finite Element Sparse Matrix Solver

Viet Khai Nguyen, Minh Tuan Nguyen and Sang Wook Lee
University of Ulsan, Korea

Abstract

The computing performance of CUDA based conjugate gradient method was investigated for computational fluid dynamics simulations. Typical symmetric and asymmetric matrices from unstructured finite element method for complex coronary blood flow simulation were considered. For CFD technique, four-step fractional P2-P1 finite element method (FEM) was applied. A linear system of equations (Ax=b) derived from FEM formulations was solved iteratively using CUDA versions of conjugate gradient (CG) and bi-conjugate gradient (Bi-CG) solvers. We mainly focused on the effect of matrix storage format in Sparse Matrix-Vector (SpMV) multiplication because it dominates the computing costs and generally occupies more than 75% of total solver time. Four different types of matrix storage format, ELLPACK-R (ELL-R), Coordinate (COO), Compressed Sparse Row (CSR) and Hybrid (HYB) were tested. The present GPU computation showed

that the CSR matrix format was the most efficient in terms of required memory size as well as speed-up. Furthermore, we found that that accessing the x-vector through cache memory can improved performance considerably. Index Terms GPU, Conjugate and bi-conjugate gradient methods, CFD, Sparse-matrix vector multiplication, Sparse matrix formats, Performance analysis.

[S3-3-4] Phonon Crystals as Elements of the Broadband Vibration and Noise Protection Systems

C.-M. Lee[1], V.N. Goverdovskiy[1], S.V. Sukhinin[2], A.P. Konstantinov[2], A.V. Trilis[2] and V.S. Yurkovskiy[2]

[1]University of Ulsan, Korea

[2]Lavrentyev Institute of Hydrodynamics of Siberian Brunch of Russian Academy of Sciences Novosibirsk, Russia

Abstract

This paper presents an approach to model and study two-component media so that to determine then a concentration of the phonon crystal components in the media by measuring the low frequency phase velocity. A method is proposed to optimize the properties of such materials.

The frequency pass- and stop-bands of vibroacoustic waves are determined for contrasting and noncontrasting phonon crystals.

Resonant phenomena in the crystals are described. The wave mechanics is studied. The influence of the monoand polydisperse distributions of non-uniformity is studied to evaluate vibration isolating and sound absorbing properties of the composite materials based on the phonon crystals.

[S3-3-5] Developmental Trends of Transport Vibration Protection Systems with Extreme Characteristics

C.-M. Lee and V.N. Goverdovskiy

University of Ulsan, Korea

Abstract

The systems with extreme characteristics (with an area of sign-changing stiffness) have proven most promising for vibration protection of humans and engineering in transport vehicles.

This paper presents a comparative analysis of different classes of such systems and shows that only some of them are ready for either replacing conventional vibration protection systems or could be used in advanced hybrids in certain types of the vehicles. However, the effective area reaches 60–65% of a travel of the systems designed on basis of thin-walled structures, while this performance averages 1–2% to 5–6% when using the other classes of the systems with extreme characteristics.

Section 4

Power engineering and renewable energy

[S4-1-1] Galloping Feature Extraction and Parameter Analysis of Transmission Line Based on Improved Frame Difference Method

ZHOU Feng, REN Guixin and HAO Ting
Harbin University of Science and Technology, China

Abstract

A new method of galloping feature extraction and parameter analysis of transmission line based on improved frame difference method is proposed for the problem that the monitoring of transmission line galloping is difficult and poor real-time.First of all,the mean filter method based on feature template is used to preprocess the image of galloping video of transmission line.Then,traversing the image by the corresponding feature template, replacing the gray value of center pixel by average gray value of the pixels covered by the template.And the improved frame difference method is used to process the two adjacent frames to get the difference image.This paper presents a method of automatic threshold selection of binary image,which can automatically select the threshold value and we can get the binary image by processing the difference image with this threshold.Finally,Using quadratic polynomial function to fit the outline of transmission line. We calculate the amplitude and frequency by the extreme points of the function and judge the bending degree of transmission line by the quadratic coefficient of quadratic polynomial function. Experiments show that this method can keep the galloping information in the maximum extent and calculate the transverse amplitude, longitudinal amplitude, galloping frequency and the bending degree of the galloping wire.

[S4-1-2] Development of Optimal Patterns of Energy Transmission in Power Network

Sodnomdorj Dari, Uuganbayar Sodnomdorj, Batbaatar Renchindorj and Nomuundari Battulga
Mongolian University of Science and Technology, Mongoliaa

Abstract

For the operation and further development perspective of power network, it is important to ensure its reliable operation with low cost. The main purpose of this presentation is to select optimal cross section of the line wire, to find optimal current and voltage value in it by developing a mathematical economic (cost) modeling of electrical energy transmission ability through the basic components of power network such as high voltage power transmission line and substation.

[S4-1-3] Comperative Study of Wind Speed Weibull Probability Distribution Parameter Estimation Methods in Case of the Mongolian South Gobi

Bavuudorj OVGOR and ENKHJARGAL Khaltar
Mongolian University of Science and Technology, Mongolia

Abstract

Due to abundance of renewable energy resources, especially wind energy resource the Government of Mongolia is set target to increase the renewable energy share in total energy. The state energy policy paper adopted by Parliament of Mongolia set target to reach a 30 percent share of renewable energy in total energy of Mongolia. Wind energy has potential to make major contributions in such increased application of renewable energy. The recent years' ex-

perience of application of the first and only wind farm in Mongolia, clearly showed the need of detailed wind resource study in order to successfully utilize wind energy in the future. This paper sets the objective to introduce first results of detailed long term wind resource monitoring and identify the most suitable method for identification of Weibull wind speed distribution function for Mongolian south Gobi region. The wind speed data collected from January 1st of 2015 to January 1st of 2017 is used for the calculations. The Mongolian University of Science and Technology in collaboration of the National renewable energy center of Mongolia under the guidance of the Ministry of Energy performing detailed wind resource assessment at the Erdene soum site of the Dornogobi aimag of Mongolia which corresponds to Mongolian south eastern Gobi region. The result of the current detailed long term wind monitoring will establish a firm base for future wind energy development in the region in the scope of the Gobitech Asia Super Grid initiative.

[S4-1-4] The Study of Remained Oil In Mongolia

Solongo Zorigt, Siilegmaa Sereenen and Alimaa Vanganjal
Mongolian University of Science and Technology, Mongolia

Abstract

The benefit of oil extraction process from oil reservoir is not been succeed enough by latest and conducted methods. In various territories and countries, the oil yield averagely fluctuates 25 to 40 percents. The oil yield depends on field geology structure and oil extraction technology, such as, for Latin America and South East Asian countries, it fluctuates 24 to 27 percents; 16 to 17% in Iran; 33 to 37% in USA, Canada and Saudi Arabia. The remained oil is the oil which can't extract nowadays technology and it configures almost 55 to 57 percents of geological proven reserve. The most difficult extracted oil is the heavy and thick oil, but the thick and heavy oil reserve was estimated large.

[S4-1-5] Spectrum Analysis by Using Detection Earthing Fault Condition for Electric Equipment

Purevdash.D and Natsagdorj.Ch
Mongolian University of Science and Technology, Mongolia

Abstract

The author presents spectrum analysis to detect earthing fault condition in online monitoring of electric equipment.

[S4-1-6] Sensorless Induction Motor Drives Based on Torque-MRAS

Bigyan Basnet and Hong-Hee Lee
University of Ulsan, Korea

Abstract

This paper presents a torque-model reference adaptive system (MRAS) scheme for sensorless induction motor drives. Open loop flux estimator, which causes the parameter inaccuracy and inverter nonlinearities in low speed, is replaced by the fixed cut-off frequency low pass filter with the positive feedback to estimate the rotor flux. The q current component is estimated from the rotor flux, stator voltage and currents, which is used to estimate the rotor speed. Simulation results are presented to validate the effectiveness of the proposed system.

[S4-1-7] Design of PV Model-Based Solar Array Simulator Engine Using Optimization Method

Young-Tae Seo, Thusitha Wellawatta and Sung-Jin Choi
University of Ulsan, Korea

Abstract

Photovoltaic (PV) model can be a viable alternative to the conventional look-up-table as an accurate and versatile solar array simulator (SAS) engine. In PV model-based SAS, PV model has a critical role to generate appropriate I-V characteristic of the PV panel under rapidly varying temperature and irradiation, and thus calculation speed as well as accuracy are key performances. In this paper, a novel algorithm that is suitable for such a SAS engine is proposed. The suggested method adopts conjugate gradient optimization to extract PV model parameters from the changing conditions and to reconstruct the exact I-V curve very rapidly. For the verification, the proposed algorithm is compared with conventional ones which have been widely used in the PV model extraction. As a result, the proposed model shows superior calculation speed with good accuracy.

[S4-2-1] Multi-Agent Voltage Control in Multiconnected Electric Networks

Alexander Fishov, Nurlan Karjaubayev and Enkhsaikhan Erdenebat
Novosibirsk State Technical University, Russia

Abstract

The development of distributed generation connected to the grid of low and average voltage, sets the task of effective control of voltage with of the decentralized automation. The means of solving this problem is a multi-agent control (MAC). Every intellectual regulator included in MA system can be a carrier of interest (agent) the subjects of the overall process energy supply (network company, small generator, the consumer) and voltage mode is defined as a compromise their interests. The paper presents a formulation of the problem of multiagent compromise control of the voltage in the active, in general, multiconnected electrical networks. Considers a one-tier system of MAC with intellectual agents having as its own area (adjoining area of the electrical network) decision-making, as well as an expanded area of concerted action. For the control area of mode, the agent uses exclusively local parameters of mode. Communication between agents is made through the channels of direct electrical connections between network nodes. MAC carries both control of mode and emergency control. Agents use a single rule base. The basic rules of decision-making and implementation of action of agents based on mode-controlled area and harmonizing actions with neighboring agents are substantiated. The multiagent structure of the voltage control is proposed and discussed. The results of the simulation of MAC voltage control for hydro power station is given.

[S4-2-2] Electret-Based Vibrational Energy Harvester With Out-Of-Plane Gap Closing Topology

Vitaly Dorzhiev, Dmitry Ostertak and Valery Dragunov
Novosibirsk State Technical University, Russia

Abstract

This work is devoted to experimental study of electret-based electrostatic vibrational energy harvester (eVEH) with out-of-plane gap closing topology converting the mechanical vibration energy to electrical energy. It has been demonstrated that the maximal power produced by the eVEH at acceleration mag-

nitude of 1 g is about 1.25 μW, this value is reached under vibration frequency of 90 Hz and load resistance of 9 MΩ. Such value of output power is comparable to that of other world-wide developments. The eVEH operation in pulse mode that is typical for WSN node where it remains in standby mode for a long time to accumulate the converted energy is studied.

[S4-2-3] Current Controller Design of a Battery Discharge Unit for Space Applications

Valery D. Yurkevich, Denis V. Makarov, Dmitriy V. Korobkov and Sergey A. Kharitonov
Novosibirsk State Technical University, Russia

Abstract

The problem of current controller design is discussed for a high frequency DC-DC converter which is based on the push-pull circuit with autotransformer. The proposed converter may be used as a battery discharge unit in power supply system of satellites. The mathematical model of the converter is derived and its properties are analyzed in order to justify the control system structure. The roportional-integral (PI) current controller is designed based on singular perturbation technique that allows to get prescribed behavior of transients in the closed loop system. Numerical simulations are included in order to show the efficiency of the proposed design methodology.

[S4-2-4] A Control Strategy to Reduce the Input Current Harmonics of AC/DC Matrix Converter under Unbalanced Input Voltages

Thanh-Luan Nguyen
University of Ulsan, Korea

Abstract

This paper presents a control strategy to achieve the constant output current and low harmonic distortion of the input currents for the AC/DC matrix converter (MC) under unbalanced input voltages. By regulating the modulation index of the converter according to the instantaneous input voltages, the output current is kept constant. In order to reduce the harmonic distortion of input currents, the input power factor angle is calculated based on the positive and negative sequence components of the input voltages. Simulation results are given to validate the effectiveness of the proposed control strategy.

[S4-2-5] An Optimal Design of Series-Series Resonant Energy Link in Wireless Power Transfer

Chae-Ho Jeong and Sung-Jin Choi
University of Ulsan, Korea

Abstract

The resonant energy link plays a vital role in the performance of inductive wireless power transfer (IPT) system, whereas the effective design method has not been actively investigated from a perspective of power conversion circuit. This paper presents a new graphical design method based on FOM-rd plane which gives convenience as well as insight to circuit designers. The proposed FOM-rd plane can estimate the voltage gain and efficiency according to the variations of magnetic coupling coefficient and the load resistance. Furthermore, the gain bifurcation phenomenon which hampers soft-switching operation and complicates the output voltage control can be readily avoided from the operating region. An energy link for 200W wireless power transfer system in series-series configuration has been designed and constructed by the proposed method, and its hardware test result verifies the usefulness of the proposed method.

Section 5

Ecology, environmental engineering, and civil engineering

[S5-1-1] Duration of the Cold and Warm Seasons and Temperature Fluctuations Across Zero Degrees and Their Implications for Civil Engineering in Mongolia

D.Dashjamts[1] and G. Namkhaijantsan[2]
[1]Department of Structures School of Civil Engineering and Architecture Ulaanbaatar, Mongolia
[2]Institute of Meteorology, Hydrology and Environment Ulaanbaatar, Mongolia

Abstract

This paper presents the results of the research conducted on duration of cold and warm seasons and temperature fluctuations across zero degrees in Mongolia. The country's wide territory prone to extreme temperature swings during cycles of four distinct seasons when temperature suddenly drops down below zero degrees during warm seasons or rises above zero degrees during the cold seasons within a day. Such radical temperature swings across zero degrees have a negative impact on human living conditions and industrial activities including civil engineering. The research indicates that the temperature fluctuations across zero degrees occur within and between seasons and even days. In addition to air temperature fluctuations the zero degrees temperature's soil penetration depth was measured and analyzed. Furthermore, the fluctuation range, frequency and zoning across country regions were determined. The results have wide application in thermomechanical calculations in civil engineering field, particularly useful for calculations of working period start and end dates, evaluation of out-door working conditions, design of working clothes, planning and implementation of health care activities and in determining optimal foundation depth. The research work presents the results in graphical presentation with distribution across regions being summarized in the map developed for practical application in the civil engineering field.

[S5-1-2] Damage Analysis of Reinforced Concrete Structures of Precast Buildings

Yagaanbuyant Duinkherjav[1] and Tamryazan Ashot Georgiyevicj[2]
[1]Mongolian University of Science and Technology, Mongolia
[2]Head of the Department of Reinforced Concrete and Masonry Structure, Moscow State University of Civil Engineering, Russia

Abstract

Damage degree of reinforced concrete load bearing structures of precast apartment buildings is studied and a probability distribution of the reinforcement corrosion is proposed. Safetyfactor of the ultimate strength of the members is re-estimated taken into account the actual loading and the actual service conditions and its relationship with the service life is proposed.

[S5-1-3] Urban Planning of Smart Ulaanbaatar

Enkhtuvshin Jaltsav and Zagdkhorol Bayasglan
Mongolian University of Science and Technology, Mongolia

Abstract

Abstract—In contemporary society, environmentally and health-friendly building design and performance utilization problem relates to sustainable, green and smart buildings. In this article, we offered

some smart solutions to buildings in accordance with the policy of developing Ulaanbaatar as a smart city.

[S5-1-4] Creation of Digital Terrain Models from Satelliteimagery and LIDAR Data for Large Scaletopographic Maps

Javzandulam Bataa and Oyuntsetseg Dash
Mongolian University of Science and Technology, Mongolia

Abstract

Large scale topographic maps play an important role in connection with the economic and social progress of developing countries and are widely used in sectors such as urban and regional planning, infrastructure, national and regional security, air transportation, oil, gas, energy, mining, administration, cadastre, insurance, agriculture, resource management, and environmental monitoring. In 1999, an USbased company successfully launched the first commercial very high-resolution earth observation satellite (IKONOS). This achievement enabled mapping companies and authorities all over the world to create Digital Terrain Models (DTM) based on satellite imagery and use them for the generation of contour lines, a key feature of large-scale topographic maps, herewith replacing the usage of costly aerial photos or time-consuming ground surveys. During the first decade of the new millennium, another technology has been introduced into the market, providing elevation data with even higher resolution and accuracy: airborne LIDAR (portmanteau of the words light and radar). This paper consists following parts: introduction, materials and methods, results, discussion and conclusion.

[S5-1-5] Emergy Assessment for the Sustainability of the Nepal Economy

Keshab Shrestha, Angelo Earvin Sy Choi and Hung-Suck Park
University of Ulsan, Korea

Abstract

Emergy accounting evaluates the sustainability of the region through integrating all three sectors of the environment, economy and society for a sustainable development. This is a widely applied comprehensive environmental accounting methodology in the aspect of the sustainability assessment. The emergy indices calculated in emergy accounting helps to understand the environmental and economic sustainability of a region and this makes comparisons with the other regions. This can also support a strategical development in unsustainable regions in terms of resource utilization. In this study, the emergy accounting methodology is applied to determine the sustainability of the Nepal economy by analyzing the economic data in the fiscal year 2014. A systematic comparison is done utilizing the emergy indices in Nepal and the other South Asian Association for Regional Cooperation (SAARC) countries. Result showed that the total emergy utilized in Nepal at 2014 was 1.86E+23 sej. The ratio of the import to export describes that most of the emergy used in Nepal comes from the importation. The empower density of Nepal is lower than the other SAARC countries, which indicates that the industrial activities have not significantly developed in Nepal. The negative impact of the industrial activities in the environment is explained by the environmental loading ratio (ELR) index. The ELR value of Nepal (7.26) describes a moderate environmental impact in terms of its industrial activities. However, the countries of India (23.6) and Pakistan (30.98) have a higher ELR value that may create future en-

vironmental problems due to a significant environmental impact in its industrial activities. The environmental sustainability index (ESI) value of Nepal is less than 1, which implies a low consumer oriented economy and self-resources production capacity in Nepal.

[S5-1-6] Dual roles of CD137 in Anti-Bacterial Responses

Byung-Sam Kim and Seong-A Ju
University of Ulsan, Korea

Abstract

Severe sepsis and septic shock caused by bacterial infections are life-threatening conditions. However, host responses to and pathophysiology of sepsis have not been clearly understood, which remains a major obstacle for the development of effective therapeutics. Herein, we report that CD137 deficiency decreased anti-bacterial responses of mice infected with G+ bacteria (Staphylococcus aureus, Streptococcus pneumonia, Enterococcus faecalis), but increased these responses in mice infected with Gram-negative (G-) bacteria (Escherichia coli, Pseudomonas aeruginosa, Salmonella typhimurium). On the contrary, stimulation of CD137 by administration of agonistic antibody enhanced anti-bacterial responses against G+, whereas, it decreased these responses against G- bacteria. Neutrophils were responsible for CD137 -mediated opposite roles in control of G+ and G- bacterial infection. Stimulation of CD137 enhanced anti-bacterial activities of neutrophils against S. aureus but decreased these activities against E. coli, while CD137 blocking produced contrary results in vivo and in vitro. Our data strongly suggest that CD137 may play dual roles in sepsis.

Section 6 Applied engineering

[S6-1-1] A Transfer Learning Algorithm Based on Regularized Discriminant Analysis

Wang Lili, Chen Deyun, Gao Xueyao,
Sun Xiaohua and Sun Dongpu
Harbin University of Science and Technology, China

Abstract

Reusing the data transferring learning of related fields is important in the real life. In recent years, many researchers have made a deep research on transfer learning, and put forward some methods of transfer learning. At present, estimating the distribution parameters and poor generalization are difficult in the transfer learning based on instance. Therefore, in this paper Gauss kernel semi-supervised discriminant analysis based on regularization method is put forward to construct and correct the embedded space. By adding pseudo markers the target field data can be introduced to transfer. In the novel transfer learning algorithm, it is solved the difficulty of estimation of distribution parameters and problem of overfitting, and at the same time the accuracy of learning and generalization ability are improved. At last the experiments show that the new algorithm is effective and excellent on both text and non text data sets.

[S6-1-2] Static Imaging Method for Monitoring on Base Course Structure of Road in Mongolia

Munkherdene Ts, Tserentogtokh Ts and
Delgermaa B
Mongolian University of Science and Technology, Mongolia

Abstract

In this paper, we consider a novel static image reconstruction method in electrical impedance tomography (EIT). To investigate the structure health of road, we place electrodes in the array of line on two beside of the road. The voltage measurements were collected with respected to all possible current injections. For reference type data, we choose all adjacent electrodes for current injection and voltage measurement data of two neighborhood electrodes of current injection electrodes. From the relation among voltage and current we produce cross sectional image of the ground, which can give information to visualize thestructure damage of road.

[S6-1-3] A Modeling of Integrated Transformer Using PSIM Magnetic Elements

Hee-Su Choi and Sung-Jin Cho
University of Ulsan, Korea

Abstract

Magnetic circuit is a powerful tool in the design of power transformers, especially for a priori evaluation of leakage and magnetizing inductance before actual production of the components. This paper investigates an alternative modeling approach using PSIM magnetic circuit library to remove duality transformation used in a conventional reluctance model and establishes formula to determine the permeance-capacitors in both core and leakage path. A simulation jig is devised to automate the parameter determination process and the derived formula has been verified by measurement results.

[S6-1-4] Batch Adsorption of Diesel Oil Using Activated Clay: Definitive Screening Design

Angelo Earvin Sy Choi[1], Hung-Suck Park[1] and Susan Roces[2]
[1]University of Ulsan, Korea
[2]Nathaniel Dugos De La Salle University, Manila City, Philippines

Abstract

Oxidative desulfurization involves the removal of unwanted sulfur compounds in diesel oil through oxidation that forms sulfone compounds. This is complemented by an adsorption process. In this study, batch adsorption of oxidized diesel oil was studied testing parameters such as pH (1-5), adsorbent dose (1-5 mg), temperature (25-55℃), agitation speed (50-250 rpm) and mixing time (50-250 min). In order to statistically support and determine the level of significance of each parameter on the response of sulfone adsorption a definitive screening design was used. Results indicate that pH, adsorbent dose and temperature showed a significant effect (p-value〈0.05) on the adsorption of sulfones in diesel oil while agitation speed and mixing time were insignificant (p-value〉0.05).

[S6-1-5] A Study on Analytical Prediction of Punch Strength Required for Ultra High Strength Parts in Piercing Process after Hot Stamping

Li Rui, Yong Seok Kim, Soon Yong Yang, Hoang Van Tho, Young Jin Yum and Jong Won Kum
University of Ulsan, Korea

Abstract

In this paper, the method for increasing the strength of the additive punches is proposed for much molds that can cope Ultra High Strength (1500MPa) sheet material through the lamination of high hardness powder and through the manufacture of high strength punch molds and the partial lamination by 3DP technique. In addition, a process analysis processor was proposed for predicting the punching strength required for shearing (piercing) of ultra-high-strength parts such as hot-stamping post-processes (piercing or trim). For predicting the punch strength, the process analysis processor is used to estimate the width and depth of concentrated stress parts. Practically, the shape range of the punch that requires high strength needs to be defined in the shearing process and suchrange can be applied for 3DP lamination of high strength powder material. In this study, the conditions and range of this process analysis will be predicted and simulated for the punch strength under the process analysis conditions based on analysis and selection from the previous research literature on the shear mechanism and process analysis of sheet material.

[S6-1-6] Carbonylation of Glycerol and Urea over Zn/Al Mixed Oxide Catalysts: Homogeneous and Heterogeneous Catalysis

Huy Nguyen-Phu, Yu Hongyan, Do Thi Lien and Eun Woo Shin
University of Ulsan, Korea

Abstract

Glycerol carbonate (GC) can be synthesized under various catalysts by reaction routes homogeneous and heterogeneous. In this research, the catalysts: ZnO, ZnAl2O4 and Zn/Al oxide (containing ZnO and ZnAl2O4 phases) with varied metal molar ratio are prepared and experimented for the synthesis of glycerol carbonate from glycerol and urea at 140℃

under vacuum condition (3kPa) to remove ammonia by-product. Reaction results are checked by GC-FID using internal standard method (tetraethylene glycol). XRD and FT-IR analysis of liquid products, fresh catalysts and spent catalysts are used to investigate the change of crystalline phase (ZnO, ZnAl2O4) and functional group (NCO, glycerol carbonate). It can be concluded that ZnO phase can dissolve into the reaction liquid and promote reaction as homogeneous catalyst, while ZnAl2O4 keep remained after reaction and act as heterogeneous catalyst. The ZnAl2O4 catalyst gives low glycerol conversion, low GC yield and low GC selectivity. While in the case of ZnO catalyst, reaction results to low GC yield, low GC selectivity but higher glycerol conversion. The Zn/Al mixed oxide has the dual effect of homogeneous and heterogeneous catalysis and achieves high GC yield, high GC selectivity, and high glycerol conversion.

[S6-1-7] Engineering of Access Point , its Analytical Modeling of Empirical Wifi Traffic

P.Minj, TS. Enkhtur and Ya.Dashdorj
Mongolian University of Science and Technology, Mongolia

Abstract

In this work the market research of AP (access point) was done in the international market. Furthermore we made our AP based on OEM (original equipment manufacturer) technology and installed our own compiling firmware on the AP. The network traffic of the AP was researched, as a result analytical model with On/Off was done and the throughput has been defined.

[S6-2-1] An Improved KeyGraph Algorithm Based on KD-tree

Sun Xiaohua, Chen Deyun, Wang Lili,
Sun Dongpu and Gao Xueyao
Harbin University of Science and Technology, China

Abstract

KeyGraph is a classical algorithm that realizes information visualization for chance discovery. By the researching of KeyGraph, an improved algorithm is proposed in this paper. Firstly, integer number is used to express analysis object. This method simplifies the analysis process. Efficiently cluster is set up based on KD-tree. This algorithm can reduce the artificial interference factors in KeyGraph, improve the execution efficiency, and find the hidden causal structure in data set.

[S6-2-2] Unmanned Aerial Vehicle-Based Automated Inspection System for High Voltage Transmission Lines

Uranchimeg Tudevdagva[1], Wolfram Hardt[1],
Stephan Blokzyl[1] and Batbayar Battseren[2]
[1]Chemnitz University of Technology
Chemnitz, Germany
[2]Mongolian University of Science and Technology, Mongolia

Abstract

Today, numerous researchers and companies use unmanned aerial vehicles (UAVs) for a wide range of different applications. Modern UAVs are equipped with powerful sensors for various measurement and inspection tasks. One of the main technology drivers of UAV-based inspection is the energy sector for renewable power and electricity distribution. This industry demands for reliable and powerful inspection solutions which support cost- and time-efficient maintenance of the electric infrastructure.

This paper describes the basic concept of a fully automated inspection system for high voltage transmission lines. The automated system shall be realised on an unmanned aerial vehicle using state-of-the-art software hardware co-design concepts for real time on board sensor data exploitation and decision making. The proposed UAV-based inspection system for high voltage transmission lines planned to verified during a real world case study in Mongolia.

[S6-2-3] Increasing of Gasoline and Gas Production in Catalytic Cracking Technology Taking Into Account Catalyst Activity

Nazarova G.Y., Ivashkina E.N.,
Stebeneva V.I. and Shafran T.A.
Tomsk Polytechnic University, Russia

Abstract

The research of the impact of feedstock group composition on the yield and quality of light fractions in the catalytic cracking technology realized taking into account the catalyst activity. The selection of technological mode of catalytic cracking to increase the yield of light fractions and reduce the excessive of coke formation was performed using the mathematical model of catalytic cracking. The mathematical model is developed on the basis of the formalized scheme of hydrocarbons transformations on zeolite catalyst. Technological mode to increase gasoline and gas production and reduce coke content in the processing of vacuum distillate with a high content of saturated and aromatic hydrocarbons taking into account the catalyst activity is recommend on the basis of calculations.

[S6-2-4] Modification of Nickel Titanate by Doping Molybdenum into Lattice Structure

Thanh-Truc Pham, Kaiming Jiang,
Hae Won Jung and Eun Woo Shin
University of Ulsan, Korea

Abstract

The research of the impact of feedstock grou In this study, molybdenum (Mo)-doped nickel titanate (NiTiO3) materials were successfully synthesized as a function of Mo content through a modified Pechini method followed by a solvothermal treatment process. Various characterization methodswere employed to investigate the optical and structural properties of the materials. XRD patterns clearly showed that the NiTiO3 structure maintained a single phase with no observed crystalline structure transformations, even after the addition of 10 wt.% Mo. In the Raman spectra and XRD patterns, peak positions shifted with achangein Mo content, confirming that the NiTiO3 lattice was doped with Mo. On the other hand, Mo doping of NiTiO3 materials changed their optical properties. DRS-UV demonstrated that the addition of Mo increased photon absorption with in the UV region. Relaxation processes were inhibited by Mo doping, which was evident in the PLspectra. Structural properties of the prepared materials were studied via FE-SEM and HR-TEM. The measured surface are a increased proportionally with Mo content due to a reduction in grain size of the materials.

[S6-2-5] An Estimation of Wave Loads on the FLP for LSRU

Jin-An Oh, In-Kyu Park and Jin-Tae Lee
University of Ulsan, Korea

Abstract

Nowadays, LNG becomes one of the strong alternative energy sources instead of oil due to its eco-friendly. In this paper, a newly designed LNG storage facility located in coastal area, called FLP, is introduced. FLP structure is composed of three parts, caisson, legs and topsides. Two kind of wave loads estimation approach is examined, one is empirical formula, and the other is numerical method. Model test results are compared with those ones.

Poster Session – 1

[P1-1] ICT Competency Level of Teacher in the MUST

ARIUNAA Khashkhuu
University of Ulsan, Korea

Abstract

Information and communication technology (ICT) plays a vital role in teaching and learning. This paper presents the landscape of teachers' ICT competency of the Mongolian Higher Education. The ICT competency level is measured empirically in terms of work aspects described in the UNESCO's ICT Competency Standards for Teachers. This study reveals that the ICT competency level of the respondents is in the knowledge deepening approach. The result suggests that the degree of ICT competency is integrative and collaborative. The result signifies that teacher educators have utilized open-ended software tools for the collaborative learning experience. There is a need to improve the level of competency, particularly skills in using complex and pervasive ICT tools to achieve innovative teaching and learning.

[P1-2] Evaluation of Wireless Sensor Network Reliability with Use of Reliability Bounds Cumulative Updating

Denis Migov
Institute of Computational Mathematics and Mathematical Geophysics of SB RAS, Russia

Abstract

Wireless sensor networks (WSNs) with perfectly reliable links and unreliable sensors are considered in the paper. A special feature of our model is that the WSN contains initially excessive amount of nodes, so the WSN can carry on work acceptably even if some sensors fail. For such networks we introduce new reliability measure as the probability that sink nodes can collect data from other nodes which amount exceeds a specified threshold limit. The condition of sink nodes connectivity in WSN is optional, so we consider two WSN reliability indices, with and without mentioned requirement. The problem of calculation of the new reliability measure is NP-hard, just like problems of other reliability measures computing. We propose a method for new reliability measure calculation and a method for cumulative updating of upper and lower reliability bounds. Based on them, we also present a method for WSN reliability evaluation.

[P1-3] Efficient Dynamic Algorithms for GTS Allocation of Wireless Sensor Network in Rail Communications

Erdenebayar Lamjav[1], Khishigjargal Gonchigsumlaa[1], Otgonbayar Bataa[1] and Young-il Kim[2]
[1]Mongolian University of Science and Technology, Mongolia
[2]Electronics and Telecommunications Research Institute, Korea

Abstract

The GTS is used by devices for cyclic data transmission and the coordinator can allocate GTS to a maximum of only seven devices. In this work, we have proposed dynamic GTS allocation algorithms for an efficient GTS allocation of wireless sensor network in Rail communications. The proposed algorithm is focused on improving the bandwidth utilization of devices and increase number of devices. The proposed schemes were tested through simulations and the results show that the new GTS allocation schemes perform better than the original IEEE 802.15.4 standard.

[P1-4] Full-Duplex Half-Duplex Transmission Mode Switching Schedule in Cognitive Radio Networks with Energy Harvesting

Hoan Tran-nhut-khai and Koo In-Soo
University of Ulsan, Korea

Abstract

We considers a transmission mode switching schedule for cognitive radio networks (CRNs) in which a pair of cognitive users (CU) utilizes a time-slotted primary channel. The CUs are powered by energy harvesters where the amount of harvested energy is finite. Harvested energy in each time slot is stored in a finite capacity battery and can be used in the next time slot. For the given scenario in which available energy for use is limited, we propose a scheme to optimize the transmission mode (i.e. full duplex, half duplex or stay silent) switching schedule for CU in each time slot based on expected throughput over next K time slots. The goal of this work aims to improve average throughput of CRN for the entire of its operation time.

[P1-5] Reducing Delivery Latency in Wireless Sensor Networks with Heavy Traffic Load

Minh Nguyen Ngoc and Myung Kyun Kim
University of Ulsan, Korea

Abstract

Recently, cross-layer routing-integrated and pipeline-forwarding are two techniques that are adopted broadly in many MAC protocols to reduce energy consumption and end-to-end delay in wireless sensor networks. Even though in the networks with light traffic, the existing protocols that implement these techniques showed some good results, in the networks with heavy load, their designs are not efficient to deal with the problem of traffic congestion. This paper presents a new protocol based on two techniques above, named CMP-MAC. By allowing sensor nodes in the network to send and receive multiple data packets in one cycle, our protocol mitigates the congestion and therefore, reduce delivery latency. Moreover, the simulation results indicate that the proposed protocol also outperforms some existing solutions in term of reducing energy consumption.

[P1-6] A Cognitive Radio-Based Early Warning System to Mitigate the Damages of Flash Floods

Saeed Ahmed, YoungDoo Lee and Insoo Koo
University of Ulsan, Korea

Abstract

Flash flood are termed as deadliest class of floods and have highest mortality rates. Coordinated efforts are being carried out across the globe to completely understand the causes of flash floods and models are being developed utilizing the communication technologies to increase the lead for an early warning and forecasting to mitigate the losses due to flash floods. In this paper, we proposed an energy efficient cognitive radio based scheme to develop an early warning system. Cognitive sensors deployed in the mountain canyons report the flood water level and its intensity to the disaster management center through a central entity i.e. cognitive radio gateway. With objective to utilize the limited battery energy of cognitive sensors efficiently, we designed an energy efficient channels assignment scheme based on Hungarian algorithm. Simulation results illustrate that proposed scheme can increase the life time of the monitoring network.

[P1-7] A Node Distribution Scheme for Maximizing Network Lifetime in Wireless Sensor Networks

Thi-Nga Dao and Seokhoon Yoon
University of Ulsan, Korea

Abstract

In wireless sensor networks (WSNs), prolonging network lifetime has been attracting a lot of attention due to the limited battery life of the nodes. Duty-cycling can be used to increase network lifetime, however a long duty cycle interval can lead to a high E2E delay, which is not desired in delay-constrained applications. Therefore, a novel energy balanced node distribution algorithm is proposed in order to maximize network lifetime while considering delay requirement, sensing coverage, and network connectivity constraints in WSNs. We formulate an optimization problem in which the objective function and constraints are estimated according to the number of nodes in each layer. Simulation results show that the proposed method achieves a higher network lifetime compared to other methods.

[P1-8] Accurate Multi-Bit Hard Decision Combination for Cooperative Spectrum Sensing in Cognitive Radio Networks

Hurmat Ali Shah and Insoo Koo
University of Ulsan, Korea

Abstract

Hard decision combination and soft decision combination needs to be combined in order to make spectrum sensing schemes both efficient and also save bandwidth. This is achieved by reporting quantized information from cognitive radio users to the fusion center. Optimal local quantization scheme is proposed in this paper where optimal energy thresholds are selected and based on these optimal thresholds quantized information is reported to the fusion center for cooperative spectrum sensing. The optimal thresholds are selected through iterative search through all possible energy distribution that is given under each hypothesis. Robust mean and robust standard deviation of the similarity scores of all cognitive radio users which is found and through Smith-Waterman algorithm a threshold is found. Cognitive radio users having a score below this threshold are excluded in final decision combination. The scheme is compared with conventional schemes. Simulation results show that the optimal scheme with quantization thresholds performs better than the other schemes.

[P1-9] Reliable Bearings Fault Diagnosis of Induction Motor Using Envelope Spectrum Analysis and Support Vector Machines

M M Manjurul Islam, Wasim Ahmed and Jong-Myon Kim
University of Ulsan, Korea

Abstract

A reliable fault diagnosis scheme for bearing elements of an induction motor has been proposed. The scheme is composed of envelope spectrum analysis and an improved one-against-all multi-class support vector machine (OAA SVM) for accurately identifying faults types. Envelop spectrum analysis (ESA) of an acoustic emission (AE) signal is first carried out to find abnormal patterns associated with bearing defects. These envelope signals are further utilized for extracting intrinsic features describing bearing defects. At the end, the extracted features are provided as an input to OAA SVM classifier for reliable fault diagnosis. Additionally, a grid search-based hypermeters selection of SVM is ap-

plied during the training phase to improve its generalization performance. To verify the efficacy of the proposed algorithm (ESA with OAA SVM) a set of experiments are presented.

[P1-10] Green Submarine: Context-Aware Automatic Reactor App

Seong-Hoon Jeong, Byung-Gul Kim, Won-Chan Jang and Jae-Hak J. Bae
University of Ulsan, Korea

Abstract

This paper introduces the Green submarine app. It has improved user convenience of noticing apps by adding situational awareness to them. The app supports our daily life. The app adds contextual reasoning by adding an ontology to Android app. In this way, ontology files to be used for inference can be built by field expert, not an Android developer. It's also easy to add new features or conditions to your app. Ontology can be reused by expanding it when developing new apps.

[P1-11] Possibility of Cellular IoT based on LTE networks

Buyankhishig Ulziinyam, Erdenebayar Lamjav, Otgonbayar Bataa and Khishigjargal Gonchigsumlaa
Mongolian University of Science and Technology, Mongolia

Abstract

The Next-generation mobile communication system has been introduced to LTE / LTE-A since 2016 in Mongolia. LTE technology provide efficient mobile broadband data communications. An interworking function (IWF) acts a gateway to enable 3G and 4G(LTE) network elements to connect and communicate with 4G LTE network elements, and interfaces. The Internet of things is the interworking of physical devices, vehicles, connected devices and other items embedded with electronics, software, sensors, actuators based on LTE network and network connectivity that enable these objects to collect and exchange data using LTE network. Our goal of this research is proposed to develop and deploy novel IoT design based on capability of LTE network instead of existing M2M services based on 3G network by extending and to improving. In this paper, we have proposed novel design based on LTE connection procedure of interworking components, network interfaces and protocol stack.

[P1-12] Game Theory Based Available Channel Competing Scheme for Cognitive Machines in Military Networks

Vu Van Hiep and Insoo Koo
University of Ulsan, Korea

Abstract

In military network, the network devices generally operate in high congested and adversarial threats environments. This paper addresses to improve efficiency of spectrum utilization by defending the attacks from adversary network and to corrupt the communication of the adversary network by performing jamming. The proposed scheme based on game theory selects the best strategy (i.e., communication or jamming strategies) for each network node (i.e., communications and jamming nodes) which can maximize the successful communication and jamming rates of the network. Simulation results prove the efficiency of the proposed scheme.

[P1-13] Nonlinear Position Control of an Electrohydraulic Series Elastic Manipulator Using a Backstepping Sliding Mode Technique

Minh Nhat NGUYEN, Duc Thien TRAN and Kyoung Kwan AHN
University of Ulsan, Korea

Abstract

This paper presents a robust control scheme regarding an electro hydraulic servo manipulator system. The back-stepping sliding mode control (BSMC) is developed to guarantee the trajectory tracking of the first arm in the presence of the known uncertainty of both mechanical and hydraulic system such as friction, leakages, oil temperature, disturbance torques which are challenges for the control design. The proposed control includes two stages: the outer position tracking loop uses sliding mode control (SMC) to compensate for disturbance estimation error with the desired cylinder torque as the control output, the inner torque control loop is designed using the back-stepping technique. The stability of the closed-loop system is proved based on Lyapunov theory. The controller performance is verified through simulations. The results show that the proposed controller provides an excellent tracking performance of the first arm in the comparison with the PID controller.

[P1-14] Optimal Relay Selection Scheme for Maximizing Secrecy Throughput in Cognitive Radio Network

Hoang Thi Huong Giang, Hiep Vu-Van, Duy-Thanh Pham, and Insoo Koo
University of Ulsan, Korea

Abstract

Nowadays, cognitive radio networks (CRNs) is emerging as a promising technology to improve efficient of spectrum utilization. However, the physical layer of CRNs is very vulnerable by attack of eavesdroppers. An eavesdropper attacks the communication by overhearing the confidential information of the transmissions among legitimate users. Moreover, one of the crucial problem in CRNs is how to efficiently utilize the limited energy of the relays. In this paper, we consider the two-hop CRNs in which a transmitter needs the help of a relay to forward the message to the receiver. Concurrently, an eavesdropper also illegally overhears the message during the transmission. We propose an approach to select the best relay in order to maximize the total secure throughput of the network with respective to the limited life time of the relays. Simulation results prove the efficiency of our proposed scheme in the CR network.

[P1-15] Bearing Fault Detection Using Adaptive Filter and Computed Order Tracking

Md Saiful Islam, Jung Cheol Lee and Uipil Chong
University of Ulsan, Korea

Abstract

This paper proposes a novel method for identification and detection of rolling element bearing faults based on adaptive filter and computed order tracking. Noise and other not-concerned harmonics are reduced from vibration signal using an adaptive filter. And then, computed order tracking is applied to remove the frequency variation of the vibration signal. Finally, spectrum analysis is applied to detect the fault features. Simulation and experimental results indicate that proposed method can identify and detect bearing faults accurately and effectively.

Poster Session – 2

[P2-1] Metal-Free Electrocatalyst for Oxygen Reduction Reaction Using B-Doped Graphene Quantum Dots/Graphene Hybrids

Tran Van Tam, Sujin Kim and Won Mook Choi
University of Ulsan, Korea

Abstract

The boron-doped graphene quantum dots (BGQD) has been synthesized by one-step, facile and low temperature method for the electrocatalyst of oxygen reduction reaction (ORR). Further the composite of reduced graphene oxide (rGO) and BGQD (G-BGQD) also was prepared for the metal-free electrocatalyst for the ORR. The G-BGQD composites exhibit significant enhanced electrocatalytic activity including positive onset potential and high current density with one step, four-electron pathway toward ORR, comparable to the commercial Pt/C catalyst. In addition, the G-BGQD composites show an outstanding long-term operational stability and high tolerance to methanol crossover effect which are comparable to the commercial Pt/C catalyst. These results demonstrate that the synthesized BGQD, as metal-free catalyst materials, may be inexpensive and efficient electrocatalyst for the replacement of Pt-based catalyst toward ORR and other electrochemical applications.

[P2-2] Synthesis of Amino-Functionalized Graphene Quantum Dots for Selective Fluorescent Probe Toward Copper Ions

Tran Van Tam, Seungdong Seo and Won Mook Choi
University of Ulsan, Korea

Abstract

We demonstrated a facile and green synthesis method of amino-functionalized graphene quantum dots (a-GQDs) for excellent selectivity and sensitivity toward Cu^{2+} ions. The as-obtained a-GQDs possess uniform size, high solubility and bright green emission with high quantum yield as high as 32.8%. Furthermore, the a-GQDs exhibits highly selective and sensitive response to Cu^{2+} ion which can be serve as effective fluorescent probe for high determination of Cu^{2+} ion. Upon adding to the increasing concentration of Cu^{2+} ions, the fluorescence intensity of a-GQDs based sensing system was gradually quenched and showed linear detection range of 50 nM- 30 μM with a low detection limit of 5.6 nM. It may be attributed to interaction between copper ions and amino (-NH2) groups on GQDs surface to form cupric amine complex. These results demonstrate that a- GQDs may promise a new way for Cu^{2+} ion quantification in practical detection related to biological system.

[P2-3] $NiMn_2O_4$ Spinel Binary Nanostructure Decorated on Three-Dimensional Graphene Oxide Hydrogel for Non-Enzymatic Glucose Sensor and Energy Storage Application

Yen-Linh Thi Ngo[1], Linlin Wang[1], Lijun Sui[1]
Seung Hyun Hur[1] and Wei Ahn[2]
[1]University of Ulsan, Korea
[2]Shanghai University of Engineering Science, China

Abstract

Nickel-Manganese spinel oxide with three-dimensional (3D) graphene oxide hydrogel network was fabricated successfully via a facile solvothermal process. The different analytical techniques including Raman spectroscopy, XRD, SEM and BET surface area measurement reveal that the successful formation of $NiMn_2O_4$/GOH nanocomposite. The

electrochemical performance of nanocomposite was significantly improved by increasing in the specific surface area with the porous surface and electrocatalytic activity. The fabricated nanocomposite exhibits excellent glucose sensing performance, i.e., high sensitivity (1310.8 uA mM^{-1} cm^{-2}), a wide linear range (5uM - 1mM and 1mM - 20mM), low detection limit and fast response time (< 5 s) in alkaline solution. Furthermore, the nanocomposite has been utilized for the supercapacitor with a high capacitance of 396.85 $F.g^{-1}$ at a current density 1 $A.g^{-1}$, which attributing to the widen operation voltage ranging from -1 V to 1 V. Consequently, the NiMn2O4/GOH nanocomposite is a possible potential material for a wide range application in glucose sensor and high energy density storage devices.

[P2-4] Selective Reduction of O-Nitroaniline Using Graphene/ZnO Hybrid as a Non-Metal Catalyst

Linlin Wang1, Lijun Sui[1], Eui Jung Kim[1] and Doan Van Thuan[2]

[1]University of Ulsan, Korea

[2]Leibniz Institute for Catalysis, Germany

Abstract

Oval-shaped graphene/ZnO quantum hybrid (GZQH) is synthesized via chemical-hydrothermal method and tested as a non-noble-metal catalyst for the selective reduction of o-nitroaniline. A facile molecular fusion process is employed to produce graphene quantum dots (GQDs) from pyrene, which is followed by hydrothermal treatment with embryonic ZnO quantum dots (5 nm in size) to yield the GZQHs. Zn2+ ions on ZnO embryo react with a functional group of graphene, which forms Zn-O-C bonding leading to highly crystalline quantum hybrids with uniform interface. The GZQHs exhibit an excellent UV-induced catalytic performance for the selective reduction of o-nitroaniline. The effect of ZnO : graphene ratio on reduction reaction rate constant is also investigated.

[P2-5] The Conducting Poly(Pyrrole-Acrylonitrile/Butylacrylate) Core-Shell Binder and its Performance in Anodes of Lithium-Ion Batteries

Yanchunxiao Qi, Minh Hien Thi Nguyen, Seul Lee and Eun-Suok Oh

University of Ulsan, Korea

Abstract

In this study, we introduce a new conducting poly(pyrrole-acrylonitrile/butylacrylate) water-based binder for anodes of Lithium-ion battery. The polymer with core-shell structure was synthesized via the microemulsion polymerization of pyrrole to form a inter core and in-situ emulsion polymerization of acrylonitrile/butylacrylate monomers to give an outer shell. The product is not only water-based but also conductive and is a promising choice as a binder. Physical and electrochemical properties of poly(pyrrole-acrylonitrile/butylacrylate) will be carefully examined to confirm those interesting advantages.

[P2-6] An Application of Nano-Sized Silicon with Core-Shell Structure to Lithium-Ion Anodic Material

Chengxiang He, Bolormaa Gendensuren, Seongdong Seo and Eun-Suok Oh

University of Ulsan, Korea

Abstract

In this research, we used a silane coupling agent (3-

aminopropyl)triethoxysilane(APTES) to modify the surface of nano silicon. After washing and drying, the modified nano-sized silicon powder reacts with sodium alginate, and form a core-shell structural. The final product was used as anode active material in order to improve the serious drawbacks such as pulverization and rapid capacity fading when compared to pure nano silicon. Next, its morphology and structure were characterized by Transmission Electron Microscope(TEM) and UV-visible absorption spectrum. Cycling test and other electrochemical tests will be done in the future.

[P2-7] Study of Sodium-Carboxymethyl Cellulose Binder on the Performance of Carbon Electrochemical Double-Layer Capacitors

Seul Lee, Yanchunxiao Qi, SeongDong Seo and Eun-Suok Oh
University of Ulsan, Korea

Abstract

In this study, we investigate the influence of molecular weight (MW) and degree of substitution (DS) of sodium-carboxymethyl cellulose (CMC) used as binder of carbon electrochemical double-layer capacitor (EDLC). CMC is usually applied as the binder to increase a viscosity as well as to enhance the adhesion ability for the electrodes of lithium ion battery and supercapacitor called electrochemical double-layer capacitor (EDLC). An activated material of supercapacitor has enormous surface area and porosity. So, the binder of supercapacitor not only keeps the available surface area but has sufficient adhesion with electrode slurry and current collector.

[P2-8] Multi-Scale Model for Pulse Wave Propagation Analysis in Human Cardiovascular System

Duc Minh Tran[1], Sang-Wook Lee[1] and Minh Tuan Nguyen[2]
[1]University of Ulsan, Korea
[2]Integrative Cardiovascular Imaging Research Center, Yonsei University Health System, Korea

Abstract

In this study, we investigated the multi-scale model for simulating propagation of pulse wave in the human cardiovascular system. In particular, we evaluated the effect of stenosis on the propagation of pulse wave and the Ankle-Brachial Index (ABI). Variations of mechanical property of vessel generate the wave reflection so that the intensity and time of reflected wave may be used as the indicators in clinical diagnostics.

[P2-9] Large Electric Field-Induced Strain in La-Doped Bi-Perovskite Ceramics

Jae-Shin Lee, Thi Hinh Dinh and Hyoung-Su Han
University of Ulsan, Korea

Abstract

We investigated the electric field-induced strain properties of La-doped $Bi_{0.5}Na_{0.41}K_{0.09}TiO_3$ (BNKT) system. To clarify the effect of A-site donor doping on the phase transition and strain enhancement, we investigated the crystal structure, piezoelectric, ferroelectric and electric field-induced strain (EFIS) properties of La-doped BNKT ceramics. Similar to our previous studies on BNKT doped with B-site donors such as Nb and Ta, it was found that La doping induced a ferroelectric-to-relaxor (FE-R) phase transition, leading to a large enhancement in EFIS just after the transition.

[P2-10] The Effect of High-Energy Ball Milling on The Electromechanical Strain Properties of Lead-Free Relaxor $Bi_{1/2}(Na_{0.82}K_{0.18})_{1/2}TiO_3/0.98Bi_{1/2}(Na_{0.78}K_{0.22})_{1/2}TiO_3-2LaFeO_3$ Composites

Hyoung-Su Han, Dae-Jun Heo, Chang-Heon Lee, Thi Hinh Dinh, and Jae-Shin Lee

University of Ulsan, Korea

Abstract

The crystal structure, ferroelectric, and electric-field-induced strain (EFIS) properties of Bi-based lead-free ferroelectric/relaxor composite materials are investigated. $Bi_{1/2}(Na_{0.82}K_{0.18})_{1/2}TiO_3$ as a ferroelectric material and $0.98Bi_{1/2}(Na_{0.78}K_{0.22})_{1/2}TiO_3-0.02LaFeO_3$ as a relaxor were synthesized via conventional ceramic processing routes while the relaxor (matrix phase) was prepared via high-energy ball milling (HEBM) after calcination. The average particle size was decreased via HEBM treatment. As a result, a high d_{33}* value of over 600 pm/V was obtained at 4 kV/mm for 30-min HEBM-treated composites. This demonstrates that HEBM treatment is effective in enhancing the strain properties of lead-free piezoelectric composite materials.

[P2-11] Poly(Acrylamide-Co-Acrylonitrile) Grafted Pectin as an Efficient Binder for Silicon/Graphite Anodes of Lithium ion Batteries

Bolormaa Gendensuren, Chengxiang He, Seongdong Seo and Eun-Suok Oh

University of Ulsan, Korea

Abstract

In our resent research, we have synthesized highly interactive and conductive binder from the mixture of acrylamide (AM) and acrylonitrile (AN) with pectin (Pec) using ammonium persulphate and TEMED as initiators via a free radical grafted copolymerization method.

Pec-graft-Poly(AM-co-AN) is applied as the binder for graphite and silicon composite electrodes of lithium ion battery for the first time. As the initial result, Si/C anode with this newly binder is found strongly efficient for the mechanical properties and lithium ion transition compared to performance of pectin and pectin grafted with polyacrylamide.

[P2-12] Removal of Pb^{2+} from Wastewater by Enzymatically-Polymerized Adsorbent

Yue Xu[1,2], Seul Lee[2], Ik-Keun Yoo[2] and Keungarp Ryu[2]

[1]Sch. of Chemistry and Chemical Engineering

Shanghai University of Engineering Science

Shanghai, China

[2]University of Ulsan, Korea

Abstract

The enzymatically-synthesized polymeric adsorbent of m-phenylenediamine (poly(m-PDA)) was investigated for the adsorptive removal of heavy metals from water. The polymerization of m-phenylenediamine was carried out using laccase in an aqueous buffer without adding any organic solvents. In an adsorption study of Pb^{2+} by poly(m-PDA), the adsorbed amount of Pb^{2+} was strongly influenced by solution pH and decreased as solution pH was lowered from 5 to 2. The adsorption isotherm of Pb^{2+} followed Langmuir equation satisfactorily.

[P2-13] Colocalization of Pyrococcus Horikoshii Glutamate Decarboxylase and Escherichia Coli GABA Transporter by Synthetic Scaffold for the Improved GABA Production

Sivachandiran Somasundarama, Hyeon Jin Jang, Jae Hoon Jeong, Taehee Kwon, Ik-keun Yoo and Soon Ho Hong

University of Ulsan, Korea

Abstract

Gamma-aminobutyric acid (GABA) is a precursor to pyrrolidone, a monomer used for the production of a biodegradable polymer known as nylon-4. GABA is also widely used in the medical industry to treat conditions such as high blood pressure, anxiety and depression. Generally, GABA is produced from glutamate by the enzyme glutamate decarboxylase (GadB). In this study, a synthetic scaffold complex was introduced between Pyrococcus horikoshii GadB and the GABA antiporter (GadC) from E. coli. P. horikoshii GadB was attached to the N-terminus, C-terminus and middle of E. coli GadC via scaffolding. Among the three scaffold complexes evaluated, the N-terminus scaffold model produced 5.93 g/L of GABA from 10 g/L monosodium glutamate (MSG). When the gabT mutant E. coli XBT strain was used, the highest GABA concentration of 5.96 g/L was obtained, which is 97.8% of GABA yield. In addition to GABA concentration, GABA productivity was increased 3.5 fold via the synthetic scaffold complex.

[P2-14] Development of Methanol Sensing Escherichia Coli Using the Chimeric Two-Component System from Paracoccus Denitrificans

Vidhya Selvamani, Hyeon Jin Jang, Jae Hoon Jeong, Taehee Kwon, Ik-keun Yoo and Soon Ho Hong

University of Ulsan, Korea

Abstract

Escherichia coli does not have the methanol sensing apparatus, was engineered to sense methanol by employing chimeric two-component system (TCS) strategy. A chimeric FlhS/EnvZ (FlhSZ) chimeric histidine kinase (HK) was constructed by fusing the sensing domain of Paracoccus denitrificans FlhS with the catalytic domain of E. coli EnvZ. The constructed chimeric TCS FlhSZ/OmpR could sense methanol by the expression of ompC and gfp gene regulated by ompC promoter. Real-time quantitative PCR analysis and GFP-based fluorescence analysis showed the dynamic response of the chimeric TCS to methanol. The expression of ompC and the gfp fluorescence was maximum at 0.01% and 0.5% of methanol respectively. These results suggested that E. coli was successfully engineered to sense methanol by the introduction of chimeric HK FlhSZ. This strategy can be employed for the construction of several chimeric TCS based bacterial bio sensors for the development of biochemical producing recombinant microorganisms.

[P2-15] Formation of Zinc Glycerolate in Direct Carbonation of Glycerol with CO_2 over $La_2O_2CO_3$/ZnO Catalysts

Hongyan Yu, Huy Nguyen-Phu, Lien Do Thi, Yong Men and Eun Woo Shin
University of Ulsan, Korea

Abstract

La-Zn mixed oxide materials have been used as a typical heterogeneous catalyst for glycerol carbonation with CO_2 to produce glycerol carbonate, which has attracted great attention as an alternative route to simultaneously utilize CO_2 and glycerol, a by-product of biodiesel. In this study, $La_2O_2CO_3$/ZnO catalysts were prepared by ethylene glycol combustion method and co-precipitation and used for direct carbonation of glycerol with CO_2 as a function of reaction times. FT-IR and XRD analyses of spent catalysts clearly exhibited the formation of zinc glycerolate as an intermediate in the reaction from glycerol to glycerol carbonate. Quantitative estimation for the formation of zinc glycerolate indicated that zinc glycerolate was preferentially formed over the catalyst prepared by co-precipitation. The different catalytic behavior on the formation of zinc glycerolate was closely related to crystalline structure of $La_2O_2CO_3$ phases.

[P-2-16] Role of CeO_2, $Ce_xZr_{1-x}O_2$ and $Ce_xZr_{1-x}O_2$-Al_2O_3 Supports in Vacuum Residue Cracking with Steam

Do Thi Lien, Hae Won Jung, Huy Nguyen-Phu, Yu Hongyan and Eun Woo Shin
University of Ulsan, Korea

Abstract

Cracking is a popular process to produce high economic value products as light oil from vacuum residual oil, resembling as the carbonaceous fossil fuels. In this study, NiK/CeO_2, NiK/$Ce_xZr_{1-x}O_2$, and NiK/$Ce_xZr_{1-x}O_2$-Al_2O_3 catalysts were synthesized by adding Ni and K onto the surface of CeO_2, $Ce_xZr_{1-x}O_2$ and $Ce_xZr_{1-x}O_2$-Al_2O_3 supports. These catalysts were used for cracking process of vacuum residue over steam at 500℃ in fixed-bed reactor system. These catalysts possess physical special property as high oxygen capacity and chemical property as self-redox ability. Over these catalysts, high amount of light oils such as naphtha, diesel and VGO were produced b oxidative cracking and catalytic cracking; and the quality of product is improved significantly by the hydrogenation over nickel metal sites.

[P2-17] Preparation of Co-$NiTiO_3$ Materials by a Solvothermal Method

Kaiming Jiang, Thanh-Truc Pham, Hae Won Jung, Yong Men and Eun Woo Shin
University of Ulsan, Korea

Abstract

Nickel titanate ($NiTiO_3$) is well known as a potential material for photocatalysis under visible light irradiation. With regard to $NiTiO_3$, key factors for the development of a highly efficient semiconductor photocatalyst include a suitable band gap for electron transfer under illumination, strong absorption of photon energy, and long life times of excited electrons to avoid bulk/surface charge recombination. In this study, we prepared Co-doped $NiTiO_3$ materials via a Pechini method followed by a solvothermal treatment to enhance their optical and structural properties. Based on diverse catalyst characterizations such as XRD, Raman, FT-IR, HR-TEM, UV-Visible absorption, PL and N_2 adsorption/desorption technique, it was found that Co doping into the $NiTiO_3$ framework induced the inhibition of PL emission and the increase in surface areas.

Poster Session – 3

[P3-1] Directivity Properties of Radiation From Crossed Dipole-Like Antennas Fed by Waveguide

Anatoly P. Gorbachev
Novosibirsk State Technical University, Russia

Abstract

The paper deal with the modified waveguide-fed radiator based on two crossed various dipole-like antennas. Each of the antennas is proposed in corresponding Russian Patent. The new arrangement of the antennas above the ground metallic plate is presented in this article. To excite both the antennas four probes inside rectangular waveguide are used. The radiation characteristics of such the radiator are presented as the results of 3D-electrodynamical modeling.

[P3-2] Electric Parameters Identification of Synchronous Generator Connecting to the Distribution Grid

Mikhail Yu. Frolov and Alexander G. Fishov
Novosibirsk state technical university, Russia

Abstract

Nowadays there is an intensive development of smart grid with small distributed generation in the whole world. The smart grid conception assume the free connection to grid of the new generating equipment, it is called plug & play technology, which allows to identify the type and parameters of the connecting elements. In the paper the electric parameters identification method was described, it uses terminal currents and voltages of all three phases, field current and rotor speed, recorded while transition process. The parameters, taken by this way, can be used for online automatic setup of rely protection, technological and emergency automatics. For demonstration of identification it was given the digital model of the simplest power system, which models the generator connection to the grid. The model was design in Simulink Matlab. The subtransient, transient and steady currents, voltages and electromotive forces in direct and quadrature axes are determined from transient process oscillograms. Using these values and Park-Gorev equations the resistances and reactances are calculated, and these values using for time constant calculation. In the last part of the paper the calculation results of parameters and errors are given, the error tolerance are substantiated and also ways of errors decreasing are given, if this necessity appears.

[P3-3] The Light Pollution by the Urban Roadlightings

ORGILBOLD Sainbileg and ENKHJARGAL Khaltar
Mongolian University of Science and Technology, Mongolia

Abstract

The light pollution is physical phenomenon similar to sound pollution and it is overspillof artificial light in the outdoor environment. Even though there are many sources of the artificial light, one of the main light polluter the street and roadway lights can be controlled by the most common and sophisticated methods. The present light pollution condition in urban environment requires development of policy on light /bulb power, types, color, design, luster, and spacing/ standards meeting social and environmental requirements for Mongolia. At the present level adoption of the advanced standards and new eco lightning could build base for future development.

[P3-4] Analysis of Seismic Signals Preliminary Processing Influence on Classification Results

Yury V. Morozov, Michael A. Rajfeld and Alexander A. Spector
Novosibirsk State Technical University, Russia

Abstract

Seismic signals preliminary processing influence on seismic waves generating objects classification results has been analyzed. The seismic signal envelope is formed by decorrelation, square detection and smoothing. The envelope is processed by the Fast Fourier Transformation to obtain the spectral classification criterions including zero to tenth spectral components for objects of four classes including person, group of people, big animal and automobile. As it is follows from computer simulation the seismic waves generating objects spectral classification based on the maximal likelihood principle gives the classification errors number, which is no more than 20% from the total classification solutions number. Using more seismic sensors helps reducing the classification errors number.

[P3-5] The Analysis of Current and Voltage Harmonic Content of Substation 35/6 kV in the Autonomous Power System and Higher Harmonics Limitation

V. Zyryanov, N. Mitrofanov and N. Kiryanova
Novosibirsk State Technical University, Russia

Abstract

A high proportion of motor load with synchronous and asynchronous motors unit capacity commensurate with the capacity of power generating units, with soft starters, variable frequency drives and rectifier load are typical for modern autonomous power systems of oil and gas industry. The essential problem is the higher harmonics of current and voltage, which greatly influence the conditions of operation of the main elements of the power equipment of power systems and negatively impact on the relay protection devices, automation, remote control and communication. The experimental research of power quality in the autonomous power supply system was made for one company in oil and gas industry which uses 6 kV tires substation 35/6 kV. The harmonic structure of currents and voltages are revealed. Circuit configuration of filter compensating devices was proposed. This circuit configuration is applicable for different operating conditions of electrical equipment and can be used separately or as a complex system. The parameters of these devices were calculated. The efficiency of calculated resonant filter of higher harmonics is shown.

[P3-6] Effects of Urban Infrastructure Development on Air Pollution in Ulaanbaatar, Mongolia

Dashjamts Bayarmaa
Mongolian University of Science and Technology, Mongolia

Abstract

Air pollution during winter months has become one of the main environmental problems of Ulaanbaatar, the capital city of Mongolia, in recent years. This paper presents the results of the research on relationship between air pollution and urban infrastructure. For Ulaanbaatar which is named as the world's coldest capital city, the thermal heating is the basic and vital component of the urban infrastructure. The other and equally tackled problem of the city are traffic jams on daily basis. Both infrastructure issues are considered as the main sources of air pollution. The research analyzes Ulaanbaatar's monthly data on air pollution, amount

of imported vehicles, production of electricity and thermal heating, coal consumption as well as health indicators. The results indicate that air pollution is significantly related to urban infrastructure development. Effective thermal heating infrastructure can contribute to reduction of air pollution in winter season and have positive relationship with health indicators of citizens' Ulaanbaatar. Lack of thermal heating infrastructure and economic hardship pushes low income citizens to burn scrap tires and bricks soaked in motor oils which cause air quality deterioration. The vehicle amounts found to have insignificant relationship with urban pollution. The finding can be explained with dominating share of hybrid vehicles imported mostly from Japan.

[P3-7] Multifactorial Estimation of Geoecological Risks for Environment

M.S. Khairetdinov[1],G.M. Voskoboynikova[2], Kh.Kh Imomnazarov[2] and A.A. Mikhailov[2]
[1]Novosibirsk State Technical University, Russia
[2]Institute of Computational Mathematics and Mathematical Geophysics Siberian Branch of RAS, Russia

Abstract

The prediction problem of the geoecological destructive impact to environment from natural and technogenic explosions is multifactorial problem. There are factors that reduce ecological impact from the explosions in near ground atmosphere: snow cover, forest, surrounding area relief. The explosions generate seismic waves in the Earth and infrasound acoustic waves in the atmosphere. The paper presents a mathematical simulation of the elastic waves propagation from infra low frequency source taking into account snow cover. The programs for calculation of the acoustic levels through mathematical model based on the conservation laws and differential equations for porous snow medium are implemented. The results of the processing and analysis of the experimental data taking into account the snow cover is executed.

[P3-8] Diffusion of Innovations in the Russian Federation Geopolitical Space

Petrov Vladimir, Korel Igor and Kafidova Natalia
Novosibirsk State Technical University, Russia

Abstract

We develop a simple model based on cellular automata approaches for the spreading of an innovation in the Russian Federation geopolitical space. The model is used to examine the Rogers's hypothesis, is of critical importance availability of early adopters. We model the dissemination of innovations in the Russian Federation geopolitical space based on the cluster analysis of official regions statistics. The results of the modeling are discussed and analyzed.

[P3-9] Synthesis and Characterization of ZnO Nanoparticles

T. Enkhtuya[1], G. Tsermaa[1], G.Batdemberel[1], P. Munkhbaatar[1], Sh. Chadraabal[1] and N. Javkhlantugs[2]
[1]Mongolian University of Science and Technology, Mongolia
[2]National University of Mongolia, Mongolia.

Abstract

This study is focused on hydrothermal synthesis method of zinc oxide nanoparticles by using ammonia and zinc chloride. Synthesized nanoparticles have been characterized by using X-ray Diffraction, UV-vis and Photon Cross Correlation (PCCS) spectroscopies, TEM analysis. ZnO thin films were prepared by spin coating method from the solution of

ZnO nano particles. XRD peak corresponds to hexagonal structure with cell parameter a=0.326 nm and c=0.522 nm. The grain size of zinc oxide nano particles has been determined 43.3 nm using the Scherrer formula. As a result of PCCS measurement, synthesized zinc oxide nanoparticles have the mean diameter of ~96 nm of main particles with particle size distribution range of from ~90 nm to ~99 nm. As the result of TEM, the respective size of nano particles was around ~96 nm. ZnO nano particles were coated on glass and indium-tin oxide (ITO) substrates. The photocatalytic activities were studied ITO substrates with ZnO thin film. ZnO thin films can be used as catalyst for reaction Cr(VI) into Cr(III).

[P3-10] Dynamical Model of The Synchronous Impact Electromagnetic Drive Mechatronic Module

Lyudmila A. Neyman and Vladimir Yu. Neyman
Novosibirsk State Technical University, Russia

Abstract

Mechanisms and devices with reciprocated electromagnetic drives are widely used in industry to provide a lot of technological processes. With respect to energy saving demands the paper is essentially focused on low-frequency synchronous impact electromagnetic machines. Such machine impact frequency is equal to or multiple of single-phase power source frequency. The development of the two-inductor synchronous impact electromagnetic machine with head free running-out needs the creation of a dynamical mathematical model as the basement for a new operating cycle and control method. The paper considers the electromagnetic impact unit dynamical model. The impact unit consists of the multi-mass oscillating system with spring linkages which is excited by the inductors system periodic magnetic field. The model is based on the Lagrange differential equations of the system electrical balance and mechanical interaction between directly moving inertial masses. The dynamical model of the two-inductor synchronous impact electromagnetic machine with head free running-out has been developed. The model is featured by the capability to simulate interconnected electromechanical processes with respect to magnetic material non-linear characteristics, inertial masses mobility degree, spring linkage properties and power loss. The calculation algorithm is proposed together with an example of the numerically implemented model in Matlab Simulink. The created model gives wide capabilities of the detailed analysis of the operating processes in electromagnetic impact units in transient and quasi-stationary modes for the improvement of their characteristics. The mathematical simulation methods have approved new operating cycle efficiency to improve electromagnetic compatibility of a power source with the electromagnetic impact unit.

[P3-11] Ventilation System Improvement Study of Metal Workshop of Erdenet ore Processing Factory

Enkhjargal Khaltar, Byambatsogt Pashka, Bavuudorj Ovgor, Namkhainyam Busjav and Battogtokh Zagd
Mongolian University Science and Technology , Mongolia

Abstract

The cast cleaning and heat processing sections of metal workshop of the “Erdenet mining corporation” LLC has capacity of processing over 250 kg metalwork for restoring worn shafts of rotating machinery and over metal part restorations. The presently operated air ventilation system at the workshop has limited capacity for removal of smoke

gas and dust which causes reduction of labor efficiency and increase of health problems among personnel. Improvement of the ventilation system could lead to increase of life time of the equipment, increase of product quality, increase of labor efficiency and in increase of overall normal operation of the mining. In order to properly assess and improve the work environment the proper equipment selection based on ventilation system operation study is required.

[P3-12] Using Vehicle Utilization Measurements as a Tool to Monitor Freight Transport Costs

Delgernasan Mishig
Mongolian University of Science and Technology, Mongolia

Abstract

Freight transport cost is the main concern of not only the trucking companies but many other business companies which deliver their goods besides producing them. The paper attempted to introduce a model to monitor freight transport cost based on company' at hand data, the vehicle utilization measurements. The study was done and introduced in a real carrier company which produces and delivers construction materials on site. As the model shows clear connections between cost and vehicle utilization measurements, it could be a good tool to be used in management decisions of the companies which deal with freight transportation.

[P3-13] Implementation of Semantic Analyses in the Computer Sign Language Translation System

Michael Grif, Evgeniy Tsoy and Yuliya Manueva
Novosibirsk State Technical University, Russia

Abstract

Russian language and Russian Sign language are considered in the article, advantages of taking into account these specifics are identified. The general case of translation (from sounding Russian into Russian sign language) is discussed. It is proved, that accounting semantic component in the translation process is a great advantage of system having this property. To increase the quality of sign language interpreter semantic unit is developed. This software is implemented in translation system and advantages of semantic unit is shown on examples. The use of semantic analysis module based on a V.Tuzovs dictionary, will accurately choose the correct lexical meaning.

[P3-14] A Novel Process for Bundling Nano-Fibers and The Mechanical Properties of The Nano-Fibrous Yarns

Tumen-Ullzii Ganbat[1], Jung HLim[2] and You Huh[2]
[1]Mongolian University of Science and Technology, Mongolia
[2]Kyung Hee University, Korea

Abstract

This study introduces a novel method to produce continuous nano-fibrous web and nano-fibrous bundle including drafting and twisting to improve the mechanical properties of the bundle. The bundle made with nano-fibrous web is roller drafted under elevated temperature surroundings. Twisting is generated on the so called Two-For-One (TFO) principle. The nano-fibrous yarns herewith produced

show excellent TFO twisting performance in the "twist generation zones". This novel method caused the structure and shape of the bundle to change, while not only the bundles got thinned by roller drafting, but the constituent nano-fibers also became thinner. The transformation from the ribbon shaped nanofibrous bundle to the ylinder-shaped twisted yarn took place. Using a scanning electron microscope (SEM), the inner structure of the bundle was assured, that is, the change of the loops that occurred during the formation of nano-fibrous web, while the distribution of the fiber orientation angle also was measured. The tensile strength of the bundle before twisting and after twisting were tested and compared to see how much the strength of the nano-fibrous bundle could be improved by drafting and twisting. A considerable improvement of the mechanical performance in tensile strength and strain at breakage was achieved for the twisted. Finally effects of the process variables for roller drafting and twisting on the changes in the structural and mechanical properties of the bundles are introduced.
Keywords: nano-fibrous web, bundles, roller draft, elevated temperature, loops, two-for-one twisting, structure, twist angle, mechanical properties.

[P3-15] Hot Pressing of Finely Dispersed Boron Carbide with Chromium Carbide (Cr_3C_2) as Sintering Additive

Yu.L. Krutskii, N.Yu.Cherkasova, O.E. Matts, D.A. Pershina, S.V. Veselov and A.I. Smirnov
Novosibirsk State Technical University, Russia

Abstract

The process of obtaining high-density boron carbide-based ceramics has been studied. Sintering was performed by hot pressing. The starting material was polydispersed ("poorly sorted" boron carbide powder with an average particle size of almost three μm. Chromium carbide powder with an average particle size of almost eight μm was used as a sintering additive. Boron carbide without sintering additives and boron carbide with the addition of almost six wt% chromium carbide were sintered. Sintering was performed in argon. When sintering boron carbide, the obtained high density against the theoretical value, and high micro hardness. During sintering of boron carbide with the addition of chromium carbide, the density and the attained microhardness increase.

[P3-16] Composite Films of Polybenzimidazole Matrix with Graphene Filler as Strain-Sensing Elements

V. A. Kuznetsov[1], A. Ya. Stefanyuk[1], A. S. Berdinsky[1], V. G. Makotchenko[2], A. I. Romanenko[2], B. Ch. Kholkhoev[3] and V. F. Burdukovskii[3]
[1]Novosibirsk State Technical University, Russia
[2]V. E. Fedorov Nikolaev Institute of Inorganic Chemistry, Russia
[3]Baikal Institute of Nature Managemen, Russia

Abstract

The paper reports on piezoresistive effect in composite films of polybenzimidazole matrix with few-layered graphene filler. The composite films were formed from graphene dispersions by flow coating. The dispersions were prepared by ultrasonic treatment of few-layered graphene in the solution of poly[2,2'(p-oxydiphenylen)- 5,5'bisbenzimidazole] in N-methyl-2-pyrrolidone solvent. Two types of films were prepared with 0.75 and 2% (weight) few-layered graphene content. Piezoresistive effect was investigated within the axial strain range from -0.12 to 0.12%. The strain was transferred to the experimental samples with precalculated beams of uniforms strength (in bending). The strain gauge factor

was shown to be independent within the error on the filler content and it is equal to 21 on average. Temperature dependences of resistivities were measured from 295 down to 245 K. Temperature coefficient of resistance is negative for both filler contents and resistivities changes were less than 3%.

[P3-17] Study on Stability of Inter-Layer Defects of Composite Materials in the Elliptic form Regarding of Nonlinear Theories

Bohoeva L.A.[1], Ganbat D.[2], Chermoshentseva A.S.[3] and Rogov V.E.[4]

[1]East Siberia State University of Technology and Management, Russia

[2]Mongolian University of Science and Technology, Mongolian

[3]Bauman Moscow State Technical University, Russia

[4]Siberian Branch of Russian Academy of Sciences, Russia

Abstract

Inter-layer defect under compressive loading is one of weak points for extended using of layered-composite materials. Thin layered components are curved and large stresses are occurred around borders of defects under loading conditions. As results of weak resistance on growing defects the stresses can increase delamination zone and consequently it will be lead to loosening of stiffness or un-symmetric structure of composite materials. These kinds of changes are becoming reasons of general fracture of construction under relatively lower loading than calculation and designing. This study considered some aspects of deformation of construction elements with detachment defects in the elliptic form. Critical loading conditions were determined and energy method was generalized in analysis of defect stabilities in terms of nonlinear settings.

[P3-18] Providing Surface Microgeometry of the Low-Wear Coating by Electro-Diamond Grinding

Kh. M. Rakhimyanov, V. V. Yanpolskiy and K. Kh. Rakhimyanov

Novosibirsk State Technical University, Russia

Abstract

The character of electrochemical dissolution of the PS12NVK coating is determined experimentally by the anode behavior of its main components, namely Ferrum (Fe), Nickel (Ni) and Cobalt (Co). The low quality of the coating surface is due to the tungsten carbide chipping out of the metal matrix during the electrochemical dissolution in water solutions of NaCl, $NaNO_3$, Na_2SO_4 neutral salts. It is shown that using the electro-diamond grinding at maximum values of the longitudinal table approach leads to improving the coating surface microgeometry. It is determined that increasing the longitudinal feed from 70 mm/min to 90 mm/min results in reducing the surface roughness from Ra=1.4 μm to Ra=0.9 μm.

[P3-19] Influence of Tool Oscillation Frequency on Quality of the Szurface Layer and Technological Possibilities of Ultrasonic Surface Hardening

V.P. Gileta

Novosibirsk State Technical University, Russia

Abstract

The influence of the tool oscillation frequency on forming the quality of the part surface layer in hardening ultrasonic processing is considered. It was determined experimentally that the device operating frequency significantly affects the micro-geometry parameters and mechanical properties of the processed surface. An increase in the operating fre-

quency in ultrasonic hardening allows us to raise the processing efficiency in providing a high quality of the part surface layer and extend the field of using this technology.

[P3-20] Increasing the Regulating Ability of Wind Turbines Based on Jet Drive

Sergey N. Udalov and Andrey A.
Novosibirsk State Technical University, Russia

Abstract

Today, wind power is the fastest-growing renewable energy source. Wind power is free, clean and endless. Furthermore, the cost of the electricity produced by wind turbines already reached the point where it is comparable with that of electricity produced by some of the conventional, fossil based power plants. However, it is still important to improve upon the technology in order to keep wind energy economically competitive with traditional and other renewable energy sources. In this paper, the idea jet drives are offered as a means of improving energy generation wind turbines.

[P3-21] Synchronized Mode Operation of Distributed Generation in Power Grid

Alexander Fishov and Andrey Marchenko
Novosibirsk State Technical University, Russia

Abstract

Synchronized work of small generation units in distributed electric grid create positive system effects such as electricity delivery to the remote areas, load profile correction, transformers unload, losses lowering, electricity quality improvement in power grid as well as reliability of electricity supply. Small generators that works in parallel with the grid cause some technical issues: short circuit current multiple growth, probable appearance of dynamic moment on small generation synchronized machine shaft and inability to maintain their dynamic stability with the grid due to minor machine rotor inertial.

Because of technical characteristics for small generation, existing methods of mode and emergency power system operation are ineffective. New method of mode and emergency power system operation is proposed. This method is based on high-speed (faster than other automations) balanced isolation for power supply system upon one of two fixed intersections in advance. One of intersections is used for isolation in excess mode, another for consumption from the grid mode. An automation via mode operation provides such intersection load that when disturbance appears (grid short circuit), it rapidly isolates self-balanced subsystem of small capacity with following automatic synchronized mode recovery. Automation research results which demonstrate its efficiency are presented by the example of power supply system based on cogeneration power station (installed capacity 10 MW) with nominal voltage 10 kV connected to electric grid 110 kV via substation 110/10 kV.

[P3-22] Environmental Issues of the Tourism Industry Development: A Case Study of Mongolia

Amartuvshin Lkhagvasuren
Mongolian University of Science and Technology, Mongolia

Abstract

Although tourism is now the world' largest industry, the environment issues are becoming more important for developing the tourism industry. Therefore, tourism is not only a powerful economic force but also one of the important factors in the physical environment as well. Mongolia is a unique and rela-

tively unexplored travel destination that offers a great combination of scenic natural features, a wide variety of untouched landscapes including vast open spaces, and nomadic life style and culture. The implementation of the government policy in the tourism industry since 1990 has resulted in creating many environmental issues in Mongolia. The purpose of this paper is to provide insight into the purpose and development of responsible and sustainable tourism in Mongolia. The positive and negative impacts on the nature derived from the tourism development of Mongolia are also analyzed in this paper.

[P3-23] Operational Properties of Gray Cast Iron Parts After Plasma-Ultrasonic Hardening

Kh.M. Rakhimyanov, Yu.V. Nikitin,
Yu.S. Semenova and A.Kh. Rakhimyanov
Novosibirsk State Technical University, Russia

Abstract

The paper is devoted to studying the operational properties of the surface layer of gray cast iron parts after using different methods of surface hardening. It is shown that combined plasma-ultrasonic hardening provides maximum value of wear resistance and contact-fatigue strength. The quantitative ratio of operational properties indices for the studied methods of surface hardening is established.

[P3-24] Automated Noise Analysis for Machine Fault Detection

Yanjin Altankhuyag[1,2] and Wolfram Hardt[2]
[1] Mongolian University of Science and Technology, Mongolia, Mongolia
[2] Technishe University, Germany

Abstract

The fault detection of electric machinery is important necessity for stability of system. The noise signal of rotating machinery is utilized for early fault diagnostic. A measured noise signal is divided down by short time duration parts. Fault carrying frequencies are extracted from digitalized signal. Envelope detector and demodulation were utilized for identifying fault frequencies with their harmonics and sidebands. Automated noise analysis is dedicated to detect and report a machinery abnormal condition. Implementation was conducted with noise signals which were obtained from an electric motors, turbine generators and bearing fault motors.

[P3-25] The Survey of Forecasting on Energy and Heating Production and its Consumption in Darkhan City

Galbadrakh Sosorbaram, Ider Khishigbayar and Khugjmaa Dorjbat
Mongolian University of Science and Technology, Mongolia

Abstract

The major objective of this study is to calculate the current situation of optimal capacity of Darkhan thermal power plants by identifying the current and future consumption of electricity and heat in Darkhan city, one of the largest industrial centers of Mongolia. Moreover, the plant is needed to determine its appropriate process with the Mongolian energy system functions and its orientation for future

development. Our goal is model annually the power and heat consumption though based on statistical information produced between 1995-2016 at Darkhan thermal power plant. In this study we discuss how to define the growth equation of the heat load of the power and heat by mathematical modeling. This survey was composed of initial data used in the range of Darkhan city.

[P3-26] Optimization of Extraction and Dyeing Parameters for Natural Dyeing Using Rhubarb (Rheum Undalitum.L) and Nettle (Urtica Cannabina.L)

Tserendulam.S[1], G.Nadmid1, Delgermaa.S[1], Kh.Soyol-Undrakh[1] and M.Tamara[2]
[1]Mongolian University of Science and Technology, Mongolia
[2] Institute of Physics and Technology, Academy of Sciences, Mongolia

Abstract
An increased interest for natural dyes started several years ago. This paper is advertising the development for the extraction of natural bio-preparation from Rhubarb (Rheum. Undulatum .L,), nettle(Urtica.Cannabina.L). The objectives of this work are to study the optimization of extraction and dyeing recipes of natural bio-preparation obtained from Rhubarb (Rheum. Undulatum .L,), nettle (Urtica. Canna bina.L) for cashmere, and to studying the fastness properties of the dyed cashmere. Optimization of bio-preparation extraction conditions is done by the solvent is water, solid to liquid ratio, time and temperature are studied by using solution's absorbance alues. Bio-preparation extract is obtained from a plant and then applied on cashmere by using mordant with various dyeing conditions. Colorfastness tests had done examined on dyed samples for light, rubbing and washing fastness are carried out according to the MNS/ISO standards. Some metal salts used by mordants in the natural dyeing processing are increased the 2-3 grade of color fastness rating of dyed fabrics.

[P3-27] A Study on the Servo System Using Predictive Control Method

Batchimeg Dorjgotov[1], Atartsetseg Lkhagvasuren[2], Erdenetsetseg Tserenlkham[2], and Ulemj Damiran[2]
[1]Ulaanbaatar District Heating Company, Mongolia
[2]Mongolian University of Science and Technology, Mongolia

Abstract
In this paper, speed control of servo motor is addressed by using Model Predictive Control (MPC). In the simulation servo system, the DC servo motor model adopts the CE110 Servo Trainer model from TQ Education and Training Ltd. The first step of this paper is to identify the mechanical and electrical parameters of the servo motor by mathematical modelling and experimental study. The second step is to comparatively evaluate the benefits of the strategies in terms of each controller's performance. The simulation results show that the proposed designs achieves better performance than the conventional proportional- integral- derivative (PID)control.

[P3-28] A Mobile Based Revision Control System for Facilitating Decision Making on a 3D Designing

N. Purevdorj and N.Davaadorj
Mongolian University of Science and Technology, Mongolia

Abstract
Recently, in competitive industrial world, it is getting

difficult to run with high speed in the market, without convergence of adopting Information and Communication Technologies. Especially, technologies such as Web and Cloud computing are widely used in distributed Research and Development and collaborative (R&D). This research work proposes a web-based collaborative design framework that enables following three parts: (1)Framework for facilitating decision making on a 3D design developing process, (2) Revision control and difference viewer framework for 3D CAD model data, (3) PhoneGap based hybrid application for utilization of proposed system in mobile environment. On decision making, in order to support modeling, real time conference room and asynchronous communication features are developed. By utilizing the conference room, designers can view 3D model, its design changes on the web-browser and can add comment on surface of 3D design data which is under developing process.

[P3-29] The Elimination of Current Overload of Parallel Transmission Lines

Alexander Dolgov and Olga Gorte
Novosibirsk State Technical University, Russia

Abstract

The power transmission lines ultra-high and high voltages may be turned on work in parallel. There is overload by current high voltage lines and under load ultra-high voltage lines in this case. Open contours are often performed to eliminate overload lines. This leads to reduced reliability of the power networks. Power electronics allows eliminating contradictions. But the cost of FACTS devices is very big. The use of reactors consistently incorporating for current limiting circuit lines of high stress is considered in the article. The impact of proposed activities on the losses of active power is analyzed also.

[P3-30] Simulation of the Multibody System Using the Lagrange Equations of the First Kind

A.R. Zagidulin, E.G. Podruzhin and G.I.Rastorguev
Novosibirsk State Technical Universit, Russia

Abstract

The paper describes a mathematical model of drop tests on the aircraft landing gear. The model is formulated using the multibody system simulation procedure based on the Lagrange equations of the first kind.

[P3-31] Continuous Voltage Phase Shift Control in Power Systems

Viktor Denisov, Anna Arestova, Igor Korotkov and Ilya Dulov
Novosibirsk State Technical University, Russia

Abstract

Nowadays the regulation and control of steady state and transient modes of electric power system are one of the most important tasks. There are numerous ways of improving static and dynamic stability, which are already realized in electrical power systems and, apparently, do not require innovations. However, the picture of an electric power system changes every day, the number of the distributed generation grows, the contribution of renewable power sources raises, influence of nonlinear load increases. Rates of development of modern electric power systems require review of the classical principles of management, since the traditional means of improving the dynamic stability are insufficient now. The paper presents the method of improving the dynamic stability based on the voltage phase shift control. The phase shift control can be discrete or continuous that is caused by the applied means

of control. The paper includes: the study of opportunity and application area of the continuous phase control for ensuring dynamic stability of electric power systems, the design of principles and control laws, mathematical modeling of electric systems with continuous control, experiment results of the continuous phase control realized in single machine system.

[P3-32] Survey of Vehicle Detection Methods

Ganchimeg. G1 and Helmut. L[2]
[1]Mongolian University of Science and Technology, Mongolia
[2] Austrian Institute of Technology, Austria

Abstract

Vehicle detection and tracking play an effective and significant role in the area of traffic surveillance system where efficient traffic management and safety is the main concern. Image processing is used in traffic surveillance for vehicle tracking, recognizing license plates, identifying obstacles in the road, etc. In this paper, the comparative study of various vehicle detection techniques is clearly demonstrated and results are compared with appropriate measures. Each technique results in efficient vehicle detection in aerial view images.

[P3-33] Researsh of Machine Dynamic

M. Erdene-Ochir
Mongolian University of Science and Technology, Mongolia

Abstract

One possibility to increase the productivity, accuracy, and safety of the crane is to reduce the payload swing during transportation. We will research this question using a simple scheme. We used the equation of the swing motion of the load as mathematical model [1]. In this work input shaping method is studied. Computer simulations are used to verify the performance of input shaping controller.

[P3-34] Improvement of the Dispatching Preplanning Process in Day-Ahead Electricity Market Using a Sequential Method

Zagdkhorol Bayasgalan[1], Tsetsgee Bayasgalan[1] and Francesco Muzi[2]
[1]Mongolian University of Science and Technology, Mongolia
[2] University of L'Aquila
L'Aquila, Italy

Abstract

This paper proposes a sequential loading method, which finds the hourly changes of frequency and optimal load distribution between power stations. The method solves to minimize the aggregate cost in the electric power system (EPS). The method also calculates the surplus or deficit of an active power in EPS, hourly power flows of each transmission lines, active power losses in the networks. Computed and analyzed the optimal regimes of Mongolian EPS by the proposed method. The result confirmed that the method can potentially benefit to supply of frequency regulation. Developed software allows to do day-ahead market planning and intraday market preplanning in EPS, which improves electricity market model.

[P3-35] A Study on Using Thermal Solar Heating System for Houses and Mongolian Gers

Enkhjargal Khaltar[1], Gombosuren Munkhbayar[1] and Davaadulam Amarbuyan[2]

[1]Mongolian University of Science and Technology, Mongolia

[2]Huree ICT University, Mongolia

Abstract

In Mongolia heating system, which is the main priority, is mostly required for private houses and traditional gers throughout the year, due to the changeable and harsh climate of the country. According to the statistics of 2015, 48% of 465'289 households are using wood or coal pellet stoves, and only 0.8% is using electric heaters. In this study, the authors investigate the possibilities of using solar heating system for houses and Mongolian gers.

[P3-36] Zero technology of Mongolian Large animal Bones, to Research and Produce Bone Concentrated Broth

Chimegee Nagaaranz[1], Damdinsuren Luvsansuren[2] and Bayasgalan Oyunbaatar[3]

[1]Institute of Technology, Mongolia

[2]Mongolian University of Science and Technology, Mongolia

[3]Khatan suikh impex LLC

Abstract

This study is part of a project that aims to investigate the possibility to develop meat by-products that can offer quality and distinctive Mongolian advantage internationally. Marrow bones were used to produce the concentrated bone broth and the possibility to develop bone broth without any flavorings except salt, from the different types of animal /beef and horse/ sources was assessed. Texture, clarity, overall acceptability and rating of beef and horse bone broths did not differed. It tasted clean and was kept natural beefy or horse meaty taste with pleasant meaty aroma and light brown color. Moisture was higher ($p<0.05$) in beef broth (43.8%) than horse (36.5%), hovewer protein and fat content were higher in horse bone broth (25.1, 13.9%) than in beef broth (23.2, 12.7%). Calcium, magnesium and iron concentration in beef bone broth (85.3, 46.7 and 23.3 mg/100g) was higher ($p<0.05$) than in horse broth (66.6, 10.0, and 12.3 respectively). Salt content was 5.52-5.87% for broths. Collagen content were 44.58 and 49.15% in total protein of concentrated broths. Beef bone broth had more ($p\leq0.05$) essential amino acids than in horse broth. A result showed that bone broth possess many health beneficial properties, such as being a good source of minerals, essential amino acids and collagen.

[P3-37] A Study of Group Arrangements of Y-Type Perfobond Rib Shear Connector

Altanzagas Ochirdorj[1], Ganzorig Erdene[1] and Sang-Hyo Kim[2]

[1]Mongolian University of Science and Technology, Mongolia [2]Yonsei University, Korea

Abstract

The main goal of the research presented in this paper is to promote the application of grouped Y-type perfobond rib shear connectors in steel-concrete composite structures. In this study, shear resistance and ductility of single row and double rows of group Y-type perfobond rib shear connectors are examined through push-out tests and numerical simulations by considering steel and concrete strength (grade), rib arrangement (single and double rib rows), spacing between adjacent shear connectors, perfobond rib shape dimensions (height, width, thickness). From the push-out tests, double rib rows of specimen's much larger plastic

deformation before failure was found, which indicates that load carrying capacity can be improved significantly by adding number of rib rows in parallel arrangement. The numerical analyses showed good agreement with experimental results. (Using the developed models) More push-out test specimens of developed models with extended design variables are tested analytically. It can be concluded that group Y-type shear connector has a superior ductility and high shear resistance, which is desirable behavior for composite structures.

[P3-38] Dry Jigging of Coals

Ulziisaikhan Purevsuren, Namnan Tumurpurev and Enkhbat Dombon
Mongolian University of Science and Technology, Mongolia

Abstract

The coal industry, including coal mining and preparation, coal-fired power generation is one of the most water-intensive industries. Water problem in coal wet processing of South Gobi dessert region of Mongolia is one of serious problem. One of possible methods in arid regions to save water is using dry separation in coal industry. This study investigates the coal particle separation in an air jigging lab device. Tests were conducted with a coal from Mongolian Southgobi dessert region Nariinsukhait mining camp in the size range from 0.5-5 mm.

[P3-39] A Study and Development of Dehairing Technology of Mongolian Sheep Wool

Enkhtuya and Batbayar
SMongolian University of Science and Technology, Mongolia

Abstract

Affected by Mongolian extreme weather condition, Mongolian sheep wool consists of various hair types with different consistencies. In this article, presented some study results of morphologic structure of Mongolian sheep wool and attributes of fibers' scale layers. Also summarized test results for identifying technological appropriate procedures of dehairing wool down.

[P3-40] Solutions and their Expected Outcomes of Introducing Green Technology to Heating Systems in Urban Settlements of Mongolia

Namkhainyam Busjav and Byambazogt P.
Mongolian University of Science and Technology, Mongolia

Abstract

Mongolia has a continental climate with cold and long winters when air temperature drops to –30℃ -40℃. For over 70% of the country's population that live in four major cities, and 335 soum centers of 21 aimags, the heating is major component of living. Coal is a primary energy source of Mongolia and the energy sector emits approximately 60% of the nation's CO_2 emissions. High number of coil boilers operating in urban settlements is one of major sources of the air pollution. Introducing green technology to heating sectors of Mongolia, especially in urban settlements can be a solution to tackle above mentioned issues in the country. Economic and environmental assessment of solutions to introduce green technologies to heating systems were conducted. Successful implementation of the selected technologies can reduce GHG emissions by 25-30% nationwide and lower the city air pollution by 60%.

[P3-41] Efficient Electric Powertrain System for Battery-Powered Electric Vehicle

Ahmed M. Omara[1] and Michael A. Sleptsov[2]
[1]Tanta University, Egypt
[2]Moscow Power Engineering Institute, Russia

Abstract

This paper introduces a pure electric vehicle (EV) based on battery-powered electric propulsion system. The proposed vehicle configuration consists of two independently driven traction motors coupled to the rear and front wheels through mechanical transmission systems. The motor and battery parameters are determined according to the required EV performance parameters. The control and management system is designed to satisfy the optimal energy consumption of the battery. The whole vehicle system is tested using AVL CRUISE simulation platform under standard driving cycle. To validate the performance of the proposed EV, different simulation results are obtained and discussed.

[P3-42] Chaotic Isomerism of Data Security in Heat Metering IOT Information System

Guangming Sun and Jinjie Huang
Harbin University of Science and Technology, China

Abstract

The heating system in China is paid great human costs both for methods of measurement and government regulation as a result of no means of economic, applicable and reliable measurement to fully observe heat supply around the clock, to do heat allocation, data acquisition and real-time monitoring dynamically. To build a digital heat metering IOT information system has become an inevitable trend of heating reform. There will be wealth of information and data exchange in heat metering IOT system, and to build a secure heat metering IOT system has become an important topic. This paper analyzes the IOT system of heat allocation device by heating time and heating area and presents a chaos security program of transmission layer isomerism based on heat metering IOT information system for the data security issues of the system. Experimental results show that the method has feature of key sensitive and good portability, and has applied successfully in heat metering IOT information system.

[P3-43] Multifactorial Prediction of Geoecological Risks from Powerful Explosions with Application the Vibroseismic Method

M.S. Khairetdinov[1], G.M. Voskoboynikova[2], V.V. Kovalevsky[2] and G.F. Sedukhina[2]
[1]Novosibirsk State Technical University,
[2]Institute of Computational Mathematics and Mathematical Geophysics Siberian Branch of RAS, Russia

Abstract

The multifactorial problem of estimation of the geoecological risks to environment and social infrastructure from mass technogenic and natural explosions such as quarry, test ground, earthquakes, etc., are considered. The explosions generate infrasound seismic waves in the Earth and acoustic waves (infrasound) in the atmosphere. Influence of the explosions to environment is defined with shock impact of the both waves types. The effects of the acoustic waves impact strongly depend of the complex of the meteorological factors and geological conditions on the tracks of waves propagation. In the paper, the results of theoretical analysis and experimental studies of these dependences through original vibroacoustic method are represented.

XI. Sponsors

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- 자동차조선 전자융합기술사업단(Automobile/Ship Electronics Convergence Center)

- 신물질창제 연구인력양성 사업단(Human Resource Center for Novel Materials Research Experts)

- 신성장 화학산업 연구인력양성사업팀(BK21 plus for New Growth Chemical Industry)

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  (Creative Students Cultivating Program for Regional Fine Chemical Industry)

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  (Advanced Training Program for Self-Optimizing Mechanical Systems)

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IFOST-2017: Key Locations

Industry-University Cooperation Hall(Building 35) of University of Ulsan

The IFOST-2017 is held in the campus of the University of Ulsan, Ulsan, S. Korea. To get there, please show the following text to the taxi driver.

▶ Korean: 울산대학교 산학협동관(35호관)으로 가주세요.

▶ English: Please take me to the University of Ulsan.
(Building 35: Industry-University Cooperation Hall)

International Hall (Building 43) of University of Ulsan

The lunch will be taken place in International Hall (Building 43) of University of Ulsan. To get there, please show the following text to the taxi driver.

▶ Korean: 울산대학교 국제관(43호관)으로 가주세요.

▶ English: Please take me to the University of Ulsan.(Building 43: International Hall)

Shilla Stay Ulsan Hotel

The recommended accommodation by IFOST-2017 organizers is "Shilla Stay Ulsan Hotel", which is just about 8km away from the University of Ulsan. To get there, please show the following text to the taxi driver. Closing ceremony will also be held in Shilla stay Ulsan Hotel on June 1.

▶ Korean: 신라스테이 울산호텔로 가주세요.

▶ English: Please take me to Shilla Stay Ulsan Hotel.

Mokhwa Wedding Hall

The Welcome party will be held in Mokhwa Wedding Hall, which is just about 8km away from the University of Ulsan, and is just about 400m from Shilla Stay Ulsan Hotel. To get there, please show the following text to the taxi driver.

▶ Korean: 목화예식장으로 가주세요.

▶ English: Please take me to Mokhwa Wedding Hall.

Notes

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93 Daehak-ro, Nam-gu,Ulsan (44610), Korea
Tel.+82-52-259-2123(~2125) Fax.+82-52-259-3522
www.ifost.org