CONTENTS

ICEIC 2019

International Conference on Electronics, Information and Communication (ICEIC) 2019

Welcome to ICEIC 2019

Technical Program Overview

On behalf of the Technical Program Committee of the 18th annual International Conference on Electronics, Information, and Communication (ICEIC 2019), it is a great pleasure to welcome all participants and introduce the technical program.

This year, 417 papers were submitted to the conference from 24 different countries all over the world. After review process, the technical program committee selected 320 qualified papers that cover a broad range of important and timely issues in the field of electronics, information, and communication technologies. The selected papers were organized into 24 oral sessions with 120 papers and 6 poster sessions with 200 papers.

The program also includes two plenary talks given by Dr. Aiguo Patrick HU from the University of Auckland, New Zealand and Prof. Heung-No Lee from Gwangju Institute of Science & Technology (GIST), Korea.

The technical program would not be possible without enthusiastic support from outstanding colleagues. First of all, we would like to express our sincere gratitude to all the participants including the authors, the speakers, and the chair persons. We appreciate the voluntary contributions from the technical program committee members. Special thanks go to the track chairs who helped on the review process and session organization. Also, we would like to thank the member of the organizing committee for their seamless assistance.

We truly hope that you will enjoy the technical program and could find big inspiration from the technical discussion and interactions with your colleagues. We also wish you have the most fruitful and pleasant time in Auckland.

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Oh-Soon Shin
Soongsil University, Korea

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Stephen Dukes (IEEE Consumer Electronics Society, USA)
Stefan Mozar (IEEE Consumer Electronics Society, USA

January 22nd (TUE), 2019

Room	Princes A+B	Princes C	Gallery 2	Gallery 3	Regatta B	Regatta C
15:00~17:00	Registration (Lobby 1F)					
17:30	Welcome Reception (Top of the Town 14F)					

January 23rd (WED), 2019

Room	Princes A+B	Princes C	Gallery 2	Gallery 3	Regatta B	Regatta C
08:30~16:00	Registration (Lobby 1F)					
09:00~10:30		P1	A1	A2	A3	A4
10:45~11:00	Opening Ceremony (Princes A+B)					
11:00~12:30	Plenary Talk 1, 2 (Princes A+B)					
12:30~14:00	Lunch					
14:00~15:30		P2	B1	B2	B3	B4
15:30~16:00	Coffee Break					
16:00~17:30		P3	C1	C2	C3	C4

January 24th (THU), 2019

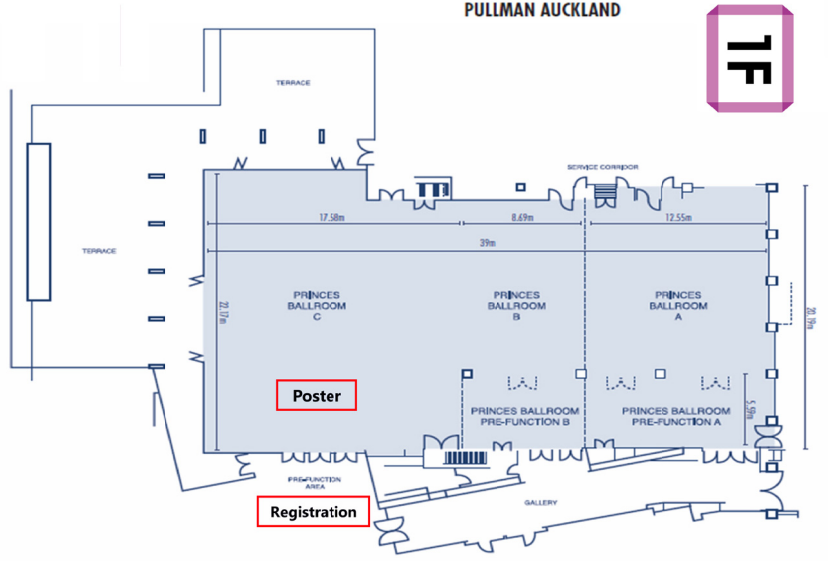
Room	Princes A+B	Princes C	Gallery 2	Gallery 3	Regatta B	Regatta C
09:00~16:00	Registration (Lobby 1F)					
10:00~12:00		P4	D1	D2	D3	D4
12:00~13:30	Lunch					
13:30~15:00		P5	E1	E2	E3	E4
15:00~15:30	Coffee Break					
15:30~17:00		P6	F1	F2	F3	F4
18:00	Banquet (Princes A+B)					

January 25th (FRI), 2019

Room	Princes A+B	Princes C	Gallery 2	Gallery 3	Regatta B	Regatta C
	ICEIC 2019 Group Discussion and Wrap-up					

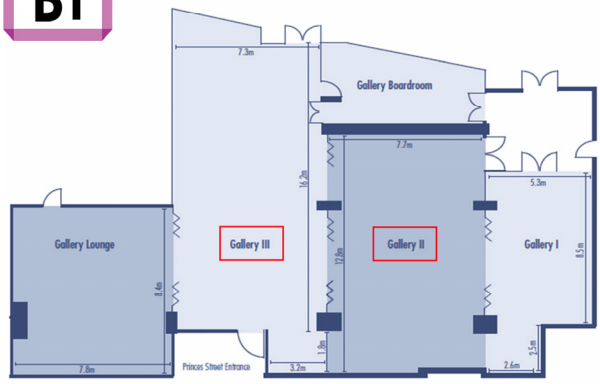
PRINCES BALLROOM FLOORPLAN - LOBBY LEVEL

PULLMAN AUCKLAND

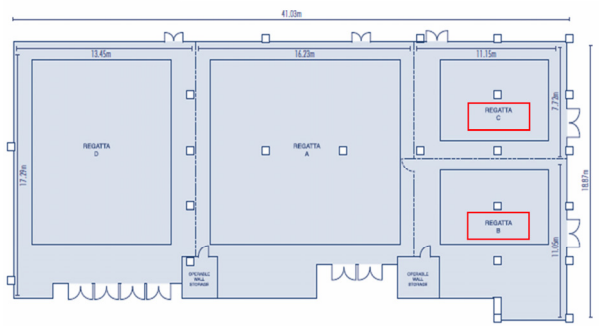


GALLERY FLOORPLAN - LOWER LEVEL
PULLMAN AUCKLAND

B1



REGATTA ROOM FLOORPLAN - LOWER LEVEL
PULLMAN AUCKLAND



Conference Information

Registration

Basically, One regular registration will cover the publication of only one accepted paper. Each additional accepted paper by the same "corresponding" author will follow the policy described below. In case of four or more papers, only three registrations are required, which will cover the attendance of three people at the conference. Beyond these three registered participants, additional registrations by coauthors and students are needed to participate in the conference.

Accepted papers (by the same Author)	First Paper	Second Paper	Third Paper	Rest of the Papers
One Paper	Regular registration			
Two Papers	Regular registration	Student Registration		
Three Papers	Regular registration	Student Registration	Student Registration	
Four Papers or More	Regular registration	Student Registration	Student Registration	Free

Registration Fee

Category	Domestic		Overseas	
	Pre-registration for IEIE/IEEE members	Non-members /On-site	Pre-registration for IEIE/IEEE members	Non-members /On-site
Author/ Regular Registration	KRW 715,000	KRW 825,000	USD 650	USD 750
Student Registration	KRW 385,000	KRW 495,000	USD 350	USD 450
Additional Proceeding	KRW 66,000		USD 60	
Additional Banquet Ticket	KRW 110,000		USD 100	

*Due date for pre-registration is by December 17, 2018

Registration Fee includes

Regular Registration

Admission to All Sessions, USB Proceedings, Banquet, Coffee Breaks

Student Registration

Admission to All Sessions, USB Proceedings, Coffee Breaks

* A banquet ticket is not included.

Presentation

Oral Presentation

Please meet the session chair at your session at least 15 minutes before the session starts. You should identify yourself to the session chair and check in with the AV staff to go over your equipment needs. You need to bring your ppt file on USB memory, and load it on the computer in your session room. You also need to confirm whether it is working properly. This is very important to pay attention to this time frame. The visual equipment provided is a beam projector.

Time assignment including discussion is as follow

Plenary : 45minutes

Regular : 15minutes

Poster Presentation

The size of the poster board is 120cm (width) × 230cm (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, and then remove your poster immediately after the session finishes.

Lunch

Lunch will be provided to all participants. Please bring your lunch coupon with your name tag.

Location	
Operating Time	January 23 (Wed) 12:30~14:00 January 24 (Thu) 12:00~13:30

Social Program

Welcome Reception

Date : Tuesday, January 22, 2019

Time : 17:30

Place : Top of the Town (14F)

An invitation to the welcome reception is extended to all participants including registered students.

Opening Ceremony

Date : Wednesday, January 23, 2019

Time : 10:45~11:00

Place : Princes A+B

All registered participants are cordially invited to join us and celebrate the official opening.

Banquet

Date : Thursday, January 24, 2019

Time : 18:00

Place : Princes A+B

We hope this banquet will offer you a good opportunity to promote friendship with participants. Delicious food and special performance will be offered at the banquet. A banquet ticket is included in the Regular Registration. Student Registration does not include the banquet.

ICEIC 2019 Group Discussion and Wrap-up

Date : Friday, January 25, 2019

Time : 09:00~11:00

Plenary Talk 1

Room:

Dr. Aiguo Patrick HU
University of Auckland, New Zealand

Basic theories and development trends of wireless power transfer technologies

Abstract

Wireless Power Transfer (WPT) has drawn wide attentions of both academic researchers and design engineers, and it has been recognized as one of the technology trends by the World Economic Forum. There is an increasing development need for wireless power transfer to movable devices for increased convenience, reliability and safety, particularly under special operating conditions where direct wire connections are difficult or impossible. However, the current technologies are still far away from being able to achieve useful amount of wireless power over long distances on the earth, nothing comparable to what have been achieved in communication systems for wireless signal transfer. This presentation will review the fundamental theories behind wireless power transfer technologies for IPT (Inductive Power Transfer), CPT (Capacitive Power Transfer), and UPT (Ultrasonic Power Transfer) systems, and discuss their fundamental features, challenges, and development trends.

Biography

Dr. Aiguo Patrick HU graduated from Xian JiaoTong University, China, with BE and ME degrees in 1985 and 1988 respectively. He received his Ph.D from the University of Auckland in 2001 before he served as a lecturer, the director of China Italy Cooperative Technical Training Center in Xian, and the general manager of a technical development company.

Funded by Asian2000 Foundation he stayed in NUS (National Univ of Singapore) for a semester as an exchange postdoc research fellow. Patrick is a leading researcher in wireless power technologies. He holds about 20 patents in wireless/contactless power transfer and microcomputer control technologies, published more than 200 peer reviewed journal and conference papers with more than 4700 citations, authored the first monograph on wireless inductive power transfer technology, and contributed 4 book chapters on inductive power transfer modeling/control as well as electrical machines.

Prof Patrick Hu is with the Department of Electrical and Electronic Engineering, the University of Auckland, New Zealand. He also serviced as the Head of Research of PowerbyProxi Ltd, as well as guest professor of Xian Jiaotong Univ, ChongQing Univ and TaiYuan Univ of Technology, China. He is a Senior Member of IEEE, the former Chairman of IEEE NZ Power Systems/Power Electronics Chapter and Chairman of NZ North Section. His research interests include wireless/contactless power transfer systems, and application of power electronics in renewable energy systems.

Plenary Talk 2

Room:

Prof. Heung-No Lee
Gwangju Institute of Science and Technology, Korea

제목

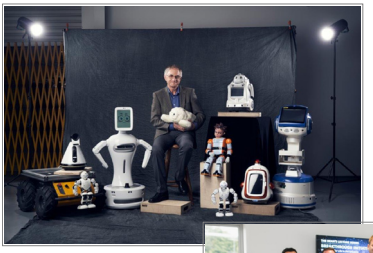
Abstract

Robots in CARES

Centre for Automation and Robotic Engineering Science,
University of Auckland

Abstract

CARES evolved from the robotics research activity across the University of Auckland. An interdisciplinary group developed over time with some thirty staff including academic researchers, postgraduate students, programme managers, project managers and professional staff from the research office and UniServices. Our mission is Inspiring and creating innovative robotic technologies that improve societal wellbeing. By integrating research and commercial interests, CARES creates a high functioning interdisciplinary team. Our skills encompass pure and applied sciences across robotics, electrical engineering, mechatronics, mechanical engineering, software engineering and computer science along with healthcare disciplines such as general practice and primary care, gerontology, nursing, pharmacy, health psychology, with expertise in user trials. CARES has secured domestic and international recognition for our collective strengths in Human-Robot interaction, robotics end-user programming and our interdisciplinary approach to research which is driven by a user-centric focus on applying robotic systems in the healthcare, home, industrial, educational and agricultural environments. We shows some of our robotic works at the ICEIC2019 exhibition.



The New Dexterity Dual Arm Hand System Telemanipulation Platform

Minas Liarokapis, University of Auckland

Abstract

In this demo we will focus on teleoperation and telemanipulation with a dual robot arm hand system, using a mapping scheme that guarantees anthropomorphism. Two motion trackers will be used to capture the position and orientation of human hands in 3D space. Human motion will be mapped to equivalent robot motion and a series of dexterous tasks will be executed by the robot arm hand systems in real time. Such telemanipulation frameworks are important for robotic platforms that need to operate in remote or dangerous environments (e.g., extraterrestrial, deep sea, radioactive etc.).

Session A

SA01 Big Data and Deep Learning I

09:00-10:30 Wednesday, January 23, 2019

Room: Gallery 2

Chair:

01 **Deep Learning Model for Atrial Fibrillation Prediction using Short-Term Electrocardiography**
Urtnasan Erdenebayar[1], Jong-Uk Park[1], Dong-Won Kang[2], and Kyoung-Joung Lee[1]
[1]Yonsei University, Korea, [2]Mediana Co. Ltd

02 **Fraud Detection with Multi-Modal Attention and Correspondence Learning**
Jongchan Park[1], Min-Hyun Kim[2], Seibum Choi[2], In So Kweon[2], and Dong-Geol Choi[3]
[1]Lunit Inc., Korea, [2]KAIST, Korea, [3]Hanbat National University, Korea

03 **Development of a Convolutional Neural Network (CNN) Detection Algorithm for Neuro-Degenerative Diseases (NDDs) based on Time-Frequency Spectrogram of Gait Force Signal**
An-Bang Liu[2,3], Febryan Setiawan[1], and Che-Wei Lin[1]
[1]National Cheng Kung University, Taiwan, [2]Buddhist Tzu Chi General Hospital, Taiwan, [3]Buddhist Tzu Chi University, Taiwan

04 **Face Attribute Editing using AttGAN and Guide Mask**
Hyeon Seok Yang and Young Shik Moon
Hanyang University, Korea

05 **Sentiment Analysis of Saudi Dialect Using Deep Learning Techniques**
Rahma M. Alahmary, Hmood Z. Al-Dossari, and Ahmed Z. Emam
King Saud University, Saudi Arabia

SA02 Image Processing

09:00-10:30 Wednesday, January 23, 2019

Room: Gallery 3

Chair:

01 **Computationally Efficient Image Upscaling Algorithm from 1080p to 4K Using Linear/Triangular Interpolation Technique**
Yu-Hsuan Lee and Cheng-Yi Tsai
Yuan-Ze University, Taiwan

02 Face Recognition using Ensemble of CNNs
Hanbyeol Bae, Yongju Lee, Taejae Jeon, and Sangyoun Lee
Yonsei University, Korea

03 A global-based fingerprint matching algorithm for touchless fingerprint
Joon Pyo Hong, Jun Beom Kho, and Jaihie Kim
Yonsei University, Korea

04 A bifurcation-based descriptor for sclera recognition
Sanghak Lee and Jaihie Kim
Yonsei University, Korea

05 An Experiment on Automatic Segmentation of Femur Bone from Pelvis CT Sequences
Young-Ji Yun[1], Muthusubash Kavitha[2], and Sung-Il Chien[1]
[1]Kyungpook National University, Korea, [2]Hiroshima University, Japan

SA03 Communication Systems I

09:00-10:30 Wednesday, January 23, 2019

Room: Regatta B
Chair:

01 Efficient MMSE-PIC Detection Scheme for Coded Massive MIMO system
Meixiang Zhang[1] and Sooyoung Kim[2]
[1]Yangzhou University, China, [2]Chonbuk National University, Korea

02 High-Throughput Covert Channels in Adaptive Rate Wireless Communication Systems
Peter M. B. Harley, Murali Tummala, and John C. McEachen
Naval Postgraduate School, Monterey

03 Optimal Preamble Length for Spectral Efficiency in Grant-Free RA with Massive MIMO
Jie Ding, Daiming Qu, and Hao Jiang
Huazhong University of Science and Technology, China

04 Interference Cancellation scheme for $M\times N$ SISO X Channel with Synergistic Alternating CSIT
Young-Sik Moon and Jong-Seon No
Seoul National University, Korea

05 The Tomlinson-Harashima Precoding-based FBMC-QAM System
Jintae Kim[1], Yosub Park[2], Hyunsoo Kim[1], and Daesik Hong[1]
[1]Yonsei University, Korea, [2]Samsung Electronics Co., Korea

SA04 VLSI and Computing Technologies

09:00-10:30 Wednesday, January 23, 2019

Room: Regatta C

Chair:

01 **Analysis of Crosstalk Noise for Coupled Microstrip Interconnect Models in High-Speed PCB Design**
Raju Mudavath, B. Rajendra Naik, and Bhaskar Gugulothu
Osmania University Hyderabad, India

02 **Implementation of multi-layer neural network system for neuromorphic hardware architecture**
Wookyung Sun, Junhee Park, Sumin Jo, Jungwon Lee, and Hyungsoon Shin
Ewha Womans University, Korea

03 **Development of Predictive Maintenance Technology for Wafer Transfer Robot using Clustering Algorithm**
Hyeong-Gyun Kim, Hee-Seung Yoon, Ji-Hyun Yoo, Hyun-il Yoon, and Seung-Soo Han
Myongji University, Korea

04 **Development of an Efficient CNN HW Accelerator by Reducing Off-chip Memory Access**
Sungjae Yoon, Hanjin Cho, and Wonjong Kim
Electronics and Telecommunication Research Institute (ETRI)

05 **A Hardware Implementation of SHA3 Hash Processor using Cortex-M0**
Dong-Seong Kim, Sang-Hyun Lee, and Kyung-Wook Shin
Kumoh National Institute of Technology

Session B

SB01 AR, VR and Graphic Applications

14:00-15:30 Wednesday, January 23, 2019

Room: Gallery 2

Chair:

01 **Image Segmentation With Deformable Spatial Pyramid Pooling**
Sang-il Ahn, Toan Duc Bui, Hyekyoung Hwang ,Yongwoo Lee, and Jitae Shin
Sungkyunkwan University, Korea

02 Analysis and Visualisation of Music
Michael Taenzer[1], Burkhard C. Wünsche[2], and Stefan Müller[3]
[1]Semantic Music Technology Group, Germany, [2]University of Auckland, New Zealand, Universität Koblenz-Landau, Germany

03 CodeRunnerGL - An Interactive Web-Based Tool for Computer Graphics Teaching and Assessment
Burkhard C. Wünsche[1], Edward Huang[1], Lindsay Shaw[1], Thomas Suselo[1], Kai-Cheung Leung[1], Davis Dimalen[1], Wannes van der Mark[1], Andrew Luxton-Reilly[1], and Richard Lobb[2]
[1]University of Auckland, New Zealand, [2]University of Canterbury, New Zealand

04 Mixed Reality Piano Tutor: A Gamified Piano Practice Environment
Will Molloy, Edward Huang, and Burkhard C. Wünsche
University of Auckland, New Zealand

05 Immersion or Diversion: Does Virtual Reality Make Data Visualisation More Effective?
Benjamin J. H. Andersen, Arran T. A. Davis, Gerald Weber, and Burkhard C. Wünsche
University of Auckland, New Zealand

SB02 Signal Processing I

14:00-15:30 Wednesday, January 23, 2019

Room: Gallery 3

Chair:

01 Motion Estimation by Using Stereo Vision Analysis For Underwater Observation System
Masyhuri Husna binti Mazlan[1], Morisawa Daisuke[1], Koike Yoshikazu[1], Shimizu Junji[1], Enomoto Eriko[1], Hirohashi Noritaka[2], Shimizu Etsuro[3], and Sakata Kunio[4]
[1]Shibaura Institute of Technology, Japan, [2]Shimane University, Japan, [3]Tokyo University of Marine Science and Technology, Japan, [4]Mukoujima Tech, Inc., Japan

02 Signal Processing in Micro-Doppler Image Based Concealed Dangerous Object Detection
Xin Di, Zhaoyu Zhang, Yi Xu, Lei Li, and Jun Tian
Fujitsu Research and Development Center Co., Ltd, P.R.China

03 Performance and Computational Efficiency of a Radar Detection Scheme for Range-Spread Targets
Seungwon Lee[1], Iickho Song[1], Seokho Yoon[2], and Jinsoo Bae[3]
[1]Korea Advanced Institute of Science and Technology, Korea, [2]Sungkyunkwan University, Korea, [3]Sejong University, Korea

04 Super-Resolution Convolutional Neural Networks Using Modified and Bilateral ReLU
Hyeongyeom Ahn, Byungjin Chung, and Changhoon Yim
Konkuk University, Korea

05 A Comparison of Machine Learning Schemes for Moving Direction Estimation with Acoustic Data
Yoojeong Seo, Beomhui Jang, and Sungbin Im
Soongsil University, Korea

SB03 Internet of Things

14:00-15:30 Wednesday, January 23, 2019

Room: Regatta B
Chair:

01 Community Collaboration Platform for Small Black Mosquito Prevention and Control
Yuan-Chih, Yu
Chinese Culture University, Taiwan

02 Let ṡ Make Some Music
Muhammad Nadeem, Aimee Tagle, and Sakayan Sitsabesan
University of Auckland, New Zealand

03 Environmental Noise Monitoring Using Distributed IoT Sensor Nodes
Adiraek Siamwala, Zac Lochhead, and Waleed Abdulla
University of Auckland, New Zealand

04 Towards Real-Time Data Delivery in oneM2M Platform for UAV Management System
Sung-Chan Choi[1,2], Il-Yeop Ahn[1], Jong-Hong Park[1], and Jaeho Kim[1]
[1]*Korea Electronics Technology Institute(KETI), Korea,*
[2]*Yonsei University, Korea*

05 Analyzing the Security of Bluetooth Low Energy
Seth Sevier and Ali Tekeoglu
SUNY Polytechnic Institute, USA

SB04 Emerging Memory Technology

14:00-15:30 Wednesday, January 23, 2019

Room: Regatta C

Chair:

01 **Statistical Modeling and Design of a 16nm 9T SRAM Cell Considering Post-Synthesis Removal of Metallic Carbon-Nanotubes**
Yanan Sun[1], Weifeng He[1], Zhigang Mao[1], Hailong Jiao[2], and Volkan Kursun[3]
[1]Shanghai Jiao Tong University, P.R. China, [2]Shenzhen Graduate School, Peking University, [3]Hong Kong University of Science and Technology, Hong Kong

02 **High performance 4T-2R Non-Volatile TCAM with NMOS Booster**
Byoungkon Jo and Kee-Won Kwon
Sungkyunkwan University, Korea

03 **Trap and Electron Occupancy Analysis in RRAM with Si3N4 Resistive Switching Layer**
Yeon-Joon Choi[1], Min-Hwi Kim[1], Tae-Hyeon Kim[1], Dong Keun Lee[1], Suhyun Bang[1], Kyungho Hong[1], Chaesoo Kim[1], Sungjun Kim[2], and Byung-Gook Park[1]
[1]Seoul National University, Korea
[2]Chungbuk National University, Korea

04 **PCI-Express Gen4.0 based Portable SSD Test System**
Jung-Hoon Cho and Soo-Il Choi
EXICON Co., Ltd., Korea

05 **Novel current-mirror based time dependent sense scheme for MLC PRAM**
Jun-Tae Choi[1], YunHeub Song[1], and Tony Tae-Hyoung Kim[2]
[1]Hanyang University, Korea, [2]Nanyang Technological University, Singapore

Session C

SC01 Communication Protocols

16:00-17:30 Wednesday, January 23, 2019

Room: Gallery 2

Chair:

01 **Study of Multi-Path TCP Scheduler to Suppress QoS Fluctuation for Improving WebQoE**
Kensuke Noda and Yoshihiro Ito
Nagoya Institute of Technology, Japan

02 **Harvest-Until-Access Protocol Based on Slotted ALOHA for Wireless Powered Dense Networks**
Hyun-Ho Choi[1] and Wonjae Shin[2]
[1]Hankyong National University, Korea, [2]Pusan National University, Korea

03 **Cost-effective Congestion-aware Load Balancing for Datacenters**
Bo Ting Chiang and Kuochen Wang
National Chiao Tung University, Taiwan

04 **An Efficient Contending-type MAC Scheme for Wireless Passive Sensor Networks Affected by Capture Phenomenon**
Phil-Seong Ghang[1], Insoo Jun[2], Heewon Seo[3], Jun Ha[3], Jin Kyung Park[3], and Cheon Won Choi[3]
[1]Rockley Photonics Inc., USA., [2]Jet Propulsion Laboratory, USA., [3]Dankook University, Korea

05 **TCP/NC performance in bi-directional loss environments**
Nguyen Viet Ha and Masato Tsuru
Kyushu Institute of Technology, Japan

SC02 Antennas and Propagation

16:00-17:30 Wednesday, January 23, 2019

Room: Gallery 3
Chair:

01 **Silver Nanoflake Printed Flexible Composite Broadband Dipole Antenna**
Kam Eucharist Kedze and Ikmo Park
Ajou University, Korea

02 **Hexagonal Shape Slotted Patch Antenna Having Defected Ground for Wide Band Applications**
Girish Awadhwal[1], Ali Bostani[2]
[1]UIT Bhopal, India, [2]College of Engineering and Technology American University of the Middle East, Kuwait

03 **Miniaturized Dual-Symmetrical Beam Antenna with Split-Ring Slot Structure**
Yohanes Galih Adhiyoga, Catur Apriono, and Eko Tjipto Rahardjo
Universitas Indonesia, Indonesia

04 **Microstrip Feed Asymmetric PatchAntenna Having Slotted Ground For UWB Applications**
Girish Awadhwal[1] and Ali Bostani[2]
[1]UIT Bhopal, India, [2]College of Engineering and Technology American University of the Middle East, Kuwait

05 A Double Layer FSS Reflector using Interdigital Split Ring Resonators for LTE and WLAN Systems

Wiset Saksiri, Pongsathorn Chomtong, and Prayoot Akkaraekthalin
King Mongkut's University of Technology North Bangkok, Thailand

SC03 Measurement and Estimation

16:00-17:30 Wednesday, January 23, 2019

Room: Regatta B

Chair:

01 Reliability of wireless sensors using low cost WiFi chipsets for Structural Monitoring

Morgan Look, Wayne S Holmes, and Roger Birchmore
Unitec Institute of Technology, New Zealand

02 Saliency Measurement and Hybrid Map based Ceiling-Vision SLAM

Ling Li, Ung-hee Lee, and Tae-Yong Kuc
Sungkyunkwan University, Korea

03 Simulation on Improvement of Position Estimation Accuracy in Underwater Using MEMS IMU

Junji Shimizu[1], Kenta Hata[1], Yoshikazu Koike[1], Hiroaki Morino[1], Eriko Enomoto[1], Masyhuri Husna[1], Noritaka Hirohashi[2], Etsuro Shimizu[3], and Kunio Sakata[4]
[1]Shibaura Institute of Technology, Japan, [2]Shimane University, Japan, [3]Tokyo University of Marine Science and Technology, Japan, [4]Mukoujima Tech, Inc, Japan

04 Application of Range Finder by Image Sensor in the Underwater Environment

Eriko Enomoto[1], Junji Shimizu[1], Yoshikazu Koike[1], Husna Masyhuri[1], Yuichi Hashimoto[1], Hiroaki Morino[1], Noritaka Hirohashi[2], Etsuro Shimizu[3], and Kunio Sakata[4]
[1]Shibaura Institute of Technology, Japan, [2]Shimane University, Japan, [3]Tokyo University of Marine Science and Technology, Japan, [4]Mukoujima Tech, Inc, Japan.

05 Low-Complexity Frequency Estimation Method Using Amplitude Tracking Square Wave

Abhisek Ukil[1], Yew Ming Yeap[2], and Kuntal Satpathi[3]
*[1]University of Auckland, New Zealand, [2]Institute for Infocomm Research, A*STAR, Singapore, [3]Nanyang Technological University, Singapore*

SC04 Sensor Technology

16:00-17:30 Wednesday, January 23, 2019

Room: Regatta C

Chair:

01 **Design of a Hybrid Column Segmented CMOS Image Sensor with an Artificial Intelligence Core and a Novel SRAM Readout Logic**
Keunyeol Park, Cheeyoung Lee, Soo Youn Kim, and Minkyu Song
Dongguk University, Korea

02 **Sensing Characteristics of Si FET-type Humidity Sensor Having a WO3 Sensing Layer by Using Pulse Scheme**
Yoonki Hong, Yujeong Jeong, Meile Wu, Seongbin Hong, Gyuweon Jung, Dongkyu Jang, and Jong-Ho Lee
Seoul National University, Korea

03 **AlGaN/GaN UV Phototransistor with recessed detected area**
Won-Ho Jang[1], Hyun-Seop Kim[1], Hyungtak Kim[1], Ho-Kyoung Lee[1], Ho-Young Cha[1], and Eugene Chong[2]
[1]Hongik University, Korea, [2]Agency for Defense Development, Korea

04 **A Low-cost Colorimeter Based on LED Light Sources**
Ittaka Aldini[1] and Soochan Kim[2]
[1]Indonesian Agency for Meteorology, Climatology, and Geophysics, Indonesia, [2]Hankyong National University, Korea

05 **Silicon Nanowire based Resonators for Increasing Near-infrared Light Absorption**
Myunghae Seo, Kihyun Kim, and Chang-Ki Baek
Pohang University of Science and Technology (POSTECH), Korea

Session D

SD01 Clouds, Platforms and Security

10:00-12:00 Thursday, January 24, 2019

Room: Gallery 2

Chair:

01 **Illuminance-robust semipermanent 2D porous code**
Kentaro Kimura, Asuka Ohashi, Yohei Fukumizu, and Takakuni Douseki
Ritsumeikan University, Japan

02 **Bibliometric Analysis of Published Literature on Industry 4.0**
Aidi Ahmi[1], Hany Elbardan[2], and Raja Haslinda Raja Mohd Ali[1]
[1]Tunku Puteri Intan Safinaz School of Accountancy Universiti Utara Malaysia, Malaysia, [2]Bournemouth University, United Kingdom (Great Britain)

03 Proposal of e-Learning System integrated P2P Model with Client-Server Model
Toshiya Kawato[1,2], Masayuki Higashino[1], Kenichi Takahashi[1], and Takao Kawamura[1]
[1]Tottori University, Japan, [2]Yonago College, Japan

04 Design Space Exploration of FPGA-based FIR Filter Group in Fourier Domain
Haomiao Wang and Oliver Sinnen
University of Auckland, Zealand

05 Managing Work Dependencies in Open Source Software Platforms
Sultan Alyahya and Ghadah Alamer
King Saud University, Saudi Arabia

06 Design and Implementation of Secure and Transferable eCoupons
M. Fahim Ferdous Khan and Ken Sakamura
Toyo University, Japan

SD02 Image Analysis and Understanding

10:00-12:00 Thursday, January 24, 2019

Room: Gallery 3
Chair:

01 Reconstructing and Calculating PSNR of Structural and Textual Images
Misbah Mateen, Amad Ud Din, and Waqar Mahmood
Fatima Jinnah Women University(FJWU), Pakistan

02 HDR Image Reproduction Using the Local Saturation-based Fusion of Multi-tone Mapping Images
Sung-Hak Lee, Dong-Min Son, and Tae-Young Jung
Kyungpook National, Korea

03 Photon crosstalk in pixel array for X-ray CMOS image sensor
Giyoon Kim[1], Kyeongjin Park[1], Kyungtaek Lim[1], Seungryong Cho[1], Hojong Chang[2], Byunghun han[2], and Gyuseong Cho[1]
[1]Korea Advanced Institute of Science and Technology, Korea, [2]Korea Advanced Institute of Science and Technology, Institute for Information Technology Convergence, Korea

04 Life Long Across All Four Seasons Scene Understanding
Zhennan Wang, Xiang Gao, Guoyang Xie, and Jishun Guo
GAC R&D Center, China

05 Extraction of Leukocyte Motions in a Microvessel using Spatiotemporal Image Analysis Method
Eung Kyeu Kim[1], Jae Won Lim[1], Kyesun Ahn[2], and Byunghyun Jang[3]

[1]Hanbat National University, korea, [2]Daeduk University, Korea
[3]University of Mississippi, USA

06 A Novel Probabilistic Appearance Model for Cigarette Detection Under Illumination Change
Han Wang[1], Daviad K. Han[2], and Hanseok Ko[3]
[1]Nantong University, China, [2]Army Research Laboratory, USA,
[3]Korea University, Korea

SD03 Communication Networks

10:00-12:00 Thursday, January 24, 2019

Room: Regatta B
Chair:

01 Wavelength-Selective Fog-Computing Network for Big-Data Analytics of Wireless Data
Michael Conrad Meyer[1], Yu Wang[2], and Takahiro Watanabe[1]
[1]Waseda University, Japan, [2]University of Aizu, Japan

02 Modeling of Wireless Sensor Networks for Detection Land and Forest Fire Hotspot
Evizal Abdul Kadir[1], Hitoshi Irie[2], and Sri Listia Rosa[1]
[1]Universitas Islam Riau, Indonesia, [2]Chiba University, Japan

03 Enhanced Adaptive Cluster Control for Energy Harvesting Wireless Sensor Networks under Geographical Non-uniform Energy Harvesting Conditions
Koya FUJINO, Kosuke SANADA, and Kazuo MORI
Mie University, Japan

04 A Closer Look at IoT ṡ Low-Power Wide Area Networks
Mncedisi Bembe, Motselisi Chere, and Tembisa Ngqondi
University of Mpumalanga, South Africa

05 Multipath Selection Method for En-route Filtering in Dynamic Wireless Sensor Network
Kyoung A Kim and Tae Ho Cho
Sungkyunkwan University, Korea

06 WIRELESS LOW POWER AREA NETWORKS IN THE INTERNET OF THINGS: A GLIMPSE ON 6LOWPAN
Motselisi Chere, Prof Tembisa Ngqondi, and Dr Mncedisi Bembe
University of Mpumalanga, South Africa

SD04 Analog and Digital Integrated Circuits

10:00-12:00 Thursday, January 24, 2019

Room: Regatta C

Chair:

01 **DVCC-based current-mode IAFs without parasitic effects**
Takao Tsukutani[1] and Noboru Yabuki[2]
[1]Matsue College, Japan, [2]Tsuyama College, Japan

02 **A Fully-Static and True-Single-Phase Dual-Edge Triggered Flip-Flop for Subthreshold Applications**
Yongmin Lee and Yoonmyung Lee
Sungkyunkwan University, Korea

03 **A Voltage-Mode Buck Converter With a Reduced Type- I Compensation Capacitor Using an Error-Amplifier Current-Sampling Scheme**
Dae-Jin Kim, Tae-Hyeong Kim, Hyeon-Sam Shin, Bo-Seok Seo, Mi-Jeong Kim, and Byung-Do Yang
Chungbuk National University, Korea

04 **A 12-bit 500KSPS Charge Recycling SAR ADC with MSB-Split Capacitors for Temperature Sensor**
Youngtaek Roh, Himchan Park, Changzhi Yu, Hyunmook Kim, and Jinwook Burm
Sogang University, Korea

05 **A Design of 34.6% High Efficiency Class-D Power Amplifier for 2.4 GHz Bluetooth Low-Energy applications**
Sol-Hee In, Yasser Mohammadi Qaragoez, and Kang-Yoon Lee
Sungkyunkwan University, Korea

06 **2-stage ESD protection circuit with high holding voltage and low trigger voltage for high voltage applications**
Byung-Seok Lee, Kyeong-Il Do, Hee-Guk Chae, Jin-Woo Eo, and Yong-Seo Koo
Dankook University, Korea

Session E

SE01 Big Data and Deep Learning II

13:30-15:00 Thursday, January 24, 2019

Room: Gallery 2

Chair:

01 **On Deep Learning based algorithms for Detection of Diabetic Retinopathy**
Haneesha Thanati, Renoh Johnson Chalakkal, and Waleed H. Abdulla
University of Auckland, New Zealand

02 **Single-image reflection removal using conditional GANs**
Miran Heo and Yoonsik Choe
Yonsei University, Korea

03 **Rule-Based Arabic Stemmer as an R package: arStemmer1**
Alshahrani Hasan A[1], Alvis C. Fong[1], and Alshahrani Fatimah[2]
[1]Western Michigan University, USA, [2]Princess Nourah bint Abdulrahman University, Saudi Arabia

04 **Design of A Bit-Serial Artificial Neuron VLSI Architecture with Early Termination**
Yun-Nan Chang and Guan-Jhen Chen
National Sun Yat-sen University, Taiwan

05 **Unmanned Store Service via a Camera-in-Hand Robotic Arm Using a Convolutional Neural Network**
Oscal T.-C. Chen, Yu Cheng Zhang, Pei-I Kuo, Zheng Kuan Lin, and Yi Lun Lee
National Chung Cheng University, Taiwan

SE02 Signal Processing II

13:30-15:00 Thursday, January 24, 2019

Room: Gallery 3

Chair:

01 **High-Precision Pedestrian Positioning by Using Radio Signals from Vehicles and Roadside Units**
Kazuhiro Toda, Suhua Tang, and Sadao Obana
University of Electro-Communications, Japan

02 **Root-MUSIC based Multiple Orthogonal Subarrays in a Rectangular Array**
Ho Jae Kim[1], Dong-Gyu Kim[1], Hea-Min Noh[1], Hyoung-Nam Kim[1], and Jeehoon Kim[2]
[1]Pusan National University, Korea, [2]The Affiliated Institute of ETRI, Korea

03 **Direction of Arrival Estimation in Planar Time Modulated Arrays**
Hea-Min Noh, Dong-Gyu Kim, Ho Jae Kim, Hyoung-Nam Kim, and Jeehoon Kim
[1]Pusan National University, Korea, [2]The Affiliated Institute of ETRI, Korea

04 **Blind beamforming based on Multi-target SCORE with a DMP algorithm**
Ji-Hyeon Kim[1], Young-Kwang Seo[1], Soon-Young Kwon[1], Hyoung-Nam Kim[1], Jin-Oh Park[2], Hyun Jin Kang[2], Jae Yun Kim[2], and Byung Ho Mun[2]
[1]Pusan National University, Korea, [2]LIG Nex1, Korea

05 **High Volume Rate Parallel Beamformer Design for 3D Medical Ultrasound Imaging**
Bo-Yuan Hong[1], Kuan-Ting Chen[1], Yin-Tsung Hwang[1], and Gua-Zua Wu[2]
[1]National Chung Hsing University, Taiwan, [2]ITRI, Taiwan

SE03 Communication Systems II

13:30-15:00 Thursday, January 24, 2019

Room: Regatta B
Chair:

01 **Proximity-based D2D Mode Selection Scheme for LTE Networks**
Han-Ni Su[1], Wen-Kang Jia[2], and Yaw-Chung Chen[3]
[1]National Chiao Tung University, Taiwan, [2]Fujian Normal University, China, [3]National Chiao Tung University, Taiwan

02 **Performance analysis of FSO transmission of double watermarked image over Weibull-Rician turbulence channel**
Stefan Panic[1], Bojan Prlincevic[2], Hranislav Milosevic[3], and Vera Petrovic[4]
[1]National Research Tomsk Polytechnic University, Russia, [2]High Technical College, Srbija, [3]University of Pristina, Serbia, [4]High school of electrical engineering, Serbia

03 **Distributed Antenna System Design for Ultra-Reliable Low-Latency Uplink Communications**
Jun-Pyo Hong[1], Jaehyun Park[1], Wooram Shin[2], and Seungkwon Beak[2]
[1]Pukyong National University, Korea, [2]Electronics and Telecommunications Research Institute, Korea

04 **Synchronization of Bursty QPSK Narrowband Satellite Receiver Having Large CFO - An Implementation on C66x TI DSP**
Dileep K G, Laxmaiah P, Ipsita S, Nithin Kumar S, Hari Prasad S V, Soundarakumar M, and Vipin Tyagi
Centre for Development Of Telematics (C-DOT), India

05 Flexible Capacity Allocation in Non-Orthogonal Multiple Access with Coordinated Direct and Alternating Relay Transmission
Yunsung Choi and Dongwoo Kim
Hanyang University, ERICA, Korea

SE04 Emerging Technologies

13:30-15:00 Thursday, January 24, 2019

Room: Regatta C
Chair:

01 The effect of Micro-current electrical stimulation on muscle atrophy caused by sciatic nerve compression
Seohyun Kim[1], DongHyun Hwang[1], Hana Lee[1], Han Sung Kim[1], and Seungkwan Cho[2]
[1]Yonsei University, Korea, [2]Cellogin Inc., Korea

02 The evaluation of a combined ceramic materialbased therapy in the musculoskeletal disorders : morphological analysis by micro-CT
DongHyun Hwang[1], Seohyun Kim[1], Hana Lee[1], Han Sung Kim[1], and Seungkwan Cho[2]
[1]Yonsei University, Korea, [2]Cellogin Inc., Korea

03 Sensitivity enhancement of the bio-FET using transinet measurement
Kyoung Yeon Kim and Byung-Gook Park
Seoul National University, Korea

04 PQ Control-based Novel Passive Islanding Detection Method for Renewable Energy Application
Xibeng Zhang, Don Gamage, Yousef Rashid, Viren Manglani, and Abhisek Ukil
University of Auckland, New Zealand

05 Efficient Data Representation for Real-time 3D Object Detection
Yurim Jeon and Seung-Woo Seo
Seoul National University, Korea

Session F

SF01 Robots and Automation

15:30-17:00 Thursday, January 24, 2019

Room: Gallery 2

Chair:

01 **Automatic PTZ Camera Control Based on Deep-Q Network in Video Surveillance System**
Dongchil Kim, Kyoungman Kim, and Sungjoo Park
KETI(Korea Electronics Technology Institute), Korea

02 **Synthesizing IEC 61499 Function Blocks to hardware**
Hammond Pearce and Partha Roop
University of Auckland, New Zealand

03 **Companion Robot focusing on Multimodal Emotional Behaviour Generation**
Joel P. De Zoysa, Li Jong, and Ho Seok Ahn
University of Auckland, New Zealand

04 **Embedded Systems Layout for Routing Planning in Smart Home**
Yang-Hsin Fan
National Taitung University, Taiwan

05 **System designed to enable scientific analysis on robot pollination algorithm for orchard robot research**
Fung Yang, Ho Seok Ahn, JongYoon Lim, Mahla Nejati, Henry Williams, and Bruce MacDonald
University of Auckland, New Zealand

SF02 Analysis and Implementation of Communication Systems

15:30-17:00 Thursday, January 24, 2019

Room: Gallery 3

Chair:

01 **Parallel Timing Synchronization Algorithm and Its Implementation in High Speed Wireless Communication Systems**
Xin Hao, Qiuyu Wu, Zhaohui Wang, and Changxing Lin
China Academy of Engineering Physics, China

02 **Performance analysis of 5G wireless transmission in the presence of kappa-mu fading and multiple NLOS interferers of arbitrary power**

Hranislav Milosevic[1], Stefan Panic[2], Vera Petrovic[3], and Suad Suljevic[4]
[1]University of Pristina, Serbia, [2]National Research Tomsk Polytechnic University, Russia, [3]High school of electrical engineering, Serbia, [4]University of Nis, Serbia

03 **Modeling of SWIPT System with ASK Modulation in LabVIEW**
Muhammad Riaz ur Rehman, Seong Jin Oh, Imran Ali, Muhammad Asif, and Kang-Yoon Lee
Sungkyunkwan University, Korea

04 **Coverage and Capacity Dynamics in 4G-LTE Deployment in India**
Ashutosh Jha and Debashis Saha
Management Information Systems (MIS), India

SF03 System Analysis and Design

15:30-17:00 Thursday, January 24, 2019

Room: Regatta B
Chair:

01 **Modelling of Shunt Active Power Filter for Harmonics Case Study of Steel Industry**
Santos Kihwele
University of Dar es Salaam(UDSM), Tanzania

02 **Enhancement of Voltage Stability Margin Using FACTS Devices for 132 kV Tanzania Grid Network**
Santos Kihwele
University of Dar es Salaam(UDSM), Tanzania

03 **Estimation of the Metering Quality in Broadband PLC AMI Based on Statistical Learning**
Dong Sik Kim[1], Beom Jin Chung[2], and Young Mo Chung[3]
[1]Hankuk University of Foreign Studies, Korea,
[2]Gachon University, Korea, [3]Hansung University, Korea

04 **Prototyping of Artificial Respiration Machine Using AMBU Bag Compression**
Mukaram Shahid
Ghulam Ishaq Khan Institute of Engineering Sciences and Technology, Topi, Pakistan

SF04 Novel Materials, Processing and Reliability

15:30-17:00 Thursday, January 24, 2019

Room: Regatta C

Chair:

01 **Investigation of 4H-SiC MOS with PECVD SiON**
Hyun-Seop Kim[1], Won-Ho Jang[1], Ho-Young Cha[1], Jae-Gil Lee[2], and Kwang-Seok Seo[2]
[1]Hongik University, Korea, [2]Seoul National University, Korea

02 **Improved Resistive-switching Performance of Sol-gel Processed ZrO_2 RRAM Devices**
Sojeong Lee, Won-Yong Lee, Bongho Jang, Taegyun Kim, and Jaewon Jang
Kyungpook National University, Korea

03 **Sol-gel Processed Mg-doped Indium Oxide Thin-Film Transistors for Improvement in Positive Bias Stress Stability**
Taegyun Kim, Bongho Jang, Sojeong Lee, Won-Yong Lee, and Jaewon Jang
Kyungpook National University, Korea

Poster Session

P01 Poster I

09:00-10:30 Wednesday, January 23, 2019

Room: Princes C

Chair:

01 **DNN based multi-speaker speech synthesis with temporal auxiliary speaker ID embedding**
Junmo Lee, Kwangsub Song, Kyoungjin Noh, Tae-Jun Park, and Joon-Hyuk Chang
Hanyang University, Korea

02 **Lower Bound for Performance of Group Testing Problems under Tradeoff Condition**
Jin-Taek Seong
Mokpo National University, Korea

03 **Moving Object Detection via Foreground and Background Segmentation**
Woo Jin Kim, Sangwon Hwang, Junhyeop Lee, Jaesung Choi, and Sangyoun Lee
Yonsei University, Korea

04 **Analysis of Redundancy Model with Two Active and Two Standby Components**
Y. Lee
Dong-eui University, Korea

05 **Parallelizing Bank-level Fine Granularity Refresh with Column Access Operation using Split Row Buffer**
Minkyu Lee and Ki-Seok Chung
Hanyang University, Korea

06 **A Fully Integrated Ka-band Low Noise Amplifier in 65-nm CMOS**
Sung Wook Yoon[1], Changyeol Kim[1], Yangji Jeon[1], Doo Hyung Woo[2], and Ilku Nam[1]
[1]*Pusan National University, Korea*
[2]*The Catholic University of Korea, Korea*

07 **A real-time visual feedback system of strength self-training with motion capture**
Hikaru Kaneko and Mitsunori Makino
Chuo University, Japan

08 **Inductively Coupled Power/Dada Link with Novel Charge Balancing Algorithm for Neural Stimulator**
Jang-Woo Park, Sang-Hoon Baek, Kyung-Sub Son, Hun-Kee Kim, Sang-Min Lee, and Jin-Ku Kang
Inha University, Korea

09 **Start-End Time Detection in Baseball Videos for Automatic Pitching Trajectory Analysis**
Hongjun Lee, Jeyeon Kim, Joongsik Kim, Jieun Yu, and Whoi-Yul Kim
Hanyang University, Korea

10 **Monopolar Microstrip Antenna Using Vialess Mushroom Resonator Array On Wired Ground Plane**
Dongho Lee[1], Yoonseuk Choi[2], and Seongmin Pyo[2]
[1]Yeungnam University College, Korea, [2]Hanbat National University, Korea

11 **A Finite Element Model for Stochastic Set Operation in Phase-Change Memory**
Min-Kyu Shin[1], Donghwa Lee[2], Pil-Ryung Cha[3], and Yongwoo Kwon[1]
[1]Hongik University, Korea, [2]Pohang University of Science and Technology, Korea, [3]Kookmin University, Korea

12 **Study on 3D Action Recognition Based on Deep Neural Network**
Sungjoo Park and Dongchil Kim
Korea Electronics Technology Institute(KETI), Korea

13 **Pedestrian' Orientation Estimation For Collision Avoidance in Advanced Driver Assistant System**
Duyoung Heo, Mira Jeong, Jae-Yeal Nam, and Byoung Chul Ko
Keimyung University, Korea

14 **Single-balanced Subharmonic LMV**
Nam-Jin Oh
Korea National University of Transportation, Korea

15 **A compact 79GHz LNA for Automotive radar in 0.13-μm SiGe BiCMOS**
Han-Woong Choi[1], Kyeong-Hyeok Lee[1], Jae-Eun Lee[1], Jeong-Taek Lim[1], Sun-Ik Lee[2], Ki-Ho Kwon[2], Jin-Back Jang[2], Won-Kyu Lim[2], and Choul-Young Kim[1]
[1]Chungnam National University, Korea, [2]Korea Aerospace Research Institute

16 **DC-DC Buck Converter for Supercapacitor**
Beomsu Yun, Taekyoung Jung, Jinhyun Kim, and Joongho Choi
University of Seoul, Korea

17 **Improved Bacteria Detection using Partial Morphological Opening**
Jaelin Lee, Younghyeon Park, and Byeungwoo Jeon
Sungkyunkwan University, Korea

18 **An Adaptive Coverage Algorithm for Multiple Mobile Robots Using Artificial Neural Network**
Eun-Jin Kim, Gun-Gyo In, Arpan Ghosh, Ho-Cheol Ahn, and Tae-Yong Kuc
Sungkyunkwan University, Korea

19 A Mobile Edge Computing Device to Support Data Collecting and Processing from IoT
Youngjae Lee, Wonjong Kim, Kiyoung Moon, and Kiltaek Lim
ETRI, Korea

20 Low-Power Programmable Gain Amplifier Using a Self-Biased Ring Amplifier for CMOS Image Sensors
Seungil Huh, Sang-Hoon Kim, Jaehyuk Choi, and Jung-Hoon Chun
Sungkyunkwan University, Korea

21 Analysis of TDM-FBG Optical Sensing in Passive Optical Networks
Nguyen Khac Binh and Su-il Choi
Chonnam National University, Korea

22 A Study on Data Interoperability for Deep Learning in CCTV Monitoring Environment
Taewoo Kim, Hyungheon Kim, and Pyeongkang Kim
Innodep Inc., Korea

23 Simulation Study on Localized States in Amorphous-InGaZnO Thin Film Transistors
Jihwan Park[1], Do-Kyung Kim[1], Jin-Hyuk Bae[1], and Hyeok Kim[2]
[1]Kyungpook National University, Korea, [2]Gyeongsang National University, Korea

24 Design of Analog and Digital Hybrid MAC Circuit for Artificial Neural Networks
Ki-Hyuk Park, Min-Hyung Cho, Young-Deuk Jeon, and Joo-Hyun Lee
Processor Research Group, Korea

25 Human Safety Assessment of 4×8 Array Antenna for Wireless Power Transfer System using 2.4 GHz and 5.8 GHz
Young Jun Ju[1], Jun Hee Kim[1], Yu-ri Lee[1], and Yong Seok Lim[2]
[1]EMF Safety Inc., Korea, [2]Korea Electronics Technology Institute, Korea

26 Design and development of complex sensor interface module in socket for Prostheses Users
Jin-Woo Shin, Su-Hong Eom, and Eung-Hyuk Lee
Korea Polytechnic University

27 NSC Data Detection Scheme in NR-based Communications System
Sangmi Moon, Soonho Kwon, Hyeonsung Kim, Byeonggyu Song, and Intae Hwang
Chonanm National University, Korea

28 A 30-GHz ladder-arrayed Si *pin* photodetector for environmental light communication
Yung Hun Jung[1], Seongjae Cho[1], Hoon Heo[2], and Yun Hyun Cho[2]
[1]Gachon University, Korea, [2]Korea University, Korea

29 Spectral Efficiency Maximization for V2X Communication Underlaying Uplink SCMA System
Gil-Mo Kang, Hyeon-Min Kim, Hieu V. Nguyen, Yoan Shin, and Oh-Soon Shin
Soongsil University, Korea

30 Learning an Object Detector Using Zoomed Object Regions
Sung-Jin Cho, Seung-Wook Kim, Kwang-Hyun Uhm, Hyong-Keun Kook, and Sung-Jea Ko
Korea University, Korea

31 Image Shaking Calibration Algorithm for The Vehicle Image-based Surveillance System
Jeong-uk Chang and Chi-ho Lin
Semyung University, Korea

32 A Low-Crosstalk 64-Pixel Stimulator Array Design for Subretinal Implants
Wajahat. H. Abbasi[1], Youkyeong Park[1], Jae Kun Kim[1], Jungsuk Kim[1], and Hosung Kang[2]
[1]Gachon University, Korea, [2]Korea University, Korea

33 Regenerative Two-Way Relay Based on Space–ime Line Codes with Power Allocation
Jingon Joung[1] and Jihoon Choi[2]
[1]Chung-Ang University, Korea, [2]Korea Aerospace University, Korea

P02 Poster II

14:00-15:30 Wednesday, January 23, 2019

Room: Princes C
Chair:

01 The Color Detection Method for Object Recognition using Dynamic Range
Thathupara Subramanyan Kavya, Young-Min Jang, Erdenetuya Tsogtbaatar, and Sang-Bock Cho
University of Ulsan, Korea

02 Performance Evaluation under Practical Channel Estimation for OFDM Transmissions in IEEE 802.11ad
Jungmin Yoon, Heonkyo Sim, and Seong-Cheol Kim
Seoul National University(SNU), Korea

03 Individual identification Based on Cascaded PCANet from ECG Signal
Jae-Neung Lee, Sung Bum Pan, and Keun-Chang Kwak
Chosun University, Korea

04 Comparison of Controller Performance by Parameters in Lateral Control of Self Driving Vehicle
Jong hwi Park, Yeong won Lee, and Byungyong You
Kyungil University, Korea

05 Random I/O Performance Boosting Technique based on Statistical I/O Traffic Patterns of Embedded Storage
Myung Sub Shin and Tae Hee Han
Sungkyunkwan University, Korea

06 Simulation of MAC layer DDoS attacks in wireless networks
Seong Oun Hwang[1], Ji-Hoon Park[2], and Byung-Seo Kim[1]
[1]Hongik University, Korea, [2]Nong-Shim Data Systems(NDS), Korea

07 Inaudible Acoustic Signal Based Multi-Point Gesture Recognition using CNN
Donghwan Shin and Jongwon Yoon
Hanyang University, Korea

08 Wireless DC power Generator for Passive RFID by using Cockcroft-Walton Voltage Multiplier in CMOS 0.18um Technology
Jae-Hyeok Song, Eun-Gyu Lee, Sun-Kyu Choi, Jung-Taek Lim, Jae-Eun Lee, Han-Woong Choi, Kyung-Hyeok Lee, Sang-Hyo Kim, and Choul-Young Kim
Chungnam National University, Korea

09 A Design of Data Path Based on CMOS Logic for a 72-Gb/s PAM-4 Transmitter in 28-nm CMOS
Moon-Chul Choi, Haram Ju, Han-Gon Ko, and Deog-Kyoon Jeong
Seoul National University, Korea

10 A Simple Ramp Generator With an Active Ramp Tracking Control For a Fast Response PWM Buck Converter
Hyeon-Sam Shin, Sang-Ho Lee, Dae-Jin Kim, Tae-Hyeong Kim, Ki-Chan Woo, and Byung-Do Yang
Chungbuk National University, Korea

11 Ring Oscillator based 1.5ps resolution vernier-Based TDC
Hyunmook Kim, Changzhi Yu, Himchan Park, and Jinwook Burm
Sogang University, Korea

12 Deep Neural Network Optimization based on Non-Uniform Quantization for Weights with Large Magnitude
Joo-Ho Kim, Kyung-Kuk Jo, and Joon-Sung Yang
Sungkyunkwan University, Korea

13 A Wideband Digital TV Receiver front-end with On-chip Notch Filter
Yangji Jeon[1], Sung Wook Yoon[1], Changyeol Kim[1], Hyunwon Moon[2], and Ilku Nam[1]
[1]Pusan National University, Korea, [2]Daegu University, Korea

14 **Optimal Cloud Computing Resource Allocation For Centralized Radio Access Networks**
Taewoon Kim[1] and Wooyeol Choi[2]
[1]Hallym University, Korea, [2]Chosun University, Korea

15 **Improvement of Curve Driving Method using Two Magnetic Sensors Array**
Ji-hwan Lee and Kwang-ryul Beak
Pusan National University, Korea

16 **RGB-D Visual Odometry Using Depth-based Feature**
Nan Cheny[1,2], Yuri Goncalves Rochaand[1], Tae-Yong Kuc[1], and Jiandong Zhang[3]
[1]Sungkyunkwan University, Korea, [2]Northwestern Polytechnical University, P.R. China, [3]Northwestern Polytechnical University, P.R. China

17 **High Linearity 65nm CMOS Ka-band SPDT Switch with Shunt Switch Device**
Kyeong-Hyeok Lee[1], Sun-Kyu Choi[1], Eun-Gyu Lee[1], Jea-Eun Lee[1], Jeong-Taek Lim[1], Han-Woong Choi[1], Sang-Hyo Kim[1], Jae-Hyeok Song[1], Dongju Lee[2], Wansik Kim[2], Jongpil Kim[2], Mihui Seo[3], Sosu Kim[3], Bang-Chul Jung[1], and Choul-Young Kim[1]
[1]Chungnam National University, Korea, [2]LIG NEX1, Korea, [3]Agency for Defense Development, Korea

18 **Multiple Transform of Intra Predicted Chrominance Signal with Information Sharing with Luminance**
Jeeyoon Park and Byeungwoo Jeon
Sungkyunkwan University, Korea

19 **Bidding Strategy for Virtual Power Plant in a Day-ahead Market**
Daeyoung Kang, Gi-ryang Jeon, and Kyu-han Shim
Korea University, Korea

20 **Moving Object Segmentation and Matching between Two Asynchronous Cameras for 3D Reconstruction**
Ji-Min Cho, Soon-Yong Park, and Sung-Il Chien
Kyungpook National University, Korea

21 **Polar code interleaver for higher order modulation**
Gangsan Kim[1], Hong-Yeop Song[1], Chanki Kim[2], Jong-seon No[2], and Jaeha Ahn[3]
[1]Yonsei University, Korea, [2]Seoul National University, Korea, [3]Agency for Defence Development, Korea

22 **Unified Time Synchronization and Fault Diagnosis Scheme of Automotive CAN Bus**
Jong-Bae Lee, Tae-Wook Kang, and Seongsoo Lee
Soongsil University, Korea

23 **Outlier Detection Technique for IoT Sensor-Driven Big Data Systems**
Sunho Seo and Jong-Moon Chung
Yonsei University, Korea

24 A 2.4 GHz Fractional-N Sub-Sampling PLL with a Hybrid Type Phase Interpolator
Yun-Sik Choi, Kitae Yoo, Dong-Hyun Yoon, Ji-Min Choi, and Kwang-Hyun Baek
Chung-Ang University, Korea

25 Monitoring Duty Cycle MAC Protocols for Various Traffic Networks
Gayoung Kim, Jingu Kang, and Minjoong Rim
Dongguk University, Korea

26 The design of monitoring system for crop cultivation environment using IOT system
Seon Gwang Kim, Sehi Park, Sung Goo Yoo, and Kil To Chong
Chonbuk National University, Korea

27 Design of Portable Functional Near-Infrared Spectroscopy-based Brain Monitoring System
Seungchan Lee and Heung-No Lee
Gwangju Institute of Science and Technology(GIST), Korea

28 A Method of Channel Selection for Multi-GNSS Receiver
Kwi Woo Park, Bo-Seok Seo, Jae-Won Suh, and Chansik Park
Chungbuk National University, Korea

29 Elbow-Fixed Distance Measuring System with Using MEMS and Laser Module, Encoder Measurement System
Soohyun Kim and Hansil Kim
University of Ulsan, Korea

30 Object Detection Based on VGG with ResNet Network
Md Foysal Haque, Hye-Youn Lim, and Dae-Seong Kang
Dong-A University, Korea

31 3D Pose Estimation of Ring-Shape Objects using Elliptical Model Fitting to Depth Image
Min-Jae Lee[1], Sang-Seung Kang[2], and Soon-Yong Park[1]
[1]Kyungpook National University, [2]Electronics and Telecommunications Research Institute, Korea

32 Fairness Improvement of BBR Congestion Control Algorithm for Different RTT Flows
Geon-Hwan Kim, Imtiaz Mahmud, and You-Ze Cho
Kyungpook National University, Korea

33 Method of Optimal Caemra Path Estimation Based on Optical Flow for Video Stabilization
Inhye Yoon, SangHyun Byun, and Joonki Paik
Chung-Ang University, Korea

P03 Poster III

16:00-17:30 Wednesday, January 23, 2019

Room: Princes C

Chair:

01 **A New Data Preparation Methodology in Machine Learning-based Haze Removal Algorithms**
Dat Ngo and Bongsoon Kang
Dong-A University, Korea

02 **Design of a Voltage Controlled Oscillator (VCO) MMIC without Varactor Diodes**
Keun-Kwan Ryu[2], Yong-Hwan Kim[1], and Sung-Chan Kim[2]
[1]WaveTrack Inc., Korea, [2]Hanbat National University, Korea

03 **Retinex Algorithm using Contrast Modification and Saturation Correction for Color Image Enhancement**
Han-Sol Kang[1], Yun-Ho Ko[1], Si-Woong Lee[2], and Byung-Ju Yun[3]
[1]Chungnam National University, Korea, [2]Hanbat National University, Korea, [3]Kyungpook National University, Korea

04 **Commercial CPUs on Performance of Distributed System**
Hee-Sung Yang[1] and Youngmi Kwon[2]
[1]Ares Co., Ltd, Korea, [2]Chungnam National University, Korea

05 **CNN Models Performance Analysis on MRI images of OASIS dataset for distinction between Healthy and Alzheimer' patient**
Bijen Khagi, Bumshik Lee, Jae-Young Pyun, and Goo-Rak Kwon
Chosun University, Korea

06 **Obstacle Detection Using Feature Analysis and Dense Disparity Map**
Chung-Hee Lee
Daegu Gyeongbuk Institute of Science & Technology, Korea

07 **Inter-Frame Compression of 3D Point Cloud Sequences**
Ji-Su Kim, Seonho Lee, Jae-Han Lee, and Chang-Su Kim
Korea University, Korea

08 **Mitigation of the Third-Order Passive Intermodulation Distortion Interference on Uplink Signal**
Beomhee Jang, Hyunchae Kim, Yoojeong Seo, Sungbin Im, and Seungmo Hong
Soongsil University, Korea

09 **Loading Effects on Upstream Converter' Input Impedance in Multistage Dc Power**
Distribution Systems
Syam Kumar Pidaparthy and Byungcho Choi
Kyungpook National University, Korea

10 Multi-user Coding Scheme for High Spectral Efficient Transmission
Arim Lee and Wangrok Oh
Chungnam National University(CNU), Korea

11 Charge trapping memory characteristics of the multilayer high-k structure with HfO_2/Al_2O_3 laminated films
Jinhyuk Yoo, Soonkon Kim, Woojin Jeon, and Byoungdeog Choi
Sungkyunkwan university, Korea

12 Agile Navigation of Indoor Quadrotor Using CV-SLAM and Adaptive Backstepping Control
Hong-Rae Kim, Sang-Yoon Kim, Ho-Cheol Ahn, Yong-Serk Kim, and Tae-Yong Kuc
Sungkyunkwan University, Korea

13 SATE: Providing Stable and Agile Adaptaion in HTTP-based Video Streaming
Wangyu Choi, Jisung Jeong, and Jongwon Yoon
Hanyang University, Korea

14 Prediction of Critical Mass Flux Using Artificial Intelligence
Ye Ji An[1], Kwae Hwan Yoo[1], Man Gyun Na[1], Kyung-Suk Kim[1], and Yeon-Sik Kim[2]
[1]Chosun University, Korea, [2]Korea Atomic Energy Research Institute, Korea

15 Channel Environment Adaptive Symbol Decision Method for Visual-MIMO Synchronization System
Tae-Ho Kwon and Ki-Doo Kim
Kookmin University, Korea

16 Design and Analyze of Compact Ku-Band Wilkinson Power Combiner in 65 nm CMOS Technology
Sang-Hyo Kim, Eun-Gyu Lee, Sun-Kyu Choi, Jung-Taek Lim, Jae-Eun Lee, Han-Woong Choi, Kyung-Hyeok Lee, Jae-Hyeok Song, and Choul-Young Kim
Chungnam National University, Korea

17 Configurable Automotive Cluster Display Considering Driver' Cognitive Characteristics
Jin-Kyu Choi, Young-Jin Kwon, Juil Jeon, Kyongho Kim, Hyunkyun Choi, and Byungtae Jang
Electronics and Telecommunications Research Institute(ETRI), Korea

18 A blockchain for media: Survey
The Aspect of Content security and Content right management
Sunghyun Cho and Chiyoung Jeong
Hanyang University, Korea

19 A Study on Embedded System Modeling Method in Virtual Machine Environment
Tai-Gil Kwon and Jin-Woong Cho
Korea Electronics Technology Institute, Korea

20 Interference-Aware Spreading Factor Assignment Scheme for the Massive LoRaWAN Network
Arshad Farhad, Dae-Ho Kim, Pranesh Sthapit, and Jae-Young Pyun
Chosun University, Korea

21 Sol-gel Processed SnO2/Au Schottky Diode
Bongho Jang, Taegyun Kim, Sojeong Lee, Won-Yong Lee, and Jaewon Jang
Kyungpook National University, Korea

22 Probabilistic Modeling of Reaction Force/Torque through Fourier Transform and Entropy Analysis
Nam Jun Cho[1], Sang Hyoung Lee[2], Il Hong Suh[1], and Hong-Seok Kim[2]
[1]Hanyang University, Korea [2]Korea Institute of Industrial Technology, Korea

23 Design of A Broadband CMOS Class-E PA for TVWS Applications
Yasser Mohammadi Qaragoez, Sung Jin Kim, and Kang-Yoon Lee
Sungkyunkwan University, Korea

24 Adversarial Style Transfer for Long Sentences
Wooyong Choi, Su Jeong Choi, Seyoung Park, and Sang-Jo Lee
Kyungpook National University, Korea

25 A 135 dB-ohm Low Noise Transimpedance Amplifier With a Gain Modifier Circuit For Very Low Current Sensing
Fatemeh Abbassi, Abdolhamid Noori, Yasser Mohammadi Qaragoez, SungJin Kim, and Kang-Yoon Lee
Sungkyunkwan University, Korea

26 Dereverberation Using Generative Adversarial Network for Reverberant Speech Recognition
Min Sik Kim, Jaemin Han, and Hyung Soon Kim
Pusan National University, Korea

27 Investigation of Time-Dependent Breakdown of normally-off AlGaN/GaN gate-recessed MISHFETs With OFF-State Stress
Dongmin Keum, Ho-young Cha, Hyungsik Shin, and Hyungtak Kim
Hongik University, Korea

28 A circled Bloom filter for the membership identification of multiple sets
Jungwon Lee and Hyesook Lim
Ewha Womans University, Korea

29 Vehicle License Plate Recognition with Anchor based Detector
Sung-Hoon Im and Jae-Heung Lee
Hanbat National University, Korea

30 Investigation of Coupling Effects of Monolithic 3D Inverter with Junctionless Field-Effect Transistors
Tae-Jun Ahn and Yun Seop Yu
Hankyong National University, Korea

31 AlGaN/GaN Heterojunction-based MIS-HEMTs with Effective SiN Passivation Layer for Improving Device Reliability
Young Jun Yoon, Min Su Cho, Jun Hyeok Jung, Won Douk Jang, Hye Jin Mun, and In Man Kang
Kyungpook National University, Korea

32 Selection of Optimal Reasoning path by Bayesian Switching mechanism in the Brain Sensory System
JeongYon Shim
Kangnam University, Korea

33 Evaluation of the Kubernetes's Container Recovery Function in Multi Node Cases
Sungun Hong and Younghan Kim
Soongsil University, Seoul, Korea

P04 Poster IV

10:00-12:00 Thursday, January 24, 2019

Room: Princes C
Chair:

01 Migration of oxygen ions and vacancies in tunneling based resistance switching element
Seung Jae Baik
Hankyong National University, Kore

02 Highly Linear InGaP/GaAs HBT Power Amplifier with Harmonic Trap for Small-Cell Applications
Hyunjin Ahn and Ockgoo Lee
Pusan Nation University, Korea

03 Low Power 3T-2R Non-Volatile TCAM Cell with Dual Match-line
Dojong Cheon[1,2] and Kee-Won Kwon[1]
[1]Sungkyunkwan University, Korea, [2]Samsung Electronics Co., LTD, Korea

04 DRAM Effects on the Embedded Processor Performance
Jongbok Lee
Hansung University, Korea

05 Simple Calibration Method between RGBD Camera and Omnidirectional Camera
Minkyu Lee, Jaesung Choi, Woojin Kim, Yongju Lee, and Sangyoun Lee
Yonsei University, Korea

06 Combining Depth Maps through 3D Weighted Least Squares in Shape from Focus
Usman Ali and Muhammad Tariq Mahmood
Korea University of Technology and Education, Korea

07 **Design and Development of Data Map Visualization Tool for Property Search of Police Information**
Sang-Yun Lee[1], Wonjoo PARK[1], Yong-Tae Lee[1], KongMin Kim[2], Gyung-Rok Yeom[3], and Jiho Shin[4]
[1]ETRI, Korea, [2]CEN Corporation Co., Ltd., [3]IWAZ, [4]Police Science Institute

08 **Performance Analysis of Multihop Multirelay Multiuser CRNs with Energy Harvesting**
Toan-Van Nguyen[1], Sang-Yep Nam[2], and Beongku An[1]
[1]Hongik University, Korea, [2]Kookje University, Korea

09 **Bandwidth Estimation Scheme Based on Network Adaptability for UHD Streaming Service**
Minsu Kim and Kwangsue Chung
Kwangwoon University, Korea

10 **Single Image Dehazing Based on Histogram Stretching**
Se Eun Kim, Cheol Woo Park, and Il Kyu Eom
Pusan National University, Korea

11 **Accurate Self-heating Simulation for Integrated Circuit Design**
Jongwook Jeon[1], Heesauk Jhon[2], Yoon Kim[3], and Myounggon Kang[4]
[1]Konkuk University, Korea, [2]Mokpo National University, Korea, [3]Pusan National University, Korea, [4]Korea National University of Transportation, Korea

12 **RGB-D Camera based Pose Estimation of Indoor Mobile Robot using Line Feature Only**
Min-Woo Ryu[1], Tae-Yong Kuc[1], Jongkoo Park[1], and Jong-Wan Seo[2]
[1]Sungkyunkwan University, Korea, [2]CASE Lab, Korea

13 **A 4.7 μA Quiescent Current Synthesizable Digital Low Dropout Regulator in 28-nm CMOS**
Jonghyun Oh, Jun-Eun Park, and Deog-Kyoon Jeong
Seoul National University, Korea

14 **Extended ICP based SLAM using straight line and point cloud**
Ung-Hee Lee, Sung-Hyeon Joo, Kyung-Tae Nam, Jong-Wan Seo, and Tae-Yong Kuc
Sungkyunkwan University, Korea

15 **Study on the performance improvement of face recognition-based security system**
using high-level image processing technology
Hyun Ahn[1], Young-Hwan Yoon[1], Sangjoon Lee[1], Yong-Min Lee[1], and Kye-Shin Lee[2]
[1]Sun Moon University, Korea, [2]The University of Akron, USA

16 **Self-Adaptive System Verification based on SysML**
Seung-Min Lee[1], Soojin Park[2], and Young B. Park[1]
[1]Dankook University, Korea, [2]Sogang University, Korea

17 Analysis of Correlation Characteristics of 10230 Period PRN Code using Concatenated Gold Code
Seung Tae Kim and Jae Min Ahn
Chungnam National University, Korea

18 A Sidelobe Mitigation Method for an FM-radio-based PCL System
So-Young Son[1], Geun-Ho Park[1], Hyoung-Nam Kim[1], Kyu-Ha Song[2], and Jun-Il Ahn[2]
[1]Pusan National University, Korea, [2]Agency for Defense Development, Korea

19 Various Device Structures for Steep Switching Silicon-On-Insulator Feedback Field Effect Transistor
Changhoon Lee and Changhwan Shin
Sungkyunkwan University, Korea

20 Real Time Android Ransomware Detection by Analyzed Android Applications
Ju-Seong Ko, Jeong-Seok Jo, Deuk-Hun Kim, Seul-Ki Choi, and Jin Kwak
Ajou University, Korea

21 Net Load Variability in Future Jeju Power System with Very High Penetration of Renewable Generation
Jinyeong Lee, Rakkyung Ko, Sangmin Ryu, and Sung-Kwan Joo
Korea University, Korea

22 Image Restoration for CsI(Tl)-Scintillator Mammography Detectors
Dong Sik Kim and Eunae Lee
Hankuk University of Foreign Studies, Korea

23 Analysis of Mining Performance Based on Mathmatical Approach of PoW
Jusik Yun, Yunyeong Goh, and Jong-Moon Chung
Yonsei University, Korea

24 On-demand Syndrome Calculation for BCH decoding
Hyeonkyu Kim, Soyeon Choi, and Hoyoung Yoo
Chungnam National University, Korea

25 Effect of soft baking temperature on solution-processed SnO2 thin-film transistors
Won-Yong Lee, Taegyun Kim, Sojeong Lee, Bongho Jang, and Jaewon Jang
Kyungpook National University, Korea

26 Comparing the Performance of a Deep Learning System for Determining Stroke Depending on a Pre-Processing Algorithm
Su-min Jung and Taeg-keun Whangbo
Gachon University, Korea

27 **A meshless method based on improved boundary distributed method for estimating of bladder size using electrical impedance tomography**
Anil Kumar Khambampati, Sunam Kumar Sharma, You Jeong Han, Sravan Kumar Konki, and Kyung Youn Kim
Jeju National University, Korea

28 **An effective model for detect Early Symptoms of Stroke**
Jae Seoung Kim and Taeg Keun Whangbo
Gachon University, Korea

29 **Radio Frequency Interference Analysis of Camera Module and Antenna in Smartphones**
Youngbong Han[1], SeungHyuk Lee[2], Hai Au Huynh[1], and SoYoung Kim[1]
[1]Sungkyunkwan University, Korea, [2]Samsung Electronics Co., Ltd, Korea

30 **Cuckoo Bloom Filter**
Ju Hyoung Mun and Hyesook Lim
Ewha Womans University, Korea

31 **Performance Analysis of TWRN with Adaptive Modulation in Presence of Channel Estimation Error over Nakagami-*m* Fading Channel**
Kyu-Sung Hwang[1] and Chang Kyung Sung[2]
[1]Kyungil University, Korea, [2]CSIRO, Australia

32 **An Evaluation of the popular CMFD methods based on binary descriptors**
Wendimagegn Tariku W.[1], Kim Hyoung Joong[1], and YongSoo Choi[2]
[1]Korea University, Korea, [2]SungKyul University, Korea

33 **Plano-Convex Lens Fabrication for Distance Sensor based on Single Vision**
Yumee Kim and Kukjin Chun
Seoul National University, Korea

P05 Poster V

13:30-15:00 Thursday, January 24, 2019

Room: Princes C
Chair:

01 **Green Cognitive Femtocells Deployment House Modelling for Interference Mitigation**
Muhammad Rafay Khan Sial and Muhammad Talha Gul
Superior University, Pakistan

02 Vectored-Bloom Filter Implemented on FPGA for IP Address Lookup
Hayoung Byun, Qingling Li, and Hyesook Lim
Ewha Womans University, Korea

03 A Study on Cell-Type Classification using Gene-Expression Data: Maximum Likelihood Approach and Support Vector Machine
Dongmug Kang, Seokhyun Yoon, and Kyoungpil Ra
Dankook University, Korea

04 Analysis of Power Consumption on Match Line of TCAM and Power Efficient Architecture
Sung-Yong Kim, Cheol Kim, Jisu Min, Seung-Kwang Hong, and Kee-Won Kwon
Sungkyunkwan University, Korea

05 A Study on Improvement of Character Recognition through Selective Application of Deep Learning Method
Yongju Park and Sangyun Kim
Korea Electronics Technology Institute, Korea

06 GNSS based waypoint generation and tracking algorithm for autonomous agricultural vehicle
Joong-hee Han and Chi-ho Park
Daegu Gyeongbuk Institute of Science & Technology, Korea

07 Low On-resistance 1700V 4H-SiC UMOSFET with Local Floating Superjunction
Jinyoung Goh and Kwangsoo Kim
Sogang University, Korea

08 A Hardware-Friendly Compression Algorithm for Profiling DDR4 Memory Accesses
Xuan Truong Nguyen[1], Jiwoong Choi[1], Hyuk-Jae Lee[1], and Hyun Kim[2]
[1]Seoul National University, Korea, [2]Seoul National University of Science and Technology, Korea

09 Machine-Learning based Loss Discrimination Algorithm for Wireless TCP Congestion Control
Kimoon Han, Jae Yong Lee, and Byung Chul Kim
Chungnam National University, Korea

10 Eye Blink Pattern based Drowsiness Detection with Convolutional Neural Network
Hyeonjeong Lee, Khurelbaatar Zolzaya, and Miyoung Shin
Kyungpook National University, Korea

11 Automotive Radar Mutual Interference Reduction Using the Variance of Signal Power
Youn-Sik Son, Ho-Kyoung Lee, and Seo Weon Heo
Hongik University, Korea

12 A Study on the Application of Decision Tree Algorithm to Differentiate Gait Phases in the Users of Transfemoral Prostheses
Sun-Jong Na[1], Su-Hong Eom[1], Chol-U Lee[1], Mun-Seok Jang[2], and Eung-Hyuk Lee[1]
[1]Korea Polytechnic University, Korea, [2]Dong-Eui Institute of Technology, Korea

13 Arduino based Balancing Robot
Sunjin Yu
Tongmyong University, Korea

14 Study on Leakage Current Characteristics of MIM Capacitors with High-k Dielectrics for Leakage Current Reduction
Jong-Min Lee[1], Jong-Min Lee[2], Pyung-Ho Choi[2], and Byoung-Deog Choi[2]
[1]Samsung Electronics Co., Korea, [2]Sungkyunkwan University, Korea

15 An Injection Locked All-Digital Referenceless CDR
Changzhi Yu, Hyunmook Kim, Himchan Park, Youngtaek Roh, and Jinwook Burm
Sogang University, Korea

16 An intelligent chat bot agent system that can provide various services according to user's intention
Donghyun Kang, Dennis Singh Moirangthem, and Minho Lee
Kyungpook National University, Korea

17 A Strategy for Estimating Bistatic Range and Velocity in FM-radio-based Passive Bistatic Radar
Geun-Ho Park[1], So-Young Son[1], Dong-Gyu Kim[1], Hyoung-Nam Kim[1], Kyu-Ha Song[2], and Jun-Il Ahn[2]
[1]Pusan National University, Korea, [2]Agency for Defense Development, Korea

18 Low Dynamic Range Image Set Generation from Single Image
Rappy Saha, Partha Pratim Banik, and Ki-Doo Kim
Kookmin University, Korea

19 Bi-Directional Depth Propagation for 2D-to-3D Conversion with Color/Depth-Based Superpixel Segmentation
Inyong Yun[1], Byunghyun Kwon[1], Joongkyu Kim[1], and Cheolkon Jung[2]
[1]Sungkyunkwan University, Korea, [2]Xidian University, China

20 K-CBS-based unilateral spatial neglect rehabilitation training contents utilizing virtual reality
Ho-Sang Moon, Sung-Wook Shin, Sung-Taek Chung, and Eok Kim
Korea Polytechnic University, Korea

21 Adaptive Plane Fitting-Based Stereo Matching with Image Guided Disparity Refinement
Jonghyun Kim, Inyong Yun, and Joongkyu Kim
Sungkyunkwan University, Korea

22 **FPGA Design and Implementation of Accelerated Stereo Matching for Obstacle Detection**
Yongseok Lee, Eunchong Lee, Sang-Seol Lee, Sung-Joon Jang, and Byoung-Ho Choi
Korea Electronics Technology Institute, Korea

23 **Resistive Random Access Memory with Controlled Surface Energy for Ultrathin Electrode Formation**
Sunghwan Lee, Shem Seo, and Seunghyun Lee
Kyunghee University, Korea

24 **Survey on the Application of BlockChain to IoT**
Research Trend for Applying BlockChain to IoT
Sunghyun Cho and Sejong Lee
Hanyang University, Korea

25 **Design and Application of Dual Loop Visual Servo to Robot Arm for Dynamic Manufacturing Automation**
Ji-Min Lim[1], Sang-Hyeon Bae[1], Tae-Yong Kuc[1], Jong-Koo Park[1], and Kwang-Hee Lee[2]
[1]Sungkyunkwan University, Korea, [2]Korea Institute of Industrial Technology, Korea

26 **A Dynamic Visual Servo Control Architecture for Human-Robot Cooperative Manufacturing Process**
Sang-Hyeon Bae[1], Ji-Min Lim[1], Tae-Yong Kuc[1], Yong-Serk Kim[1], and Kwang-Hee Lee[2]
[1]Sungkyunkwan University, Korea, [2]Korea Institute of Industrial Technology, Korea

27 **Improved implementation method of DPWM for NTV DC-DC converter in 65nm CMOS**
Wonjune Hwang, Dang Van Thai, Dong-kyu jung, and Kwang-Hyun Baek
Chung-Ang University, Korea

28 **Performance Analysis of Satellite Laser Transmission System**
Won Ho Kim and Seon Gi Kim
Kongju National University, Korea

29 **Skin-Attachable Epileptic Seizure Detector**
Inyeol Yun, Jinpyeo Jeung, Yoonyoung Chung, and Young-Seok Kim
Pohang University of Science and Technology(POSTECH), Korea

30 **Reconfigurable Gain, Low Noise Trans-Impedance Amplifier with process compensation and wide input range for Biosensor Applications**
Abdolhamid Noori, Fatemeh Abbassi, Yasser Mohammadi Qaragoez, Sung-Jin Kim, and Kang-Yoon Lee
Sungkyunkwan University, Korea

31 A Machine Fault Detection and Diagnosis System using a Sound-to-Image Conversion Feature Representation
Caleb Vununu[1], Oh-Heum Kwon[1], Suk-Hwan Lee[2], Kyung-Won Kang[2], and Ki-Ryong Kwon[1]
[1]Pukyong National University, Korea, [2]Tongmyong University, Korea

32 Depth Map Estimation Model with Efficient Feature Extraction Module
Soo-Yeon Shin, Dong-Myung Kim, Byung-Do Yang, Chan-Sik Park, and Jae-Won Suh
Chung-Buk National University, Korea

33 Development of Electromagnetic Wave Remote Power Transmission System Using Beam Forming Technique
Yongju Park
Korea Electronics Technology Institute, Korea

34 ACO-based Optimal Node Selection Method for QoE Improvement in MEC Environment
Sanghoon Lee and Hwasung Kim
Kwangwoon University, Korea

P06 Poster VI

15:30-17:00 Thursday, January 24, 2019

Room: Princes C

Chair:

01 Fog Synthesis For Effective Object Detection On Road Driving Images
Kyeong-Min Jeong and Byung Cheol Song
Inha University, Korea

02 SSKIP: Lifetime Aware Page Skipping for Multi-Level Cell Flash-based Solid-State Drives
Jian-Geng Li[1], Guan-Yu Chen[1], Hsung-Pin Chang[2], and Da-Wei Chang[1]
[1]National Cheng Kung University, Taiwan, [2]National Chung-Hsing University, Taiwan

03 Analysis of Underwater Acoustic Communication Channel Parameters in Shallow Water
Jong Rak Yoon, Jihyun Park, and Minja Bae
Pukyong National University, Korea

04 High Breakdown Voltage 4H-SiC UMOSFET with a Source-Trench Oxide Structure
Taehong Kim and Kwangsoo Kim
Sogang University, Korea

05 A Preprocessing Method for Improving the Compression Ratio of LPDDR4 Command Trace
Jiwoong Choi[1], Boyeal Kim[1], Hyuk-Jae Lee[1], and Hyun Kim[2]
[1]Seoul National University, Korea, [2]Seoul National University of Science and Technology, Korea

06 Window Processing of SSB CP-OFDM System for the OOB Spectrum Reduction
Kyeongsoo Jang, Dayoung Kim, Changyoung An, and Heung-Gyoon Ryu
Chungbuk National University, Korea

07 Low Power Digital PWM Buck Converter With a Clock-Gating Shift-Register
Tae-Hyeong Kim, Dae-Jin Kim, Hyeon-Sam Shin, Sang-Ho Lee, Jae-Won Suh, and Byung-Do Yang
Chungbuk National University, Korea

08 Comparison of Clustering Algorithms Based on Weighted Clustering Metrics for Unmanned Aerial Vehicle Networks
Muhammad Yeasir Arafat and Sangman Moh
Chosun University, Korea

09 Cyclostationary Feature Detection for Spectrally Overlaid Systems
Jaehyun Park[1] and Heesun Park[2]
[1]Pukyong National University, Korea, [2]The Affiliated Institute of ETRI, Korea

10 Slip and Tip-over Prediction Map for Stable Driving of Mobile Robot
Sungmin Lee and Jaebyung Park
Chonbuk National University, Korea

11 A 16x16 Programmable Anlaog Vector Matrix Multiplier using CMOS compatible Floating gate device
Yong-Hyun Kim, Jong-Moon Choi, Je-Joong Woo, Eun-Je Park, Sang-Won Kim, and Kee-Won Kwon
Sungkyunkwan University, Korea

12 A Realtime Autonomous Robot Navigation Framework for Human like High-level Interaction and Task Planning in Global Dynamic Environment
Sung-Hyeon Joo, Sumaira Manzoor, Yuri Goncalves Rocha, Hyun-Uk Lee, and Tae-Yong Kuc
Sungkyunkwan University, Korea

13 Phased Array Ultrasonic using Coded Pulse for Grating Lobes Suppression in Air
Sang-Ho Park, Jeong yeonkeun, and Kwang-Ryul Baek
Pusan National University(PNU), Korea

14 **Pre-training Framework for Improving Learning Speed of Reinforcement Learning based Autonomous Vehicles**
Jung-Jae Kim[1], Si-Ho Cha[2], Minwoo Ryu[3], and Minho Jo[4]
[1]POSCO R&D Center, Korea, [2]Chungwoon University, Korea, [3]KT R&D Center, Korea, [4]Korea University, Korea

15 **Impacts of Hydrogen Exposure on the Electrical Properties of $ZrO_2/Al_2O_3/ZrO_2$ Films**
Pyungho Choi, Jongmin Lee, and Byoungdeog Choi
Sungkyunkwan University, Korea

16 **Indoor Localization using Vanishing Point and Environment's Structural Feature**
Gang-Myung Lee and Kwang-Ryul Baek
Pusan National University(PNU), Korea

17 **Design of Servo Motor Speed Adaptive Control System Using Neural Network**
Yo-han Ko, Chong-deuk Lee, Sung-Goo Yoo, and Kil-To Chong
Chonbuk National University, Korea

18 **A Long Wavelength-dependent Optical Memory Characteristics of Amorphous Oxide-based Thin Film Devices**
Junyoung Bae, Inkyung Jeong, and Sungsik Lee
Pusan National University, Korea

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Heungseop Ahn[1], Daejin Kim[1], Hoil Kim[1], Gwangmin Lee[1], Jaeho Lee[1], Seungwon Choi[1], Markus Mueck[2], Vladimir Ivanov[3], and Young-Seo Park[4]
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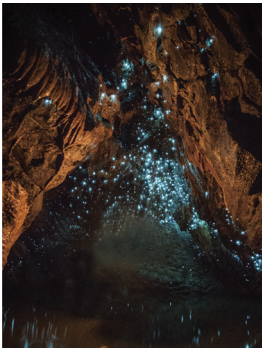
Waitomo Glowworm Caves



The glowworm, Arachnocampa luminosa, is unique to New Zealand. Thousands of these tiny creatures radiate their unmistakable luminescent light as our expert guides provide informative commentary on the Caves' historical and geological significance.
Waitomo Glowworm Caves are a must-see for any traveller. Enjoy the world famous boat ride under thousands of magical glowworms and become a part of over 120 years of cultural and natural history.

THE BOAT RIDE

Marvel at Mother Nature's light display as you glide silently through the starry wonderland of the Glowworm Grotto. Meander underground along the Waitomo River and gaze in silence at the myriad of glow-worm lights that make up the Glowworm Grotto. As you enter this galaxy of tiny living lights, you'll immediately experience a serene ambience and be fascinated and intrigued by tiny glowworms that light your way.

Hobbiton Movie Set

Visit the movie The Lord of the Rings and the Hobbit movie set (Hobbiton Movie Set: Hobbit Village) and experience the middle ground (Middle-earth). The guide tour begins with a view of the beautiful view of the Kaimai Ranges (Kaimai Lances) far away, running on a picture-like landscape of 1,250 acres of sheep ranch. Take a look at the back end (Bag End) and many other Hobbit houses where Frodo and Bilbo's adventures began, and visit Green Dragon Inn (Mill) and the Party Tree (Party Tree). I also hear an exciting story about how Hobbitton started.

Coromandel

There are many walkways and trekking courses in the wooded forest, and there are many places to do like skydiving and sea kayaks, as well as famous tourist attractions such as Hot Water Beach, which are special natural sea hot springs in hot waters due to volcanic activities.

Most of the travelers who visit Coromandel go to the Coromandel Peninsula, where the Cassidral Cove is a mysterious scenery with a cave-like hole in the rock overlooking the turquoise seawater, and a film location where the Chronicles of the movie Narnia are filmed.

Rotorua

Rotorua is a city in New Zealand, North Island, with an area of 2,614.9 km^2 and a population of 68,200 in Rotorua in 2009. Rotorua is located at the center of the North Island, 60 km south of Tauranga, 80 km north of Taupo, 105 km east of Hamilton, and 230 km southeast of Auckland. Volcanoes and geothermal development have developed, and it is the largest tourism center in New Zealand as the center of Maori culture. The city is well known for its geothermal activities, and these create geysers, the most famous of which is the Pohutu geyser with Wakareware, and it is made of hot mud. This geothermal activity originated in the city of Rotorua Caldera, where Rotorua became the home of many large-scale research institutes at universities and has the Wyariki Institute of Technology

Pukaki Lake

If you want to see the mystery of nature while traveling on the South Island of New Zealand, let's hear Lake Pukaki. The iceberg, located between Queenstown and Christchurch, is facing Mountain Cook, New Zealand's highest peak, and the mysterious lake, which boasts its distinctive clear water, attracts many travelers. The landscape of the lake, which is made up of natural changes by the sunset and the wind, is a work of God's art that admires the landscape of the lake. As you drive along the lakeside, you can see the sign of the Fookaki Lake Information Center, which is the best place to have another attraction, as you can see from the observation deck built in the building.

Auckland Sky Tower

The Auckland Sky Tower is located in the middle of downtown Auckland, New Zealand's largest economic center. If you want to watch the view of Auckland, climb the sky tower and enjoy 360 degrees of the city over the glass from the observation deck. From the observatory, you can see almost all the city of Auckland, including Harbor Bridge and Devonport, and there are sky jumps and skywalks that you can experience for a fee when you climb to the top. Sky Tower jump, which is gaining popularity among young travelers who visited Auckland, is enjoyed at 192m of the tower, and you can fly the Auckland Building Forest by wearing jumpsuits and safety devices.

Agrodom Farm

Agrodom Farm is a reenactment of New Zealand's authentic farm. Not only can you meet mild animals close, but you can also watch fleece pod shows. You can see not only wool clippings but also 19 sheep and sheep who can know the kind of wool, and you can see the cute show, and take a bus to see the kiwi orchard and honey. You can experience a typical New Zealand farm, such as feeding milk to lambs and cows.

Modeling of Wireless Sensor Networks for Detection Land and Forest Fire Hotspot

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Abstract — **Forest fires in Indonesia is one of big issue and disaster because of Indonesia located in tropical region, furthermore some of region consist of peat land that high risk for fire especially in dry season. Riau Province is one of region that regularly incident of forest fire with affected the length and breadth of Indonesia. This research proposes development of Wireless Sensor Networks (WSNs) for detection of forest fire hotspot in Indonesia, further case location in Riau province one of the region that high risk forest fire in dry season. WSNs technology used for ground sensor system to collect environmental data, any change by the times reporting to the data center to be analyze. Data training for fire hotspot detection is done in data center to determine and conclude of fire hotspot then potential to become big fire. The deployment of sensors will be located at several locations that has potential for fire incident in previous case and forecast location with potential fire happen. Mathematical analysis is used in this case for modelling number of sensor required to deploy and the size of forest area. The design and development of WSNs give high impact and feasibility to overcome current issues of forest fire and fire hotspot detection in Indonesia. The development of this system used WSNs highly applicable for early warning and alert system for fire hotspot detection.**

Index Terms **— WSNs, Forest Fire Hotspot, Detection, Sensors**

I. INTRODUCTION

Land and forest fire in Indonesia is a disaster that incident annually happen, especially in summer season. Data shows that total loss because of this fire in 1997 is USD2.45 billion [1], but this loss still smaller compare to 1995, the loss is USD19.1 billion. Riau province is one of the state that high risk to this disaster because of type of land which is peat land. Total economic loss for Riau province in year 2015 because of fire up to USD1.65 billion. Beside economic loss, most of activities stop because of badly environmental (haze) and all of school, government office and other institution no activities. The impact of this land forest fire is not only in Indonesia or Riau Province but to the others country such as Malaysia and Singapore, because of Riau is directly border to that countries. Current procedure is using satellite to detect hotspot then informs to the authority and team will go to the site for action to stop fire, there is no prevention action although there is some socialization and campaign to communities to stop firing land and forest but in some area because of peat land its can be fire by itself.

Therefore, in this research focus on developing ground level smart monitoring system to detect and monitor the environmental behavior in term of temperature, humidity and gasses as represent fire hotspot parameters. The integration of WSNs sensors would have an effect to local community and local authority to access the information through developed real-time database online. It is anticipated to be faster and cheaper solution than to satellite data acquisition and this would definitely be beneficial to social welfare and economy development. In addition, the development of real-time database would also require some support from them as a policy maker to understand how the system works and also understand the pattern of the results so that an appropriate action can be taken.

II. LITERATURE REVIEW

Environmental monitoring caused by land and forest fire can be done in many ways, most of technology currently use is satellite images, by capture earth image to find hotspot for environmental detection. In Indonesia, satellite used as well for detection land and forest fire by government to monitor status of fire hotspot. A new technology use for hotspot detection is wireless sensor, this technology ability to detect potential of fire by analyze environmental changing. Proposes new method for land and forest fire detection and monitoring system to be able to give early warning system before fire disaster is happen, by analyze environmental changing with various sensors and detection method this system able to give accurate information of location as well early warning for prevention action. Fig.1 shows a satellite image for Indonesia hotspot status by mid of year 2017, most of hotspot located in central of Sumatera and west of Kalimantan Island.

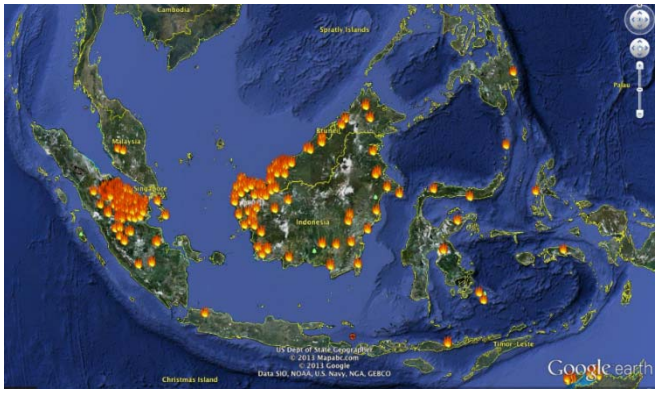

Fig. 1. Fire hotspot in Indonesia based on satellite image [2].

Wireless Sensor Networks (WSNs) can be apply in many applications, such as in remote environmental monitoring, industrial automatic control, remote sensing and target tracking. The similar application system is in environmental

monitoring system which is for fire hotspot detection that can make a real-time monitoring and detection. WSNs consists numerous number of small nodes in most situations, which small nodes are deployed in remote and inaccessible hostile environments or over large geographical areas. The large number of sensor small nodes sense environmental changes and report them to cluster head node or sensor base station, then through a gate way to transfer data to the servers which the deployment and maintenance should be easy and scalable.

A system to development of a simulator for approximates behavior of a wireless network of temperature sensors deployed in the area affected by a wildfire. Based on a new signal processing to approach in which the temperature experienced at a sensor due to a spreading of fire front is modelled as the mixture of two-dimensional Gaussian distributions as discussed [3]. WSNs based Wildfire Hazard Prediction (WFHP) system is a systematic description of architectural details and requirements of WSN for WFHP applications. The model measure in terms of network latency, energy consumption, and scalability is analyzed through simulation. Verification of model sanity and performance are carried out taking real weather datasets and their corresponding wildfire hazard outputs as benchmarks and elaborate in [4].

Modeling forest fires according to the Fire Weather Index (FWI) system which is one of the most comprehensive forest fire danger rating systems. Then, a model the forest fire detection problem as a node k-coverage problem ($k \geq 1$) in WSNs. Approximation algorithms for the node k-coverage problem which is shown to be NP-hard. The simulation shows that algorithms: activate near-optimal number of sensors, converge much faster than other algorithms, significantly prolong (almost double) the network lifetime, and can achieve unequal monitoring of different zones in the forest [5]. Development of WSNs based on multi-sensor system and artificial neural network (ANN). Sensors (CO, CO2, smoke, air temperature and relative humidity) were integrated into one node of WSNs. An experiment was conducted using burning materials from residual of forest to test responses of each node under no, smoldering-dominated and flaming-dominated combustion conditions. For achieving higher identification rate, an ANN model was built and trained with inputs of four sensor groups: smoke; smoke and CO2; smoke and temperature; smoke, CO2 and temperature as discussed in [6].

Several research on Wireless Sensor Network (WSN) as discuss in [7], the WSN Simulator is developed based on proposed Sensor model and WSN model. The WSN Simulator address important design issues as: coverage of the area under surveillance in relation to initial sensor deployment, number of sensors needed for targeted deployment, and coverage change as function of time. A new approach for forest fire monitoring and detection as discussed in [8] which using data aggregation in WSN. The proposed approach can provide faster and efficiently reaction to forest fires while consuming economically WSN's energy, which has been validated and evaluated in extensive simulation experiments. Wireless sensor network be able to provide better solution for disaster management and rescue operations such as earthquake detection and alert system, flood detection, landslide detection, forest fire detection, water level monitoring of Himalayan Rivers, monitoring of glaciers, pilgrimage and tourist management are various examples where WSN can be used. Sensors are deployed for measuring various parameters and on [9, 10].

WSN algorithm to identify malicious data injections and build measurement estimates that are resistant to several compromised sensors and even when they collude in the attack. The methodology to apply this algorithm is in different contexts and evaluate its results on three different datasets drawn from distinct WSN deployments [11, 12]. The others research have been done is application of WSN in predicting natural disasters like hailstorm, fire, rainfall etc. by WSN are infrequent and stochastic [13]. As well as in design and implementation of a smart fire detection system using a WSN and Global System for Mobile (GSM) communication to detect fires effectively and reduce false positives, the system uses smoke and temperature sensors [14]. Application of WSN in energy conservation, reducing data transmission delay and improving the network lifetime. Used of cluster-chain mobile agent routing (CCMAR) for low energy adaptive clustering hierarchy (LEACH) and power-efficient gathering in sensor information systems (PEGASIS) [15].

III. MODELING OF WSNS IN FIRE HOTSPOT DETECTION

Nowadays, many kind of monitoring system based on aim and objective as well as parameters to be monitor. Environmental monitoring for fire hotspot detection is implemented in some of institution or agency to monitor latest status of environmental. Current technology using is mostly from satellite data to detect hotspot of fire hotspot, this technology has some weakness and limitation such as only detect when fire already happen and in some case for example in bad weather or cloudy then satellite unable to penetration of cloud and image will not update. Ground sensing technology which is WSNs enable to penetrate smoke environmental as well to detect fire hotspot. WSNs sensor will deploy in the area with high risk of fire to collect data such smoke detection, temperature, particle changing, etc. All the information collected by sensors will send to sensor base station as gateway to transfer data to monitoring system (data center) because the distance between sensor base station to monitoring system very far away more than 100 km in some area to monitor data to analyze any changing of environmental image. Beside new technology and smart sensors as elaborate previously, common environmental parameters such as temperature, humidity, wind speed and direction are applying in this monitoring system as supporting data to analyze potential of fire.

The use of WSNs sensors and base stations will setup at difference area to collect information from environmental and sensors deploy surrounding. Information collected by sensor forward to base station and will keep in internal database then send to monitoring system (data center), because of sensor base station locate in rural area that far away up to 200 km then solar panel system will use as power supply for system. Latest technology of communication system also proposes such as 4G technology or even 5G technology for future in order to achieve real-time data to display to monitoring system. In the end of this system expected be able to gives early warning before fire is happen to authority for prevention action. Fig. 2 shows a map of fire hotspot detected in Riau Province in Indonesia.

Fig. 2. Fire hotspot detected by satellite image in Riau Province.

The impact of land and forest fire to the land as shows in fig. 3, there are a few fire hotspots in smoke environmental. The point and typical of hotspot is very important to design and model of sensors in detecting of hotspot on the field, whether fire is spreading or point to a central of hotspot.

Fig. 3. Example of fire hotspot detected in a land fire.

Another model of fire in a forest with big fire is required to design WSNs sensor to detect how big the fire spreading and impact to the forest as shows in fig. 4.

Fig. 4. Example of fire hotspot detected in a forest fire.

The area of fire hotspot modeling coverage assumes a set of WSNs sensors distributed over a geographical region of land or forest area, in this case Riau Province in Indonesia is model to monitor that coverage area. Coverage function P is given as:

$$P = f(x, y, t) = \{(x_1, y_1), \ldots (x_n, y_n)\},$$
$$(x_k, y_k) = f(t), k = 1,2,3,\ldots,n \quad (1)$$

where (x, y) are coordinates of sensor within the monitored region, and t is time. Model is using a projection in the 2D space of a fire surveillance region, which is a 3D sphere. In the case of network is stationary, without mobile WSNs sensors, but the sensor positions are time dependent, since sensor nodes of WSNs are expected to stop operating in time. In this cease operation can have different causes: hardware faults, accidental, battery depletion, and intentional sensor removal, etc.

Assume to define coverage index IP as a scalar value representing the percentage of coverage for the area under the monitoring at a specific time as:

$$IP = \frac{\text{area covered with sensors}}{\text{the total area of the surveillance region}} \cdot 100\% \quad (2)$$

The basic model component is a WSN sensor node defined as a vector:

$$S = (d, E(t)) \quad (3)$$

where d is a range of sensor transmission, or radius of transmission area, the area covered by radio signal for data exchange with a neighboring node. E(t) is energy available for sensor power supply. Assume a homogenous sensor network with n unified type sensors and one hub-sensor for communication with a dispatcher node.

Network parameters are described as a vector:

$$M = (n, f_0, \Delta E) \quad (4)$$

where n is the number of sensors, fo is the frequency of regular transmissions, and ΔE is energy consumption per transmission. Assume that sensor nodes periodically transmit the data collected to the neighboring nodes. Energy consumption ΔE includes also energy spent in sensing and data processing. Each node has two roles:

(a) sensing environmental data and its transmission.

(b) receiving data from neighboring nodes and forwarding.

The sensing role is defined in accordance with the WSNs sensor network application, and can be easily influenced with sensor node type selection. Energy consumption ΔE is thus linked to the sensor node type and its value is listed in the sensor node data sheet. The forwarding neighboring sensor node data role is primary defined by communication protocol. WSNs simulator having knowledge of sensor nodes positions and defines paths for data forwarding employing optimization algorithms. Assume that routing optimization would be implemented in the real protocol as well. In order to simplify the model, each sensor node is aware of its GPS co-ordinates, which are used in communication as an identification code. It is also assumed that the hub node initially broadcasted across all the nodes. Based on these assumptions it is possible to implement optimized routing algorithm. Energy consumption needed for receiving and forwarding neighbor data is ΔE. Object under surveillance is modeled as four-side stationary polygon defined as a set:

$$O = (A, B, C, D) = \{(x_A, y_A), (x_B, y_B), (x_C, y_C), (x_D, y_D)\} \quad (5)$$

where A, B, C and D are polygon points with co-ordinates (x, y).

The role of WSNs hub sensor node is to collect data from each sensor node and forward the data to base station or co-ordination center. Data package received and forwarded by the hub node contains originator sensor node address and measurement values (temperature, humidity and CO_2). The WSN hub node has uninterrupted power supply and that communication channel between the hub node and co-ordination center is unremitting. Hence, simulation is treating the hub sensor as "constantly available". The main objective of the simulation is to optimize network routes for data transmission from sensor nodes to the hub node [7].

In addition of the use and model of fire hotspot sensor to prevent incident of fire, the environmental sensor in WSNs system to detect several of parameters that normally appear because of land and forest fire such as Carbone Dioxide (Co2), Haze, Air Temperature and Humidity. Fig. 5 shows impact for environmental because of land or forest fire, case recorded from Pekanbaru City in Riau Province Indonesia.

Fig. 5. Topology of WSN sensor nodes deploy in forest for fire detection.

IV. Development WSN in Forest Fire Detection

Forest fires are a natural and recurrent phenomenon or manmade, in many case of the world. Burning areas are mainly located in temperature climates where its rainfall is high enough to enable a significant level of vegetation, but in summers session are very hot and dry environment, be able to create a dangerous fuel load. Global warming will contribute to increase the number and importance of these disasters. In every season, not only are thousands of forest hectares destroyed by wild land fires, but also properties, assets and public resources and facilities are destroyed because of fire.

A forest fire in general a dynamic phenomenon that may changes its properties and behavior by the time from one place to another and with the passage of time. In the fact that the forest fuel available in a given location is limited, for a fire to continue it must spread to neighboring fuel. This is performed through the complex heat spread to neighboring fuel and performed through the complex fire behavior. Another approach is also based on the WSNs paradigm has been designed and developed in the context of a research project that included all the key actors in forest as well as fire fighting for operations. This unique proposed ecosystem has provided the solution with a holistic perspective that results in a set of distinguishing features, which all node types can include environment and meteorological sensors.

Another scenario is in fig. 6 shows a schematically structure proposed of the development ZigBee-WSNs-based system for land and forest fire detection and protection management, consisting of multi-sensor nodes, coordinators, cluster heads, routers and remote decision server. This cluster-tree network topology structure proposes design to reduce the loss of energy and data package while transferring. ZigBee technique is a global standard based on IEEE 802.15.4 applicable for low-rate wireless Personal Area Networks (PAN). ZigBee is one of the wireless network standard targeted at low power sensor that apply in multi frequencies 868 MHz or 915 MHz and 2.4 GHz. The technical advantage proposes of ZigBee is to offer a system with long battery life, small size, low-cost, high reliability and automatic or semi-automatic installation. Therefore in this development design WSNs node to achieve an optimal choice for forest fire detection and monitoring [16].

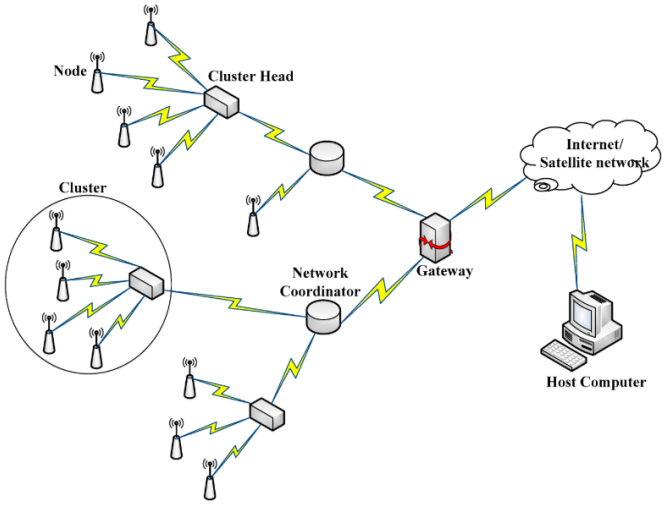

Fig. 6. A WSN sensor nodes propose use ZigBee standard.

Actual hardware on WSNs node for fire hotspot detection and monitoring can be found in many types in the market. Where temperature, humidity, smoke and carbon sensor installed in the node to detect all the parameter that high relation to the forest fire. Fig. 7 shows actual fabricated sensor ready to deploy, before sensor node deploy in the field the sensor nodes have to configure based on design and requirement. All the nodes will send a data or message to the WSNs coordinator that has function to receive all information from node scattered.

Fig. 7. A WSN sensor nodes propose use ZigBee standard

Proposed monitoring system expected to detect any abnormality in environmental for land and forest fire,

monitoring system normally used by government institution or agency assign to do a monitoring. With a new technology proposed with smart sensors, the system may adopt by many company to detect and monitoring environmental based on they are purpose. For example, a paper and pub company may use this monitoring system for detection fire or hotspot at they are farming area. Furthermore, the monitoring system can be used for community for they are to know environmental status such as air quality, temperature, humidity, etc. A mobile application can be done based of data collected then community be able to check environmental by remote in mobile phone or others mobile device. The application and product potential for market and new novelty based on smart sensor developed, a decision easier to do because have some background and real data. During research and development of smart monitoring system, government and some private institution such as industrial and community have to involve in this project. Information of area with high risk and placement of sensor base station in correct location is very important to achieve faster and accurate data to send to monitoring system. Thus, some information from local community is really helping to determine sensor location. Government institution as well because to get license to enter in some of area that under control of government for example protected forest area and special land for industrial etc.

V. CONCLUSION

Development of WSNs nodes for land and forest fire detection, furthermore for monitoring have been modelled. In this case the design and analysis use mathematical approach according to the area have to cover which in the whole Riau Province in Indonesia. Air temperature and humidity, haze and Co2 sensor are high light in this case because of those parameters are basic parameters to the fire hotspot case either in the land or forest area. Proposed design sensors node use ZigBee model, with low power then sensor nodes can use in long life as node powered by battery. In order to cover the whole of Riau province, minimum have to create network coordinator in each of area and a gateway to access in server (cloud database) as well monitoring computer. Theoretical proposed concept of WSNs very applicable to use for detection forest fire, especially in Riau Province in Indonesia.

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REFERENCES

[1] N. Yulianti, H. Hayasaka, and A. Usu, "Recent Forest and Peat Fire Trends in Indonesia The Latest Decade by MODIS Hotspot Data," *Global Environmental Research,* vol. 16, no. 22, pp. 105-116, 2012.

[2] Google. (2018). *Google Earth*.

[3] E. S. Manolakos, D. V. Manatakis, and G. Xanthopoulos, "Temperature Field Modeling and Simulation of Wireless Sensor Network Behaviour During A Spreading Wildfire," presented at the 16th European Signal Processing Conference (EUSIPCO 2008), Lausanne, Switzerland, August 25-29, 2008, 2008.

[4] H. Sabit, A. Al-Anbukya, and H. GholamHosseinib, "Wireless Sensor Network Based Wildfire Hazard Prediction System Modeling," presented at the The 2nd International Conference on Ambient Systems, Networks and Technologies, 2011.

[5] M. Hefeeda and M. Bagheri, "Forest Fire Modeling and Early Detection usingWireless Sensor Networks," *Ad Hoc & Sensor Wireless Networks,* vol. 7, pp. 169-224, 2008.

[6] X. Yan, H. Cheng, Y. Z. W. Yu, H. Huang, and X. Zheng, "Real-Time Identification of Smoldering and Flaming Combustion Phases in Forest Using a Wireless Sensor Network-Based Multi-Sensor System and Artificial Neural Network," *Sensors,* vol. 16, no. 1228, pp. 1-10, 2016.

[7] A. Aksamovic, M. Hebibovic, and D. Boskovic, "Forest fire early detection system design utilising the WSN simulator," in *2017 XXVI International Conference on Information, Communication and Automation Technologies (ICAT)*, 2017, pp. 1-5.

[8] Y. Liu, Y. Liu, H. Xu, and K. L. Teo, "Forest fire monitoring, detection and decision making systems by wireless sensor network," in *2018 Chinese Control And Decision Conference (CCDC)*, 2018, pp. 5482-5486.

[9] D. Pant, S. Verma, and P. Dhuliya, "A study on disaster detection and management using WSN in Himalayan region of Uttarakhand," in *2017 3rd International Conference on Advances in Computing,Communication & Automation (ICACCA) (Fall)*, 2017, pp. 1-6.

[10] C. Aranzazu-Suescun and M. Cardei, "Distributed algorithms for event reporting in mobile-sink WSNs for Internet of Things," *Tsinghua Science and Technology,* vol. 22, no. 4, pp. 413-426, 2017.

[11] V. P. Illiano and E. C. Lupu, "Detecting Malicious Data Injections in Event Detection Wireless Sensor Networks," *IEEE Transactions on Network and Service Management,* vol. 12, no. 3, pp. 496-510, 2015.

[12] E. A. Kadir, S. L. Rosa, and H. Gunawan, "Application of RFID technology and e-seal in container terminal process," in *2016 4th International Conference on Information and Communication Technology (ICoICT)*, 2016, pp. 1-6.

[13] A. Kansal, Y. Singh, N. Kumar, and V. Mohindru, "Detection of forest fires using machine learning technique: A perspective," in *2015 Third International Conference on Image Information Processing (ICIIP)*, 2015, pp. 241-245.

[14] M. Saoudi, A. Bounceur, R. Euler, T. Kechadi, and A. Cuzzocrea, "Energy-Efficient Data Mining Techniques for Emergency Detection in Wireless Sensor Networks," in *2016 Intl IEEE Conferences on Ubiquitous Intelligence & Computing, Advanced and Trusted Computing, Scalable Computing and Communications, Cloud and Big Data Computing, Internet of People, and Smart World Congress (UIC/ATC/ScalCom/CBDCom/IoP/SmartWorld)*, 2016, pp. 766-771.

[15] S. Sasirekha and S. Swamynathan, "Cluster-chain mobile agent routing algorithm for efficient data aggregation in wireless sensor network," *Journal of Communications and Networks,* vol. 19, no. 4, pp. 392-401, 2017.

[16] E. A. Kadir, "A reconfigurable MIMO antenna system for wireless communications," in *2017 4th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI)*, 2017, pp. 1-4.

Certificate of Presenter

January 22, 2019

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We certify that the above person participated in as a presenter 2019 International Conference on Electronics, Information and Communication (ICEIC 2019) which was held at Pullman Auckland Hotel, New Zealand from January 22 – January 25, 2019.

Sincerely yours,

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