

2021 18th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON 2021)

**Virtual Conference
19 – 22 May 2021**

Pages 1-584



**IEEE Catalog Number: CFP2106E-POD
ISBN: 978-1-6654-4738-6**

**Copyright © 2021 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP2106E-POD
ISBN (Print-On-Demand):	978-1-6654-4738-6
ISBN (Online):	978-1-6654-0382-5

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com



CONTENTS

About ECTI-CON 2021	iv
Welcome Message from ECTI-CON 2021 General Chair	v
Welcome Message from Dean of Faculty of Engineering, CMU	vii
Welcome Message from ECTI President	viii
Keynote Speakers	ix
Organizations	xiii
Detailed Program	xv
Parallel Session 1 Room 1 SS20 (I): Special Session on Communication Technologies on GNSS, Image Processing, Smart farming, and AI telehealth	
Performance Assessments of Correction Models in GNSS Network-based RTK Positioning (<i>Chayanon Laoniphon, Thayathip Thongtan, Chalermchon Satirapod</i>)	2
GNSS active control point determinations (<i>Serm Chinnarat, Thayathip Thongtan, Jittrakorn Bairaksa</i>)	6
Adaptive Kernel Approach to Inverse Problems and Image Restoration using Block Coordinate Descent (<i>Parin Chaipunya, Wachirapong Jirakitpuwapat, Kittithuch Paponpen</i>)	10
Dual Mode Controlled Water Surface Garbage Collecting Robot by using Embedded Deep Learning (<i>Jantana Panyavaraporn, Natthawat Chaimongkol, Nattasit Limsomnuek, Wichai Wasayangkul, Nathamon Charoenwattana, Paramate Horkaew</i>)	14
Detection and Classification of Incoming Ambulance Vehicle using Artificial Intelligence Technology (<i>Tiramanat Sarapirom, Settawit Poochaya</i>)	18
Parallel Session 1 Room 2 IT(I): Information Technology	
User's Perception of Delay: An Experiment Using Progress Indicators (<i>Chatpong Tangmanee, Surached Wisansirikul</i>)	23
Neural Crytosystem for Textual Message with Plasticity and Secret Dimensions (<i>Hangyi Wang, Chidchanok Lursinsap</i>)	27
Impacts of Kernel Factorization on Different Resized Images in Object Recognition Base on Inception Convolutional Neural Network (<i>Ladawan Phumthong, Siriporn Supratid</i>)	31
A Comparison Study of Using Linear and Nonlinear Classifiers on Object Recognition Based on Inception Convolutional Neural Networks with Different Numbers of Inception-Block (<i>Jirayut Thanomsingh, Siriporn Supratid</i>)	35
A Big Data Analysis on Efficiency of Bangkok Taxi System (<i>Kavepol Khunsri, Sooksan Panichpapiboon</i>)	39
Parallel Session 1 Room 3 PS (I): Electrical Power Systems	
ACOPF with SOCP Hierarchy for Power Loss Minimization (<i>Akira Chuppawa, Sotdhipong Phichaisawat, Patchrapa Wongchai</i>)	44
Remote Control Switch Allocation Algorithm base on Evaluation of System Reliability Indices (<i>Paramet Wirasanti, Tana Paisarnsutthishon</i>)	48
A Locating Diagnosis of Partial Discharge on Cross-bonding Ground System (<i>W. Inwanna, S. Mongkolsatitpong, P. Chancharoensook, N. Pattanadech</i>)	52
Cost-Effective Insulation Coordination Design for 115-kV Transmission Line due to Lightning Back Flashover (<i>Phonesavanh Sengmanivanh, Komsan Hongesombut, Suphicha Punyakunlaset, Dulpichet Rerkpreedapong, Sillawat Romphochai</i>)	56
Excitation and Resonance Hazards of Single-Phase Induction Generator (<i>Ali A. A. Ismail, Amr Elnady</i>) ...	60
Parallel Session 1 Room 4 SS5 (I): Special Session on Antennas and Microwave Technologies for Modern Wireless Communications	
An Efficient Analysis of the Far-field Radiation of a Huygens Source Antenna Embedded in Dielectric Multilayer Slabs Using the Equivalent CCITL Model (<i>Supakit Kawdungta, Danai Torrungrueng, Alongkorn Lang</i>)	65



CONTENTS

Design of Antenna Arrays by Using Modified Fruit Fly Optimization Algorithm (<i>Supakit Kawdungta, Danai Torrungrueng, Alongkorn Lang, Chuwong Phongcharoenpanich</i>)	69
Double-Layer Passive Tag Antenna for UHF RFID Applications (<i>Kittima Lertsakwimarn, Sangwon Kittiwittayapong, Danai Torrungrueng</i>)	73
Impedance Matching Optimization for GPS Frequency Band based on CSRR Load Technique Neighboring Triangular Slot Antenna (<i>Kamontip Wattakeekamthorn, Thanakit Wattakeekamthorn, Chatree Mahatthanajatuphat, Prayoot Akkaraekthalin, Danai Torrungrueng</i>)	77
Optimization for antenna based IoT in Smart agricultural applications (<i>Pinit Nuangpirom, Veerachai Jaikampan, Parida Jewpanya</i>)	81
Parallel Session 1 Room 5 CS (I): Communication Systems	
Channel Activity Detection with the Modified Backoff Algorithm for LoRaWAN (<i>Kasama Kamonkusonman, Rardchawadee Silapunt</i>)	86
Impact of Gateway Placement and Energy Consumption for Data Processing on Lifetime of IoT Networks (<i>Nakrop Jinaporn, Poompat Saengudomlert</i>)	90
Log data traffic characterization for packet loss estimation in ALICE O ² system (<i>Napatsorn Pitakkotchakorn, Vasco Chibante Barroso, Peerapon Siripongwutikorn</i>)	94
LEACH Distributed Clustering Improvement for Wireless Sensor Networks (<i>Awangga Febian Surya Admaja, Muhamad Asvial</i>)	98
A Performance Comparison Of Spectrum Sensing Exploiting Machine Learning Algorithms (<i>Pongphat Nimudomsuk, Montakan Sanguanwattananaraks, Kanabadee Srisomboon, Wilaiporn Lee</i>)	102
Parallel Session 1 Room 6 COM (I): Computers	
The performances of Pre-trained Convolutional Neural Networks in Clothing Sketch Classification (<i>Fitri Arnia, Siti Aisyah, Khairun Saddami, Khairul Munadi</i>)	107
The Application of Convolution Neural Network for Coconut Maturity Classification (<i>Lertchuwongsa Noppon, Parinyavuttichai Nipon</i>)	112
Discovery of Association Rules between Factors Affecting User Satisfaction in Software Project by FP-GROWTH Algorithm (<i>Katawut Kaewbanjong, Sarun Intakosum</i>)	116
Using Fast Intersection to improve SCAN Algorithm (<i>Worakun Ata, Thapanapong Rukkanchanunt, Jakarin Chawachat</i>)	123
Airport Buildings Classification through Remote Sensing Images Using EfficientNet (<i>Pimpisa Charoenchittang, Petarpa Boonserm, Kazuki Kobayashi, Nagul Cooharajanone</i>)	127
Parallel Session 2 Room 1 SS20 (II): Special Session on Communication Technologies on GNSS, Image Processing, Smart farming, and AI telehealth	
Improvement of Single Point Positioning Accuracy by using GAGAN Satellite-Based Augmentation System in Thailand Region (<i>Somkit Sophan, Watid Phakphisut, Lin M. M. Myint, Pornchai Supnithi</i>)	132
Compact CNN Model for Classifying Rose Apple Species and Detecting Their Skin Defects (<i>Nitikarn Nimsuk, Wilasinee Paewboontra</i>)	136
Underwater image enhancement algorithm combining color correction and multi-scale fusion (<i>Xinnan Fan, Liang Lu, Pengfei Shi, Xuewu Zhang</i>)	140
Moisture Prediction System with LSTM Technique for Cactus Farm (<i>Kitipoth Wasayangkool, Siwalee Dangstri, Ekachai Chootieng, Kriengkri Luangampol, Kanabadee Srisomboon, Wilaiporn Lee</i>)	144
Monitoring characteristics of dried banana slices using image processing (<i>Piyanun Ruangurai, Tapanee Nachan, Rewat Bunchan, Chaiyaporn Silawatchananai</i>)	148
Parallel Session 2 Room 2 IT (II): Information Technology	
Comparison of Deep-Learning Training Techniques for Person's Social Convention Estimation Model (<i>Pakpoom Patompak, Rachadaporn Jaisanit, Tunyawat Somjaitaweeporn</i>)	153
A Check-in System Supporting Multiple Attendees Check-in at a Time by Proximity-based Methods (<i>Nopparut Sae-Lim, Ananta Sinchai, Nathan Yiangsupapaanontr, Panwit Tuwanut</i>)	157



CONTENTS

Q-Learning traffic-distributing approach to managing multiple-destination traffic (<i>Chawannuch Sibmeunpiam, Chayanon Sub-r-pa</i>)	163
Automatic Rubber Tree Classification (<i>Panaththa Pongsomsong, Paruj Ratanaworabhan</i>)	167
Forecasting Tourist Arrivals with Keyword Search using Time Series (<i>Patthamaphon Kaewmanee, Jirapond Muangprathub, Wichuta Sae-Jie</i>)	171
Parallel Session 2 Room 3 PS (II): Electrical Power Systems	
Robust Optimization of Power System Stabilizer Parameters Based on Pole Placement (<i>Thanon Panyarat, Sermsak Uatrongjit</i>)	176
Reduction of Electric Field from Power Transmission Lines Using Phase Angle Adjustment Technique and Particle Swarm Optimization (<i>Sirirat Seemapapong, S.S.Sivaraju, Vuttipon Tarateeraseth</i>)	180
The Simulation Result of Modern Lightning Protective Equation for the Rolling Sphere Method (<i>Arnon Singhasathein, Wetarin thansiphraerth, Kotchapong Sumanonta</i>)	184
An Optimal Pricing Mechanism for Peer-to-Peer Energy Trading Market with Consideration of Distribution System Operation Criteria (<i>Pikkanate Angaphiwatchawal, Yannawich Puksirikul, Surachai Chaitusaney</i>)	188
Peak-Shaving of Feed-in PV Power for Residential PV-Battery System with Added Feedback-Adjustment Scheme (<i>Krit Chatchairungruang, Surapong Suwankawin</i>)	192
Parallel Session 2 Room 4 SS5 (II): Special Session on Antennas and Microwave Technologies for Modern Wireless Communications	
TEXTILE SLOT BOW-TIE ANTENNA FOR WIDE BAND APPLICATION (<i>Kittisak Thongda, Thinnawat Jangjing, Paitoon Raklua, Boonyarit Kumkhet</i>)	197
Chipless RFID Sensing for Dielectric Property of Light Weight Concrete (<i>Rattapong Suwalak, Kittisak Phaebua, Chuwong Phongcharoenpanich, Titipong Lertwiriya-prapa, Somsanouk Pathoumvanh, Danai Torrungrueng</i>)	201
A Textile Right Angle Slot Antenna with Dualband Circularly Polarization (<i>Suthisa Kesorn, Norakamon Wongsin, Thinnawat Jangjing, Chatree Mahatthanajatuphat, Paitoon Raklua, Danai Torrungrueng</i>) ...	205
A Study of Wireless Communications Systems for Robotic Communications in Underground Pipes and Ducts (<i>V. Doychinov, S. A. Zaidi, N. Chudpooti, P. Akkaraekthalin, N. Somjit, I. D. Robertson, K. V. Horoshenkov, J. Wakeling</i>)	209
Triple-band Dipole Antenna using Interdigital Technique for LTE, WLAN, and 5G Network Systems (<i>Prayoot Akkaraekthalin, Pongsathorn Chomtong, Danai Torrungrueng, Napadol Jutrakul, Sutjapol Karnkrasung, Apirada Namsang, Reungyot Lerdwannittip</i>)	214
Parallel Session 2 Room 5 CS (II): Communication Systems	
Performance Evaluation of Downlink Multi-user OFDMA Scheduling in 5G New Radio (NR) (<i>Hajar Indah Fitriasari, Anugrah Indah Lestari, Dyah Lalita Luhurkinanti, Riri Fitri Sari</i>)	219
Reinforcement Learning-Based Adaptive Modulation for Vehicular Communication (<i>Nazmia Kurniawati, Yuli Kurnia Ningsih</i>)	224
Data Pattern Effect of SOA at 25 Gbps with Different PRBS and Multi-channel Amplification (<i>Pichakorn Sawatdee, Duang-rudee Worasuchee, Ruben S. Luis, Satoshi Shimizu, Satoshi Shinada, Hideaki Furukawa, Naoya Wada</i>)	228
Formation of the New Multi-sender Authentication Codes Via Symplectic Space through Finite Commutative Rings with Applications (<i>Wachirapong Jirakitpuwapat, Poom Kumam, Parin Chaipunya, Habib ur Rehman</i>)	232
Feasibility Study and Performance Analysis of NB-IoT communications for PEA Smart Grid Network (<i>Kittiwat Srivilas, Chaiyod Pirak</i>)	240
Parallel Session 2 Room 6 COM (II): Computers	
Low resolution image area classifier based on Convolutional Neural Network (<i>Jaturon Ngernplubpla, Kulwarun Warunsin, Orachat Chitsobhuk</i>)	246



CONTENTS

Three-Dimensional Point Cloud Registration Using Particle Swarm Optimization (<i>Ritipong Wongkhuenkaew, Sansanee Auephanwiryakul, Nipon Theera-Umpon</i>)	250
A Genetic Algorithm as a Classifier (<i>Yodthong Rodkaew</i>)	254
An Implementation of Machine Learning for Parkinson's Disease Diagnosis (<i>Hassapol Thummikarat, Prabhas Chongstitvatana</i>)	258
Inhalation and Exhalation Recognition through a Face Mask Using Thermal Imaging (<i>Rong Phoophuangpaioj, Panida Charnkeitkong</i>)	262
Parallel Session 3 Room 1 SS20 (III): Special Session on Communication Technologies on GNSS, Image Processing, Smart farming, and AI telehealth	
Calculating AGC and C/N0 Thresholds of Mobile for Jamming Detection (<i>Chotipong Sakorn, Pornchai Supnithi</i>)	268
Video Shot Boundary Detection Using Principal Component Analysis (PCA) and Deep Learning (<i>Dipanita Chakraborty, Werapon Chiracharit, Kosin Chamnongthai</i>)	272
Construction of LSTM model for total electron content (TEC) prediction in Thailand (<i>Pathorn Chimsuwan, Pornchai Supnithi, Watid Phakphisut, Lin Min Min Myint</i>)	276
Real-Time Jamming Detection and Position Estimation via Software-Defined Radio (SDR) (<i>Kasamawat Thanakan, Kitisak Sapphaniran, Trin Palasarn, Pornchai Supnithi, Watid Phakphisut, Chotipong Sakorn</i>)	280
Curve Slope Estimation and Perpendicular Line Detection for Computing Automatic Footprint Chippaux-Smirak Index (<i>Pramual Choorat, Kittinaporn Pornpromvinit, Varinthon Pikunthong, Vittawat Tidchai, Suttipan Aksornniem</i>)	285
Parallel Session 3 Room 2 IT (III): Information Technology	
Novel American Sign Language Fingerspelling Recognition in the Wild with Weakly Supervised Learning and Feature Embedding (<i>Peerawat Pannattee, Wutipong Kumwilaisak, Chatchawarn Hansakunbuntheung, Nattanun Thatphithakkul</i>)	291
Cyberbullying detection on Tweets (<i>Aekachai Phanomtip, Thaiyathorn Sueb-in, Sirion Vittayakorn</i>)	295
Feature Selection Based on Hierarchical Concept Model Using Formal Concept Analysis (<i>Patsita Wetchapram, Jirapond Muangprathub, Boonyarit Choopradit, Apirat Wanichsombat</i>)	299
Fig Fruit Recognition Method Based on YOLO v4 Deep Learning (<i>Wu Yijing, Yang Yi, Wang Xue-fen, Cui Jian, Li Xinyun</i>)	303
User Interface Redesigning Based on a Usability Design Framework (<i>Pinnaree Kureerung, Lachana Ramingwong, Sakgasit Ramingwong</i>)	307
Translating TOSCA Model to Kubernetes Objects (<i>Woramon Chareonsuk, Wiwat Vatanawood</i>)	311
Parallel Session 3 Room 3 PS (III): Electrical Power Systems	
Revision of the Optimal Capacitor Placement in Radial Distribution System; Viewpoint of Utility (<i>Komson Daroj, Laddawan Wongsukhonthanit</i>)	316
D-distance Factor for High Voltage Transmission Line Risk and Cost Analysis (<i>Cattareeya Suwanasri, Surapol Saribut, Waraporn Luejai, Thanapong Suwanasri</i>)	320
The Analysis of the Sag distance for supplying the High Voltage of the Stranded Aluminium (<i>Nattapong Phanthuna, Chanon Tewsikares, Panisra Phrmmank, Akaradage Khongkaphan, Piyatida Phanthuna, Boonserm Ainsuk</i>)	324
The Preliminary Study of Partial Discharge Behavior of Crosslinked Polyolefin (XLPO) Unshielded Cable Insulation Under Temperature Variations (<i>Jakawan Singhasivanon, Nirudh Jirasuwankul</i>)	328
An Experimental Study on Dielectric Response of the Crosslinked Polyolefin (XLPO) Insulation of the Unshielded Cable Under Electric Field and Heat Flux (<i>Jakawan Singhasivanon, Nirudh Jirasuwankul</i>)...	332
Parallel Session 3 Room 4 SS5 (III): Special Session on Antennas and Microwave Technologies for Modern Wireless Communications	



CONTENTS

A Compact Multiband Cavity Filter using Interdigital Technique for LTE, S-Band and WLAN Systems (<i>Pongsathorn Chomtung, Prayoot Akkaraekthalin, Peerayu Phengsuwan, Suttisak Kaida, Apirada Namsang, Reungyot Lerdwannittip, Phakkawat Jantree</i>)	337
A Study of Impedance Bandwidth Improvement of Printed Dipole Antenna for DTV (<i>Saran Kampeephat, Sidtipan Todsungnoen, Paowphattra Kamphikul, Warakorn Sarikha</i>)	341
High Gain Dual Polarized Antenna using a Narrow Pulse Model in Minkowski Fractal Patch (<i>Norakamon Wongsin, Thanakarn Suangun, Chatree Mahatthanajatuphat, Prayoot Akkaraekthalin, Danai Torrungrueng, Paitoon Rakluea</i>)	345
Gain Improvement of Slot Antenna with Wire Medium for Modern Wireless Communication (<i>Aitthiphak Boonyakiat, Paowphattra Kamphikul</i>)	349
Performance Investigations of Electromagnetic Absorber Made by Natural Rubber (<i>Kiadtisak Salayong, Kittisak Phaebua, Titipong Lertwiriya-prapa</i>)	353
Hybrid Metamaterial Technique for Performance Improvement of Monopole Antenna for WLAN (<i>Paowphattra Kamphikul, Saran Kampeephat, Aitthiphak Boonyakiat, Thanawat Thiasiriphet</i>)	357
Parallel Session 3 Room 5 CS (III): Communication Systems	
ELMx-based Channel Estimation for Massive MIMO Systems (<i>Chittapon Keawin, Peerapong Uthansakul, Apinya Deekaikam</i>)	362
QoE-Based Precoding for Partially Massive MIMO (<i>Farung Samklang, Peerapong Uthansakul, Monthippa Uthansakul</i>)	366
Efficient Computation of Collision Probability for Grant-Free Multiple Access with Repeated Packet Transmissions (<i>Poompat Saengudomlert, Sarbagya Buddhacharya</i>)	370
Development of Interference Mitigation Techniques based Artificial Neural Network for IoT Network (<i>Natthanan Promsuk</i>)	374
Construction of Punctured Polar Codes Based on Genetic Algorithm (<i>Krittiyaporn Mueadkhunthod, Lin Min Min Myint, Pornchai Supnithi, Watid Phakphisut</i>)	378
Parallel Session 3 Room 6 COM (III): Computers	
Designing of IoT-based Smart Waste Sorting System with Image-based Deep Learning Applications (<i>Chaiwat Sirawattananon, Nittaya Muangnak, Wannapa Pukdee</i>)	383
Applying Convolutional Neural Network Algorithm for Classify a Tomato Species (<i>Parinya Kittisut, Surachai Ongkittikul</i>)	388
Comparative Study Estimating and Detecting Chalkiness of Thai Hom Mali Brown Rice Grains Using Image Analysis and Four Segmentation Techniques (<i>Walailuck Wongruen</i>)	392
Steam Trap Opening Sound Recognition (<i>Punyanut Damnon, Phimphaka Taninpong, Jakramate Bootkrajang</i>)	400
Releasing ARP Data with Differential Privacy Guarantees For LAN Anomaly Detection (<i>Norrathep Rattanavipanon, Kuljaree Tantayakul, Donlapark Ponnoprat, Hideya Ochiai, Touchai Angchuan, Sinchai Kamolphiwong</i>)	404
An Automatic Networking Device Auditing Tool Based on CIS Benchmark (<i>Assadarat Khurat, Phirawat Sangkhachantharanan</i>)	409
Parallel Session 4 Room 1 PE (I): Power Electronics	
A Comparative Analysis of Transient Performance between PWM-based and Model-predictive-control-based Virtual Synchronous Generators (<i>Jonggrist Jongudomkarn</i>)	414
Five-level Cascaded Multilevel H-Bridge Inverter for Single-Phase PV Grid-Connected System (<i>Sakdawut Boontua, Prayad Kongsuk, Viji Kinnares</i>)	418
Phase-Sequence Adaption Method and Model Prediction Control of Active Power Filter (<i>Yundi Chu, Ming Yang, Liangchen Shi, Jienan Han</i>)	422
A Fault Current Boosting Technique for Grid Connected Inverters (<i>Preenapan Panya, Surapong Suwankawin</i>)	426



CONTENTS

Pulse-width modulation technique for a multi-input dc-dc boost converter (<i>Mohammad Afkar, Seyyed Amin Sadat Sakkak, Roghayeh Gavagsaz-Ghoachani, Matheepot Phattanasak, Serge Pierfederici, Panarit Sethakul</i>)	430
Parallel Session 4 Room 2 IT (IV): Information Technology	
Data Analytics for Forecasting CO ₂ Emission and Power Generation by Energy Type (<i>Tapanee Treeratanaporn, Sahassawat Posungnern, Dineenath Romphoyen</i>)	435
Thinkercise: An educational VR game for Python programming (<i>Thirada Theethum, Attawut Arpornrat, Sirion Vittayakorn</i>)	439
Portable Hybrid e-Learning Box for Agriculture to Support Farmer in Rural Areas: What2Grow Learning Box (<i>Kritsana Punyaporn, Pornchai Tummarattananont, Sila Chunwijitra, Phondanai Khanti</i>)	443
Designing an Interactive Online Learning Platform to Support a Practical Subject During COVID-19 Outbreak (<i>Peerumporn Jiranantanagorn, Konlayut Tippayakulpiroj, Panuwat Saikaew</i>)	447
Design and Simulation of Outbound Functions in Warehouse Operations with Queueing Theory (<i>Worawut Han-klup, Taweesak Samanchuen</i>)	451
Parallel Session 4 Room 3 PS (IV): Electrical Power Systems	
Prosumers in Local Energy Market Based on Non-cooperative Game Theory (<i>Phittawat Yotha, Kittisak Intaprom, Paramet Wirasanti</i>)	457
Voltage Dip Mitigation Technique by PV Converter Control with STATCOM functions - A Case Study of Phra Nakhon Si Ayutthaya, Thailand (<i>Worawat Uraisawat, Siriroj Sirisukprasert</i>)	461
A Waste Carbon Copy Paper Counter Electrode For Dye-Sensitized Solar Cell (<i>Sukrit Intharatholo, Sarawut Panmung, Pakpoom Chansri, Tanapon Tomrongkunanant</i>)	465
A Cooperation between OLTC and Local Controls of Photovoltaic Inverter for Enhancing the Hosting Capacity of Typical Distribution System in Thailand (<i>Pikkanate Angaphiwatchawal, Patipol Katasema, Surachai Chaitusaney</i>)	469
A Multi-k Double Auction Pricing Mechanism for Peer-to-Peer Energy Trading Market of Prosumers (<i>Pikkanate Angaphiwatchawal, Chuppawit Sompoh, Surachai Chaitusaney</i>)	473
Parallel Session 4 Room 4 SS5 (IV): Special Session on Antennas and Microwave Technologies for Modern Wireless Communications	
Development of Compact Size on UWB Slot Antenna using Stair-Step Impedance with Pentangular Stub for Supporting 5G Application (<i>Thanakarn Suangun, Norakamon Wongsin, Chatree Mahatthanajatuphat, Prayoot Akkaraekthalin, Danai Torrungrueng, Paitoon Rakluea</i>)	478
Study of the Limitation of Characteristic Modes Using the Far-Field Based Reconstruction Technique for Complex Antenna Structures (<i>Sanchai Eardprab, Chuwong Phongcharoenpanich, Danai Torrungrueng</i>)	482
A Compact Wideband Printed Slot Antenna with Gain Enhancement for GPR Applications (<i>Thanakorn Sutham, Wanwisa Thaiwirot, Prayoot Akkaraekthalin, Suramate Chalermwisutkul</i>)	487
Ultra-Wideband Slotted Patch Antenna for mm-Wave Wireless & Ku-band Satellite System (<i>Md. Moklesur Rahman, Heung-Gyoon Ryu, Md. Najmul Hossain</i>)	491
Spatial Correlation in Propagation Channel Prediction Model (<i>Indar Surahmat</i>)	495
Parallel Session 4 Room 5 CS (IV): Communication Systems	
Optimal Number of LED Lamps for Li-Fi Communications (<i>Paramed Rakbanglam, Peerapong Uthansakul, Monthippa Uthansakul</i>)	500
Double Power Allocations for User Fairness in P-NOMA System (<i>Tidaporn Fuasungnoen, Peerapong Uthansakul, Monthippa Uthansakul</i>)	504
Joint Design of Channel Output Quantizer and LUT-Based LDPC Decoder (<i>Chatuporn Duangthong, Pornchai Supnithi, Watid Phakphisut</i>)	508
Interleaved CRC Codes for Polar Codes with Partitioned List Decoding (<i>Anusorn Wongsas, Lin Min Min Myint, Pornchai Supnithi, Watid Phakphisut</i>)	512
Dual-SIM NB-IoT Modem Design for AMI Smart Meter (<i>Benish Khan, Chaiyod Pirak</i>)	516



CONTENTS

Parallel Session 4 Room 6 BIO (I): Biomedical Engineering

Study of Pulse Fidelity in Different Human Subjects for In-body Communications of Liver-implanted Medical Monitoring Applications (<i>Pongphan Leelatien</i>)	521
3D-Texture-Segmentation of Prostate Cancer from Multimodal MRI Data (<i>Kraisorn Chaisaowong, Markus Kitza</i>)	525
Enhancing Accelerometer-based Human Activity Recognition with Relative Barometric Pressure Signal (<i>Jantakarn Makma, Dusit Thanapatay, Tsuyoshi Isshiki, Jatuporn Chinrungrueng, Surapa Thiemjarus</i>) ..	529
A Conceptual Framework of Deploying a Trained CNN Model for Mobile Breast Self-Screening (<i>Roslidar, Masduki Khamdan Muchamad, Fitri Arnia, Maimun Syukri, Khairul Munadi</i>)	533
Breathing Sound Detection from The External Auditory Canal with Condenser Microphones (<i>Puripak Chunchakam, Panwit Tuwanuti, Wipa Sangpisit, Paramote Wardkien</i>)	538

Parallel Session 5 Room 1 PE (II): Power Electronics

Three-phase Inverter with Direct Torque Control for Brushless DC Motor (<i>Sirichai Dangeam</i>)	543
The Implementation of Fundamental Harmonic Approximation Technique on Electric Vehicle Wireless Charger (<i>Worapong Pairindra, Panya Khemmook, Surin Khomfoi</i>)	547
A Phase Lead-Lag Synchronous PLL for Grid Synchronization of a Single Phase Inverter (<i>Jetmarong Pongpaiboon, Thamvarit Singhvilai, Supun Tiptipakorn, Chutthaval Jeraputra</i>)	551
An Enabling Resynchronization Technique for Grid-Connected Voltage-Source Converters (<i>Nuttakit Kijshavavithaya, Surapong Suwankawin</i>)	555
A DC-DC modular structure converter for photovoltaic applications (<i>Mohammad Afkar, Roghayeh Gavagsaz-Ghoachani, Matheepot Phattanasak, Serge Pierfederici</i>)	559

Parallel Session 5 Room 2 IT (V): Information Technology

DNA assembly method for a non-model organism using a more distantly-related reference sequence (<i>Benchapol Benchaphattharaworakul, Nalina Phisanbut, Kornsorn Srikulnath, Punpiti Piamsa-nga</i>)	564
Closed Smart Vegetable Growing Cabinet System (<i>Kanchai Chaiwpiriyapun, Tidarat Raktong, Kriddikorn Kaewwongsri</i>)	568
Constraint-based Clustering Approach for Retrieving of Relevant Decided Civil Cases in Thai (<i>Jantima Polpinij, Khanista Namee</i>)	572
Classification of Pomelo Leaf Diseases Using Convolution Neural Network (<i>Sirirat Laosim, Taweesak Samanchuen</i>)	577
Student Behavior Report Management System on Somsri.IO (<i>Natchaporn Chaengmongkol, Somnuek Sinthupuan, Attawit Changkamanon, Snit sitti</i>)	581

Parallel Session 5 Room 3 PS (V): Electrical Power Systems

Optimal Setting in PV Inverters for Network Loss Minimization (<i>Suttichai Meetunkit, Sanchai Dechanupaprittha</i>)	586
A Practicable framework for risk assessment of distribution transformers using PEA smart meter data (<i>Rapeepat Chummuuan, Dulpichet Rerkpreedapong</i>)	590
Determination of Load Security Region Using SOCP Hierarchy (<i>Pongsakorn Sukheeboon, Sotdhipong Phichaisawat, Patchrapa Wongchai</i>)	595
Dynamic Frequency Support by Photovoltaic System with Virtual Inertia Control in Microgrid (<i>Nuttanan Chalittaporn, Pisitpol Chirapongsananurak</i>)	599
Dissolved Gas Analysis of 115 kV Steel Industry Transformer using new IEEE Standard (<i>Naris Chattranont, Poonsri Wannakarn, Sakhon Woothipatanapan, Nattachote Rugthaicharoencheep</i>)	603

Parallel Session 5 Room 4 SS17 (I): Special Session on Advanced Data Storage Technology for Sustainable Future

An Intertrack Interference (ITI) Subtraction Scheme for Bit-Patterned Media Recording (<i>Chaiwat Buajong, Chanon Warisarn, Santi Koonkarnkhai, Piya Kovintavewat</i>)	608
--	-----



CONTENTS

Associated Sectors of Magnetic Recording System via Spatially Coupled LDPC Codes (<i>Sirawit Khittiwitachayakul, Pornchai Supnithi, Watid Phakphisut</i>)	612
Symbol-Flipping Method for Block Decoding in Bit-Patterned Magnetic Recording (<i>Siwakon Sokjabok, Mutita Mattayakan, Chanon Warisarn, Santi Koonkarnkhai, Piya Kovintavewat</i>)	616
Codeword Design of a Rate-5/6 for Single-Reader Two-Track Reading in BPMR Systems (<i>Mutita Mattayakan, Siwakon Sokjabok, Chanon Warisarn</i>)	620
Parallel Session 5 Room 5 SS14 (I): Advances on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology and Applications	
SAGC Circuit Design and Implementation for FSK Modem through Radio Channel (<i>Apichat Sutam, Apiwat Magkeethum, Paramote Wardkein, Jeerasuda Koseeyaporn, Sukkharak Sae-chia</i>)	625
Comparison of ionospheric F2-layer peak height (hmF2) derived by ionosonde with IRI-2016 model at Chumphon, Thailand (<i>Sakkrapop Khuangsatung, Noraset Wichaipanich, Kornyanat Hozumi</i>)	629
Detecting Floating Plastic Marine Debris using Sentinel-2 Data via Modified Infrared NDVI (<i>Suphongsa Khetkeeree, Sompong Liangrocapart</i>)	633
Multi-Factor based Face Validation Attendance System with Contactless Design in Training Event (<i>Sasakorn Pichetjamroen, Ekkachan Rattalalerdnusorn, Chalee Vorakulpipat, Achara Pichetjamroen</i>) ...	637
Application of Elman and NCA to uncover most informative parameter for load forecasting (<i>Emre Akarslan, Fatih Onur Hocaoglu</i>)	641
Parallel Session 5 Room 6 BIO (II): Biomedical Engineering	
Effect of Applied Force on Baseline Drift in Two-Electrode ECG Measurement (<i>Arphorn Promking, Suchin Trirongjitmoah, Arporn Teeramongkorasmee</i>)	646
Biliary Tract Autofluorescence Cleaning for Liver Cryo-imaging Data (<i>Thanapong Chatboonward, Patiwet Wuttisarnwattana</i>)	650
Design and Implementation of CO ₂ Incubator to Study the Effect of Wi-Fi 6 Signals on Human cells (<i>Sugun Watanaaorsomboon, Sakdiphong Punpai, Wanlaya Tanechpongamb, Vuttiapon Tarateeraseth</i>) ...	654
Non-invasive monitoring of Diabetes through analysis of the exhaled breath by electronic nose (<i>Tanthip Eamsa-ard, Chutintorn Sriphrapradang, Natnaree Phukkaphan, Teerakiat Kerdcharoen</i>)	658
Phase Learning to Extract Phase from Forelimb(s) and Hindlimb(s) Movement in Real Time (<i>Dollaporn Anopas, Junquan Lin, Seng Kwee Wee, Peh Er Tow, Sing Yian Chew, Wei Tech Ang</i>)	662
Parallel Session 6 Room 1 PE (III): Power Electronics	
Analysis and Small-Signal Modeling of a Coupling Inductance Input Side High Conversion Ratio of a Single Switched Boost Converter (<i>W.Sangpattaramatee, A.Bilsalam</i>)	667
Power Factor Correction of a Single Phase AC/DC Boost Converter Using Fuzzy Logic Controller (<i>Hatta Sawachan, Koson Chaicharoenaudomrung, Jakkrit Pakdeeto</i>)	671
Implementation of the Single-Phase AC-AC Matrix Converter without DC Link (<i>Prasopchok Hothongkham, Kittphong Poomphachana, Jirasak Songboonkaew</i>)	675
Design of A Class-E Direct AC-AC Converter with Only One Capacitor and One Inductor for Domestic Induction Cooker (<i>Patipong Charoenwiangnuea, Santi Wangnipparnto, Satean Tunyasrirut</i>)	679
Topology of Three DC-DC Modular Converters Based on Three-level Converters for Fuel Cell Systems (<i>Mohammad Afkar, Seyyed Amin Sadat Sakkak, Roghayeh Gavagsaz-Ghoachani, Matheepot Phattanasak, Wiset Saksiri, Serge Pierfederici, Panarit Sethakul</i>)	683
Parallel Session 6 Room 2 DCS (I): Devices, Circuit and Systems	
Clock & Data Recovery for PAM-4 in a Short-Range FSK Wireless Radio Link (<i>Apinut Kaewmune, Phanumas Khumsat</i>)	688
27-MHz FSK Wireless System Resilient to In-band Interference for IoT Applications (<i>Thannatorn Boonrungruedee, Phanumas Khumsat</i>)	692



CONTENTS

High-order Chebyshev Notch Filter based on MO-OTA and its application in Biosensor (<i>Siradanai Srisamranrungrueang, Natapong Wongprommoon, Pipat Prommee</i>)	696
A Fast Settling Frequency-to-Voltage Converter with Separate Voltage Tracing Technique for FLLs (<i>Xin Ding, Jianhui Wu, Chao Chen</i>)	700
Electronically Controllable Precision Rectifiers Based on Voltage Differencing Gain Amplifier (<i>Jirawat Hirunporm, Wiset Saksiri, Montree Siripruchyanun</i>)	704
Parallel Session 6 Room 3 SP (I): Signal Processing	
Diffusion inverse Square-root Recursive Least Square-based Algorithm with Adaptive Network (<i>Suchada Sitjongsataporn, Sethakarn Prongnuch, Theerayod Wiangtong</i>)	709
Audio Information Hiding in Sub-signals by deploying Singular Spectrum Analysis and Psychoacoustic Model (<i>Phondanai Khanti, Ekachai Phaisangittisagul, Takahiro Shinozaki, Jessada Karnjana</i>)	713
Speech Gesture Generation from Acoustic and Textual Information using LSTMs (<i>Ausdang Thangthai, Kwanchiva Thangthai, Arnon Namsanit, Sumonmas Thatphithakkul, Sittipong Saychum</i>)	718
Vehicle Manufacturer Recognition (VMR) using SSD model (<i>Apichon Kitvimonrat, Sarin Watcharabutsarakham</i>)	724
Parallel Session 6 Room 4 CIM (I): Controls Instrumentation and Measurements	
Neural Networks for State-of-Charge Estimation of Li-ion Batteries (<i>Shixi Hou, Yuzhuang Qian, Zhouhe Zhang, Jienan Han</i>)	729
Assessment of the Indoor Air Quality and Energy Consumption of the AIIR Betong Hospital (<i>Thawin Matung, Thammanoon Sookchaiya, Prasit Nangtin</i>)	733
CFP RRT for an automatic robot in the narrow space and the trapped goal environment (<i>Menghorng Bun, Cherdak Kingkan, Waree Kongprawechnon, Hiroki Nakahara</i>)	737
Implementation of a IR Sensor as a Measurement Device for Smart Farming (<i>Kritsana Sureeya, Chalakorn Karupongsiri, Kanadit Chetpattananondh</i>)	742
2-DOF PID Controller of a Wind turbine and Synchronous Generator For Load Frequency Control Optimization by PSO (<i>Somporn Tiacharoen</i>)	746
Parallel Session 6 Room 5 SS14 (II): Advances on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology and Applications	
Critical Implications of Longterm IoT Applications in Thailand (<i>Worrajak Muangjai, Teerasak Somsak, Nattawat Panlawan, Thanakit Aroonchai, Pathumwadee Jeenthanom, Kant Nak-iam, Jutturit Thongpron, Montri Ngaodet, Kosol Oranpiroj, Phiched Thanin</i>)	751
Developing Animal Habitat Learning Aid for Visually-Impaired Primary School Students (<i>Upady Hathasin, Pratch Piyawongwisal</i>)	755
The Hydrophobicity Class of Porcelain Insulator Detection Based on Digital Image Processing : A Paper Review (<i>Poothtip Sonkaeo, Chanchai Techawatcharapaikul</i>)	759
Forecasting the Quantity and Concentration of Flocculant in Clarification Process for Sugarcane Industry (<i>Singhadid Chantaruk, Diew Koolpiruck, Prabhas Chongstitvatana</i>)	763
The Arbitrage System on Decentralized Exchanges (<i>Naratorn Boonpeam, Warodom Werapun, Tanakorn Karode</i>)	768
Parallel Session 6 Room 6 BIO (III): Biomedical Engineering	
Coronavirus infected lung CT scan image segmentation using Deep Learning (<i>Kanat Atsipong, Somprasonk Gabbualoy, Pattarapong Phasukkit</i>)	773
Weighted Ensemble for Plant Protein Subcellular Localization Using Particle Swarm Optimization (<i>Warin Wattanapornprom, Thanagorn Glomrit, Tinnaphop Prayongsup, Pitchayanin Suwanthanasarat, Supatcha Lertampaiporn</i>)	777
Facial-Machine Interface-based Virtual Reality Wheelchair Control using EEG Artifacts of Emotiv Neuroheadset (<i>Theerat Saichoo, Poonpong Boonbrahm, Yunyong Punsawad</i>)	781



CONTENTS

Masked Face Recognition Using Principal component analysis and Deep learning (<i>Susanta Malakar, Werapon Chiracharit, Kosin Chamongthai, Theekapun Charoenpong</i>)	785
Electrochemical Portable Mini-Potentiostat for Graphene-Carbon Paste Electrochemical Sensor (<i>Kessarat Ugsornrat, Assawapong Sappat, Chakrit Sriprachuabwong, Adisorn Tuantranont</i>)	789
Parallel Session 7 Room 1 PE (IV): Power Electronics	
Magnetic Field Distribution Using FEM for Permanent Magnet Generators with Various Magnet Configurations (<i>Peerawat Meesuk, Vijit Kinnares</i>)	798
Cascaded H-bridge Multilevel Inverter for Induction Motor Drive with Improved Grid Current Quality (<i>Prayad Kongsuk, Sakdawut Boontua, Vijit Kinnares, Jongrak Boonseng</i>)	802
Study of Three-phase Self-excited Induction Generator and Operating as Single-phase Induction Generator Supplying Non-linear Load (<i>Panurak Nakorn, Parinya Machot, Vijit Kinnares, Chalermchat Manop</i>)	806
Application of D-STATCOM for Voltage Sag Mitigation and Power Oscillation Damping (<i>Yeun Leukhampeng, Panumat Sanpoung, Kittaya Somsai</i>)	810
Investigation of the operating point effect on commandable zones of a two-modular DC-DC converter based on a three-level boost converter (<i>Mohammad Afkar, Seyyed Amin Sadat Sakkak, Roghayeh Gavagsaz-Ghoachani, Matheepot Phattanasak, Wiset Saksiri, Serge Pierfederici, Panarit Sethakul</i>)	816
Parallel Session 7 Room 2 DCS (II): Devices, Circuit and Systems	
Single-Phase, Single-Loop PLL-Based BPSK, QPSK, 8-PSK Demodulators (<i>Chutpipat Chaichomnan, Phanumas Khumsat, Apisak Worapishet</i>)	821
A Wide Linearity Range of LVDT Using Approximate Function (<i>Krit Angkeaw, Surachai Chunchay, Preecha Thongdit</i>)	825
A 20-MHz 0.323-mW 23.9-dBm-IIP3 4 th -order Current-Reuse Lowpass Filter (<i>Surachoke Thanapitak, Tatcha Chulajata, Pongsatorn Sedtheetorn, Khaled Hayatleh, Wanlop Surakampontorn</i>)	829
A Square Wave and Sinusoidal Quadrature Oscillator Based-on LT1228 (<i>Karan Angkun, Rapeepan Kaew-on, Phamorn Silapan</i>)	833
A Current-mode Phase-shifted Multicarrier PWM based on Commercially Available IC (<i>Pawich Choykhuntod, Rapeepan Kaew-on, Phamorn Silapan</i>)	837
Parallel Session 7 Room 3 SP (II): Signal Processing	
Improving automatic transcription of call center speech using data simulation (<i>Vataya Chunwijitra, Nattapong Kurpukdee</i>)	842
Multimodal Signals Subject Authentication System (<i>Turky N. Alotaiby, Saleh A. Alshebeili, Gaseb Alotaibi</i>)	846
Proportionate Adaptive Sub-Filters for Nonlinear Acoustic Echo Cancellation (<i>Srikanth Burra, Asutosh Kar</i>)	849
Automated Media Segmentation in Intravascular Ultrasound Images using Geometric Principal Component Analysis (<i>Janya Onpans, Watcharaphong Yookwan, Supawadee Srikamdee</i>)	853
Parallel Session 7 Room 4 CIM (II): Controls Instrumentation and Measurements	
Optimal PID Controller Design for Antenna Azimuth Position Control System by Lévy-Flight Intensified Current Search Algorithm (<i>Wattanawong Romsai, Auttarat Nawikavatan, Kittisak Lurang, Deacha Puangdownreong</i>)	858
Improving Support Vector Classification Efficiency with Principal Component Analysis (<i>Auapong Yaicharoen, Kuo Yamada</i>)	862
PI Controller Design for ZETA Converter (<i>Surattikarn Suwannaprom</i>)	866
A Single-phase Smart Meter With Autocalibration and Load Control Conformed to OpenADR Protocol (<i>Noppameth Pawitpanich, Wanchalerm Pora, Napong Panitantum</i>)	870
State Space Model for Speed Control BLDC Motor Tuning by Combination of PI - Artificial Neural Network Controller (<i>Sompod Wongkhead</i>)	874



CONTENTS

Parallel Session 7 Room 5 SS14 (III): Advances on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology and Applications

Fall Detection Using Half Circle Ultrasonic Array Sensors for Indoor Environment (<i>Chokemongkol Nadee, Patcharanun Yingkayun, Krisda Yingkayun</i>)	879
OCD Behavior Observation using RSSI-based ZigBee in Indoor Environment (<i>Khajitpan M. Kritpolviman, Nipont Changjai</i>)	883
ALUMINUM CAN COLOR SORTER OF PROGRAMMABLE LOGIC CONTROL (<i>Kittisak Thongda, Aekachai Puesuntia, Yuktithath Chawanonphithak</i>)	887
The Maximum Power Point Tracking Device using Arduino ATmega2560 Processing and Data Expressing on LCD 3.5-inch Display (<i>Aphaiphak Prathumthip</i>)	891

Parallel Session 7 Room 6 SS2 (I): Special Session on Data Science and Artificial Intelligence

Multi-additional Sampling Multi-objective Efficient Global Optimization applied to UAVs Airfoil Design Problem (<i>Tharathep Phiboon, Athaphon Ariyarat, Masahiro Kanazaki, Yuki Kishi, Sujin Bureerat, Wannida Sae-Tang</i>)	896
Automatic Rice Plant Disease Evaluation Method Based on Anomaly Detection and Deep Learning (<i>Teepakorn Tosawadi, Teerasit Kasetkasem, Wanlaya Laungnarutai, Teera Phatrapornnant, Itsuo Kumazawa</i>)	900
Design of Deep Learning Architecture for Classification of Orchid Diseases (<i>Patnaree Srichocksittikul, Nitikarn Nimsuk</i>)	904
Prediction of Secondary Students Performance: A Case Study (<i>Nor Hanisah Razak, Aida Mustapha, Aziz Nanthaamornphong, Mohd Helmy Abd Wahab, Salama A Mostafa</i>)	908
DNA Sequencing Analysis Framework for ABO Genotyping and ABO Discrepancy Resolution (<i>Ratsameetip Wita, Samerkae Somhom, Jakarin Chawachat, Areerat Thongratsameethong, Nampeung Anukul, Chonticha Sirikul</i>)	913

Parallel Session 8 Room 1 PE (V): Power Electronics

High Frequency Interleave Techinque Based on High Step-up Push-Pull Resonant Converter Modules (<i>S. Kantavara, P. Kummanee, H.Sawachan, A. Bilsalam</i>)	918
Simulation Model of Electric Buses Charging Using Wireless Energy Transfer with a Push-Pull Converter (<i>Tawatchai Jitson, Siriruch Cheapanich</i>)	922
Design and Implementation of GaN based DC-AC Converter for Wireless Power Transfer Applications (<i>Anwar Jarndal, Ali A. A. Ismail, Azizulrahman Shafiqurrahman, Majd A. Saloumi, Saleh A. Abdullah, Ahmed E. Younes, Yahya N. Mansoor</i>)	926
A Prototype of Block UU Shape Ferrite Cores Inductive Wireless Power Transfer for EV Charger (<i>Teerasak Somsak, Anon Namin, Wuttikai Tammawam, Jutturit Thongpron, Wiwat Tippachon, Kosol Oranpiroj</i>)	930
Constant Current - voltage with Maximum Efficiency Inductive Wireless EV Charging Control using Dual - sides DC Converters (<i>Teerasak Somsak, Anon Namin, Thanet Sriprom, Jutturit Thongpron, Uthen Kamnarn, Nopporn Patcharaprakiti</i>)	936

Parallel Session 8 Room 2 SS9 (I): Special Session on Electrical and Electronic Materials, Devices and Applications

Synthesis of Dextran-coated Magnetite Nanoparticles for Cancer Drug Delivery (<i>Patcharaporn Tadsanaphum, Nophawan Paradee</i>)	943
Fabrication of Transdermal Patch from Freeze-dried Agarose Hydrogel for Electrically Controlled Release (<i>Kittithat Thanakorhimpol, Nophawan Paradee</i>)	947
The Electrical Properties of Lanthanide Doped Potassium Sodium Lithium Niobate Based Silicate Glass (<i>Ploypailin Yongsiri, Suchinda Sattayaporn, Wipada Senanon, Kamonpan Pengpat</i>)	951
Influence of processing parameters on the hydrogen storage properties of dip coated lithium alantate thin films (<i>Choosak Choawarot, Vilailuck Siritwongrungron, Janjira Hongrapipat, Shusheng Pang, Michael Messner</i>)	955
Autonomous Security Robot Base on SLAM (<i>Chanin Joochim</i>)	959



CONTENTS

Parallel Session 8 Room 3 SS11 (I): Special Session on Electrical, Electronic and Smart Community Innovations

Trade Distance and Price Model for Electric Vehicle Charging using Blockchain-based Technology (<i>Kantamon sukkrajang, Rakkrit Duangsoithong, Kusumal Chalermynnont</i>)	964
Induction Heating Application using Frequency Control Techniques for Hot Tensile Testing (<i>Nathabhat Phankong, Jirapong Jittakort, Panithan Chakkuchan, Suwat Kitcharoenwat, Vichian Hathairatsiri, Chainarong Wisassakwichai, Saichol Chudjuarjeen</i>)	968
Electric Grill Using Energy From Battery (<i>Nathabhat Phankong, Jirapong Jittakort, Panithan Chakkuchan, Putthiphong Kirdpipat, Winai Methavithit, Ekkapol Anusurain</i>)	972
Photovoltaic Cell Energy Transfer System Using Series Connected Bidirectional Resonant Converters (<i>Nathabhat Phankong, Panithan Chakkuchan, Jirapong Jittakort, Nopparat Paivimut, Choosak Kamonkhantithon, Saichol Chudjuarjeen</i>)	976

Parallel Session 8 Room 4 SS8 (I): Special Session on Microcontroller, Control with the Development of Intelligent Technology in which Agriculture Applications

Inspection System and 3-Phase Electric Energy Value Measurement by the Internet of Things for Industrial Education (<i>Phadungrat Prongphimai, Sayan Chaiwas, Kanokwan Ruangsiri</i>)	981
A Development of Intelligent Farm System for Low Carbon Agricultural Management (<i>Isaree Srikun, Chulalak Changul, Kanittha Oumaree</i>)	985
Development of Internet of Things Technology for Control System Mulberry Smart Farm: A case study at Surin Province (<i>Pischanunt Sonthitham, Arkira Sonthitham, Chatchai Khuantham</i>)	989
Development of Sprayer Vehicle using Unmanned System Technology by Remotely Operated Control for Organic Rice Field (<i>Chatchai Khuantham, Arkira Sonthitham</i>)	993
.....	
A Simulation of Mobile Transportation Robot for Agricultural Products Handling to Warehouse (<i>Arkira Sonthitham, Chatchai Khuantham, Chaiyapon Thongchaisuratkrul</i>)	997

Parallel Session 8 Room 5 SS3 (I): Special Session on Automation Control System and Smart Technology Applications

Automated Storage and Retrieval System using FIFO Method via PLC-Integrated Human Machine Interface (<i>Waraporn Luejai</i>)	1002
Development of a Wireless Stop Light Synchronization System for Single-lane Traffic Control (<i>Adisorn Sirikham</i>)	1006
Faults Detection Simulator of Generator using Internet of Things Technology (<i>Niyawadee Srisuwan, Warunee Srisongkram</i>)	1010
Height Estimation Clamp by using Vision System (<i>Napassadol Singhata</i>)	1014
Experimental Machine Learning for RSSI fingerprint in Indoor WiFi Localization (<i>Pongwut Koovimol, Suwat Pattaramalai</i>)	1018

Parallel Session 8 Room 6 SS2 (II): Special Session on Data Science and Artificial Intelligence

Plant Leaf Disease Classification using Local-Based Image Augmentation and Convolutional Neural Network (<i>Jirasak Wongbongkotpaisan, Sopon Phumeechanya</i>)	1023
.....	
Recurrent Neural Network based Underground Object Detection using A-scan Ground Penetrating Radar (<i>Poomsak Choochim, Panut Kasjarun, Pattarapong Phasukkit</i>)	1028
Prediction of Football Matches Results: Decision Forest against Neural Networks (<i>Azrel Aiman Azeman, Aida Mustapha, Nazim Razali, Aziz Nanthaamornphong, Mohd Helmy Abd Wahab</i>)	1032
A Hyperparameter Tuning Approach for an Online Log Parser (<i>Tinnakorn Marlaithong, Vasco Chibante Barroso, Phond Phunchongharn</i>)	1036
Machine Learning Approach with Multiple Open-source Data for Mapping and Prediction of Poverty in Myanmar (<i>Nyan Lin Htet, Watee Kongprawechnon, Suttipong Thajchayapong, Tsuyoshi Isshiki</i>)	1041



CONTENTS

Parallel Session 9 Room 1 PE (VI): Power Electronics

- The Simulation Study of an Offline Robust Model Predictive Control for a DC-DC Buck Converter (*Parakon Chokchuaiphathanakit, Chuttchaval Jeraputra, Pornchai Bumrungsri*) 1047
- Digital Sliding Mode Current Control with Fixed-Frequency PWM of Bidirectional DC/DC Converter for Residential DC Microgrid (*Pokkrong Vongkoon, Pisit Liutanakul, Chayut Bunternngchit, Alongkorn Pirayawaraporn*) 1051
- An Accurate Time-Domain Waveforms of Class-E ZVDS Inverter in Series- and Parallel-Load Network for Domestic Induction Cooker (*Patipong Charoenwiangnuea, Piyapat Pounsri, Kittipong Sriamad, Ruthapong Khumchaiyo, Sakda Prommeuan, Prasit Nangtin*) 1055
- Design of a Low-cost and Simple Solar Emulator for Laboratory Studies (*Ekkawid Hayakwong, Athipat Matarach*) 1059
- Cascade control with flatness-based charge MPPT control applied to photovoltaic boost converters (*Mohammad Afkar, Roghayeh Gavagsaz-Ghoachani, Matheepot Phattanasak, Serge Pierfederici*) 1063

Parallel Session 9 Room 2 SS9 (II): Special Session on Electrical and Electronic Materials, Devices and Applications

- A Study of Voltage Stability Improvement for EEC High-Speed Electrified Railway System using SVC (*Tossaporn Charoengan, Krischonme Bhunkittipich*) 1068
- Electromagnetic Force Improvement of the Double-PM Modular Linear Doubly Salient Machine by PM sizing (*Warat Sriwannarat, Pirat Khunkitti, Apirat Siritaratiwat, Natakorn Thasnas, Napaporn Phuangsornpitak*) 1072
- Peer-to-Peer Energy Trading Market: A Review on Current Trends, Challenges and Opportunities for Thailand (*Arwut Takkabuttra, Charnon Chupong, Boonyang Plangklang*) 1076
- Material Identification Using Feature Extraction (Range of IQ) in Wireless System (Lime SDR Mini) (*Amulya Bhattarai, Ushik Shrestha Khwakhali, Sneha Paudel, Sakchhi Paudel, Domingos Da Costa*) ... 1080
- Vision-based Drones Tracking Using Correlation Filters and Linear Integrated Multiple Model (*Niven Junliang Sie, Shao Xuan Seah, Jalvin Jiaxiang Chan, Jiahe Yi, Kim Hoe Chew, Teng Hooi Chan, Sutthiphong Srigrarom, Florian Holzapfel, Henrik Hesse*) 1085

Parallel Session 9 Room 3 SS18 (I): ECTI-SICE Special Session on Advances in Control Engineering and Applications

- Stability-certified Deep Reinforcement Learning Strategy for UAV and Lagrangian Floating Platform (*M.S.M.Muslim, Z.H.Ismail*) 1092
- Model Predictive Control of Microgrid Energy Management System with Optimal Power Flow Constraints Using Second Order Cone Programming (*Jirapong Boonpeng, Jitpanu Maneeratpongsuk, David Banjerdpongchai*) 1096
- The application of compressing speaker frequency control for cancelling the air-vortex turbulence from trucks causing unbalance to motorcycle (*Wachirawit Rangdang, Chanchai Techawatcharapaikul*) 1100
- Trial Production of a Small Snake Type Robot that can be Mounted on a Disaster Rescue Robot (*Takaaki Hagiwara, Yuuki Katou*) 1104
- A design method of the control system using double feedback control with low sensitivity and robust stability by independent design of the controllers (*Daisuke Koyama, Kotaro Hashikura, Md Abudus samal Kamal, Kou Yamada*) 1108

Parallel Session 9 Room 4 SS21 (I): Special Session on AI-based Medical Devices and Emerging Medical Applications

- Development of Flicker Visual Stimulus by Mixing Fundamental and Its Harmonic Frequencies for SSVEP-based Brain-Computer Interface (*Nannaphat Siribunyaphat, Yunyong Punsawat, Yodchanan Wongsawat*) 1113
- An Investigation on Alpha-Beta Ratio of EarEEG System (*Boonyanuch Wijarn, Yodchanan Wongsawat*) 1117



CONTENTS

Portable Facial Stimulator Design and Standardization: IEC 60601-1-2 (<i>Songyos Piluek, Sansit Ngamrassameewong, Tirapoot Jatupornpoonsub, Lattika Tiawongsuwan, Dilok Puanhvuan, Thunyanoot Prasertsakul, Ratanapat Chanubol, Wuttipong Tirakotai, Yodchanan Wongsawat</i>)	1121
Rehabilitation Robotic System with Forelimb-Hindlimb Phase synchronization in Rats with Spinal Cord Injury (<i>Dollaporn Anopas, Junquan Lin, Seng Kwee Wee, Peh Er Tow, Sing Yian Chew, Wei Tech Ang</i>)..	1125
Cloud-based Gait Analysis Using a Single IMU for Parkinson Disease (<i>Jetsada Amin, Peeraya Ruthiraphong</i>)	1129
Parallel Session 9 Room 5 SS3 (II): Special Session on Automation Control System and Smart Technology Applications	
The Development of an Automatic Control System for Electrical Appliances with Object Detection Technology (<i>Seree Khunchai, Apichat Somsanga, Rachata Tama, Chaiyapon Thongchaisuratkrul</i>)	1134
Multi-color Pop Art Product by Silk Screen Printing for the Textile Industry (<i>Kritsada Tasuntia, Preecha Somwang, Den Kogphimai, Kasem Promarin, Ekbodee Muangklang, Kanya Kosum</i>)	1138
Development of Wireless Soil Moisture Measurement and Recording Devices (<i>Warunee Srisongkram, Pisit Vimonthanasit, Somsak Wannachai, Jakkarin Thinnakorn, Artit Yawootti</i>)	1142
Automated Resource Management System based on Kubernetes Technology (<i>Jirayus Sithiyopasakul, Tuanjai Archevapanich, Boonchana Purahong, Paisan Sithiyopasakul, Chawalit Benjangkaprasert</i>)	1146
Athletes Movement Tracking device for Soccer players (<i>Tuanjai Archevapanich, Jirayus Sithiyopasakul, Jiran Sithiyopasakul, Paisan Sithiyopasakul, Thanavit Anuwongpinit, Boonchana Purahong</i>)	1150
Parallel Session 9 Room 6 SS2 (III): Special Session on Data Science and Artificial Intelligence	
Combining Technical Indicators and Deep Learning by using LSTM Stock Price Predictor (<i>Pattareeya Piravechsakul, Teerasit Kasetkasem, Sanparith Marukatat, Itsuo Kumazawa</i>)	1155
LegalBERT-th: Development of Legal Q&A Dataset and Automatic Question Tagging (<i>Kannika Wiratchawa, Tanutcha Khunthong, Thanapong Intharah</i>)	1159
Sensitivity Analysis of Random Forest Hyperparameters (<i>Thitiya Trithipkaiwanpon, Unchalisa Taetragool</i>)	1163
Token Allocation for Course Bidding With Machine Learning Method (<i>Chonbadee Juthamane, Krerk Piromsopa, Prabhas Chongstitvatana</i>)	1168
Application of Machine Learning in Assignment of Child Delivery Service in Afghanistan (<i>Nasratullah Nasrat, Kittichai Lavangnananda</i>)	1172
Author Index	