

PROCEEDINGS OF SPIE

Eighth International Symposium on Advances in Electrical, Electronics, and Computer Engineering (ISAEECE 2023)

**Shubin Yan
Pavel Loskot**
Editors

**17–19 February 2023
Hangzhou, China**

Sponsored by
Zhejiang University of Water Resources and Electric Power (China)
AEIC Academic Exchange Information Centre (China)

Organized by
North China University of Technology (China)

Published by
SPIE

Volume 12704

Proceedings of SPIE 0277-786X, V. 12704

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

Eighth International Symposium on Advances in Electrical, Electronics, and Computer Engineering
(ISAEECE 2023), edited by Shubin Yan, Pavel Loskot, Proc. of SPIE Vol. 12704,
1270401 · © 2023 SPIE · 0277-786X · doi: 10.1117/12.2688086

Proc. of SPIE Vol. 12704 1270401-1

The papers in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIDigitalLibrary.org.

The papers reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from these proceedings:

Author(s), "Title of Paper," in *Eighth International Symposium on Advances in Electrical, Electronics, and Computer Engineering (ISAEECE 2023)*, edited by Shubin Yan, Pavel Loskot, Proc. of SPIE 12704, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X
ISSN: 1996-756X (electronic)

ISBN: 9781510666290
ISBN: 9781510666306 (electronic)

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2023 Society of Photo-Optical Instrumentation Engineers (SPIE).

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIE. DIGITAL LIBRARY

SPIDigitalLibrary.org

Paper Numbering: A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE at the time of publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc. The CID Number appears on each page of the manuscript.

Contents

xi *Conference Committee*

INTEGRATED ELECTRICAL AND MICROELECTROMECHANICAL DESIGN

- 12704 02 **Short-term electric power prediction in a certain area based on least squares support vector machine** [12704-71]
- 12704 03 **Test method for keyboard and LED driver based on ATE** [12704-96]
- 12704 04 **Power grid equipment operation status monitoring system based on Internet of Things technology** [12704-92]
- 12704 05 **Adaptive filter based position and speed estimation for high-speed PMSM control** [12704-172]
- 12704 06 **Numerical simulation of the magnetic field in a magnetohydrodynamics momentum ring** [12704-158]
- 12704 07 **Mechanism of non-linearity and self-oscillation for H-bridge converters** [12704-155]
- 12704 08 **Finite-time adaptive output feedback control for photovoltaic power generation servo systems with output constrains** [12704-163]
- 12704 09 **Research and design of a C-band miniaturized, low-power, high-isolation T/R component** [12704-23]
- 12704 0A **A state synchronization method of mimic architecture device** [12704-36]
- 12704 0B **Research on design cost integration based on modular 3D view of distribution network** [12704-65]
- 12704 0C **Design and research on the combination of on-line and off-line stress experiment of gravity dam** [12704-41]
- 12704 0D **Analysis and research of phase-shift push-pull forward ZVS converter** [12704-130]
- 12704 0E **Solution method of three-phase voltage errors in the transformer based on the genetic algorithm** [12704-95]
- 12704 0F **Measurement and modeling methods for broadband impedance characteristics of large-scale electrical equipment** [12704-128]
- 12704 0G **Study on synoptic diagnosis of large-scale wind power abnormal state events under the influence of cold wave** [12704-25]

- 12704 OH **Analysis of the digital transfer framework of power grid engineering based on the integration of QR code and blockchain** [12704-169]
- 12704 OI **Optimization of docker container live migration solution** [12704-63]
- 12704 OJ **Research on anonymous auxiliary road condition detection scheme based on crowdsourcing** [12704-47]
- 12704 OK **Knowledge tracking model based on recurrent neural network and transformer** [12704-5]
- 12704 OL **Architecture design of a distributed workflow platform based on microservice architecture** [12704-58]
- 12704 OM **Data processing based on circular variable filter type of spectroradiometer** [12704-11]
- 12704 ON **Development method of a new broadband high precision voltage divider and comparative analysis of measurement accuracy** [12704-173]
- 12704 OO **Research on the influence of inverter power supply on the vibration and noise source of the linear induction motor in the medium-low speed Maglev train** [12704-70]
- 12704 OP **Design and implementation of RISC-V-based vector operation unit for embedded processor** [12704-18]
- 12704 OQ **A method of customizing GasP with logical effort** [12704-93]
- 12704 OR **An optical fiber sensor for determination of 2-chlorophenol based on iron (III) tetrasulfophthalocyanine catalysis** [12704-136]

ELECTRICAL ENGINEERING AND SMART GRID APPLICATION

- 12704 OS **Research on convergence of heterogeneous networking for smart operation and monitoring of high-voltage transmission lines** [12704-33]
- 12704 OT **Distribution network state estimation based on maximum likelihood under mixed measurement** [12704-20]
- 12704 OU **Analysis of the impact of inverter distributed generation on 10kV power grid relay protection** [12704-80]
- 12704 OV **The study on beam pointing accuracy of array antennas considering interval deviations** [12704-56]
- 12704 OW **BIM construction model design of multi-in-phase parallel cable layout sequence for high voltage cables** [12704-175]
- 12704 OX **Fault diagnosis of intelligent electric meter based on SCGWO-DF** [12704-109]

- 12704 0Y **Research on magnetic encoder based on temperature compensation** [12704-179]
- 12704 0Z **Electroencephalography artifact removal based on an autoencoder deep network** [12704-100]
- 12704 10 **Short-term power load forecasting based on IWOA-GRU** [12704-54]
- 12704 11 **Value analysis of power customers based on combined weight-TOPSIS** [12704-66]
- 12704 12 **Portable package detection imaging method based on planar ECT technology** [12704-121]
- 12704 13 **The core technique and application of knowledge graph in power grid company administrative duty** [12704-119]
- 12704 14 **Sensitivity analysis of underwater control system based on IA-PSO** [12704-107]
- 12704 15 **Research on multi-form flexible resource aggregation model of virtual power plant based on cloud model** [12704-62]
- 12704 16 **Methods for monitoring electricity market operations under multiple timescale transactions** [12704-3]
- 12704 17 **Construction of robot ontologies knowledge base in intelligent space** [12704-167]
- 12704 18 **Comparative study on grid structure of low voltage AC/DC hybrid microgrid based on flexible reliability index** [12704-138]
- 12704 19 **Investigation of influence of distributed PV on operation performance of distribution network based on Monte Carlo simulation** [12704-74]
- 12704 1A **Research on multidimensional risk assessment system of renewable energy distribution network based on value at risk** [12704-78]
- 12704 1B **Construction of a feature vector-based prediction model for locating line losses in power grids** [12704-94]
- 12704 1C **Application of artificial intelligence technology in real-time electricity price forecasting: window-based XGBoost** [12704-150]
- 12704 1D **A novel medium- and long-term load forecasting method based on sensitivity analysis of multi meteorological indicators** [12704-4]
- 12704 1E **Study on the stability of power market regulation under the multi-user coupling demand response** [12704-57]
- 12704 1F **Simulation analysis of photovoltaic grid-connected inverter system based on two-stage structure** [12704-50]
- 12704 1G **Research and design of microgrid system structure based on multi-energy complementary power generation in rural areas** [12704-99]

12704 1H **An optimal configuration method of new generation and high-capacity synchronous condenser for enhancing the power grid voltage support [12704-129]**

DIGITAL CIRCUIT SIMULATION AND POWER PROCESSING

12704 1I **Cooperative optimization of power system based on demand response [12704-32]**

12704 1J **Optimal configuration of electricity/heat/gas shared energy storage based on the probability prediction method [12704-177]**

12704 1K **Differential protection method for EHV transmission line based on current traveling wave prediction [12704-157]**

12704 1L **Study on site selection for pumped-storage power plants, wind farms, and photovoltaic power plants [12704-137]**

12704 1M **CFSORT: improved SORT based on coarse to fine mechanism for object tracking [12704-171]**

12704 1N **Fast black box attack of face recognition system based on metaheuristic simulated annealing [12704-79]**

12704 1O **Limitations of wind speed correction in representative years of wind farms [12704-89]**

12704 1P **A modeling technique for generalized power quality data [12704-68]**

12704 1Q **Design and implementation of UAS interoperability based on different protocols [12704-122]**

12704 1R **An improved power-frequency admittance model of multi-machine parallel system with VSG as the main power supply [12704-2]**

12704 1S **Research progress of laser spot center detection technology [12704-153]**

12704 1T **Multiple people continuous tracking and identification using millimeter-wave radar [12704-145]**

12704 1U **Design of non-delayed full link high precision internal calibration scheme for radar system [12704-108]**

12704 1V **On the development of the hybrid energy storage system that enhance the frequency stability of Southern Xinjiang power system [12704-21]**

12704 1W **Multi-market, multi-entity two-tier trading optimization study for integrated energy systems [12704-87]**

12704 1X **Node importance measurement based on the improved K-shell in complex network [12704-113]**

12704 1Y **Application of digital communication technology based on DSP and FPGA in active power filter [12704-140]**

- 12704 1Z **Two-layer optimization model of joint peak shaving of energy storage and thermal power units** [12704-114]
- 12704 20 **Research on enterprise comprehensive load modeling based on large motor group** [12704-10]
- 12704 21 **Proposal of human digital twins system on behaviour recognition** [12704-49]
- 12704 22 **Load margin and stability analysis of power-gas interconnection system considering N-1 and power flow transfer prediction** [12704-13]
- 12704 23 **Synthesizing reversible functions via bounded model checking** [12704-142]
- 12704 24 **Joint estimation of SOC for lithium batteries based on DAREKF** [12704-9]
- 12704 25 **Coherence evolution of three-state quantum walk on lattice** [12704-116]
- 12704 26 **Research and application of attitude optimal estimation for quadrotor UAV** [12704-73]

COMPUTER SYSTEM AND IMAGE INFORMATION PROCESSING

- 12704 27 **Research on the design of DUT board for the V93000 test system** [12704-34]
- 12704 28 **Image retrieval based on multimodality neural network and local sensitive hash** [12704-46]
- 12704 29 **A scene understanding network based on driving scene** [12704-117]
- 12704 2A **Research on intelligent electronic manhole cover system based on edge computing** [12704-14]
- 12704 2B **Looseness extent recognition of hydraulic pipeline clamps based on multi-scale feature fusion CNN model** [12704-134]
- 12704 2C **Design of key data monitoring software for underwater target** [12704-126]
- 12704 2D **Exploration of frame animation technology based on WinCE platform** [12704-64]
- 12704 2E **Research on security protection framework of power communication network based on software defined network** [12704-118]
- 12704 2F **Unpaired strong-light image augmentation network with illumination curve** [12704-26]
- 12704 2G **Design and implementation of embedded university laboratory security system** [12704-120]
- 12704 2H **A multi-scale representation method for map curves based on BLG tree structure** [12704-151]

- 12704 2I **Research on bridge health monitoring system based on cloud-edge-end architecture**
[12704-102]
- 12704 2J **Wireless MESH network routing protocol based on link state information** [12704-52]
- 12704 2K **Design and implementation of Jiangxi earthquake monitoring management platform**
[12704-17]
- 12704 2L **Quantitative analysis of chemical pollution such as ammonia nitrogen in the Chaohu Lake
basin** [12704-6]
- 12704 2M **Design and implementation of dormitory security system based on CC2530** [12704-61]
- 12704 2N **Fault location of flexible DC system based on BP neural network** [12704-35]
- 12704 2O **RGB image and monochromatic image of hyperspectral image for identification of apple fungi
infection** [12704-69]
- 12704 2P **Research on the development direction of new power system under carbon peak and carbon
neutral targets** [12704-178]
- 12704 2Q **Design of load ground station system supporting intelligent charge management** [12704-168]
- 12704 2R **A cost deviation warning of system based on historical data** [12704-90]
- 12704 2S **Design of multi-MCU system based on single flash boot strategy** [12704-91]
- 12704 2T **A fast deduplication scheme for stored data in distributed storage systems** [12704-143]
- 12704 2U **Research on image recognition of power control system based on BHS-CTPN and AA-CRNN**
[12704-97]
- 12704 2V **Trajectory prediction combined with FairMOT for multi-object tracking** [12704-29]
- 12704 2W **Flexible job-shop rescheduling based multi-agent system considering TOU electricity price**
[12704-110]
- 12704 2X **Crash clustering technique based on core behavior extraction of program crash states**
[12704-43]
- 12704 2Y **The strategic idea of building a new power system in three steps** [12704-115]

ADVANCED ALGORITHM AND POWER DATA DETECTION

- 12704 2Z **Unsupervised anomaly detection method based on deep learning and support vector data
description** [12704-85]

- 12704 30 **Selection method of key stability features of power grid based on improved ant colony algorithm** [12704-146]
- 12704 31 **Short-term power load forecasting based on GRU neural network optimized by an improved sparrow search algorithm** [12704-16]
- 12704 32 **Substation outdoor instrumentation detection algorithm based on improved YOLOv5** [12704-106]
- 12704 33 **Impact of different data processing methods on model diagnostic performance** [12704-37]
- 12704 34 **Research on complex network link prediction algorithm based on node influence and resource path** [12704-51]
- 12704 35 **Multi-AGV scheduling in automated container terminal based on improved whale optimization algorithm** [12704-12]
- 12704 36 **Garbage classification algorithm based on improved EfficientNetV2 network** [12704-44]
- 12704 37 **A semi-supervised learning for teacher-student model based on structural reparameterization** [12704-165]
- 12704 38 **Neural network method for inversion of hard point height of medium and low speed maglev track** [12704-180]
- 12704 39 **Intelligent monitoring small target detection algorithm based on improved faster R-CNN** [12704-125]
- 12704 3A **Sparse subspace clustering algorithm with non-convex constraints** [12704-27]
- 12704 3B **Multi-channel dictionary learning speech enhancement based on power spectrum** [12704-131]
- 12704 3C **Research on the algorithm of 3D pose solving based on binocular vision** [12704-152]
- 12704 3D **Optimized modular inversion algorithm over prime fields and hardware implementation** [12704-72]
- 12704 3E **Research on the calibration algorithm of magnetic resonance probe performance testing system** [12704-98]
- 12704 3F **Design of image mosaic algorithm for substation** [12704-159]
- 12704 3G **An improved feature point-based LK optical flow algorithm for robotic arm control** [12704-15]
- 12704 3H **Chaotic adaptive particle swarm algorithm based on tent mapping for multi-objective optimization of combined cooling, heating, and power source-store-load systems** [12704-135]
- 12704 3I **Design of fast and sparse accelerator for deep learning model based on FPGA** [12704-141]

- 12704 3J **Distribution network fault recovery strategy based on IBPSO-SA algorithm** [12704-24]
- 12704 3K **Graph factorization machine based recommendation algorithm with graph construction and attention mechanism** [12704-139]
- 12704 3L **A novel orthogonal constraint-based subspace learning method for electronic nose drift compensation** [12704-53]
- 12704 3M **Short-term load forecasting model of GRU based on improved sparrow search algorithm optimization** [12704-86]
- 12704 3N **Deep reinforcement learning-based path planning for net sealing robot** [12704-75]
- 12704 3O **Optimization of static data race detection algorithm based on out-of-order parallel SystemC simulation with array element granularity** [12704-7]
- 12704 3P **Research on click fraud prediction based on multi-algorithm fusion** [12704-45]

Conference Committee

General Conference Chair

Tao Zhang, North China University of Technology (China)

Conference Chairs

Shubin Yan, Zhejiang University of Water Resources and Electric Power (China)

Pavel Loskot, Zhejiang University-University of Illinois at Urbana-Champaign Institute (China)

Technical Program Chair

Fushuan Wen, Zhejiang University (China)

Publication Chairs

David Llulluy-Nuñez, Civil Association University of Sciences and Humanities (Peru)

Pavel Loskot, Zhejiang University-University of Illinois at Urbana-Champaign Institute (China)

Program Committee Chairs

Marina Yusoff, Universiti Teknologi MARA (Malaysia)

Nor Shuhadah Wan Nik, Universiti Sultan Zainal Abidin (Malaysia)

Rajwali Khan, University of Lakki Marwat (Pakistan)

International Technical Program Committees

Tao Wang, Sun Yat-Sen University (China)

Michal Feckan, Comenius University in Bratislava (Slovakia)

Surej Rajan C, Toc H Institute of Science and Technology (India)

Julia Qing Zheng, California Baptist University (United States)

Babu George, Fort Hays State University (United States)

Mohamed Said Mahmoud, China National Pulp and Paper Research Institute (China)

Qudrat Ullah Khan, Institute of Precision Medicine, Fudan University (China)

Rahul Vishwanath Dandage, Rajendra Mane College of Engineering & Technology (India)

Hamid R. Ghaeini, CISPA - Helmholtz Center for Information Security
(Germany)

Nada M. Al Hakkak, Baghdad College for Economic Science
University (Iraq)

Zahriladha Bin Zakaria, Universiti Teknikal Malaysia Melaka (Malaysia)