## 2022 International Conference on **Applied Physics and Computing** (ICAPC 2022)

Ottawa, Ontario, Canada **8-10 September 2022** 



**IEEE Catalog Number: CFP22DC1-POD ISBN**:

978-1-6654-6304-1

### Copyright © 2022 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:
 CFP22DC1-POD

 ISBN (Print-On-Demand):
 978-1-6654-6304-1

 ISBN (Online):
 978-1-6654-6303-4

#### **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



# 2022 International Conference on Applied Physics and Computing (ICAPC) ICAPC 2022

#### **Table of Contents**

Committeesxvii
2022 International Conference on Applied Physics and Computing
Simultaneous Realization of Terahertz Metasurfaces with Polarization Filtering and Wavefront Shaping via Phase Change Materials
Study on Electronic Structure and Optical Properties of Bulk and Monolayer Ag2Te
Safety Management System of Electric Vehicle Power Battery
Prediction of 3D Cluster Energy Based on CatBoost Regression Model and Genetic Algorithm 15  Zixuan Li (Wuhan University of Technology, China), Zexuan Li (Wuhan  University of Technology, China), Jiuqiang Zhang (Wuhan University of  Technology, China), and Jiazhuang Yao (Wuhan University of Technology,  China)
Experimental Study on the Steady-State Characteristics of Hydrogen Fuel Cell Engines
Characteristics Analysis and Development Trend Overview of Solar Cells
Research on Mine Wind Intelligent Measurement Method Based on Data Fitting and Numerical Simulation

Numerical Simulation and Intelligent Computing of Negative Pressure on Step Surface of Stepped Spillway dam
(Southwest Forestry University, China)
Research on Phosphorus Measurement Method in Water Based on Computer Recognition  Technology
Analysis of Structural Characteristics and Development Trend of Solar Cells
The Computer Numerical Simulation for the Coagulation Behavior of Uranium Aerosol
Computer Aided Design of Water Injection Well Intelligent Cleaning Device and Fluid Mechanics Calculation
Improvements on pH Sensitivity of ISFETs Based on Multiphysics Coupling
Survival Analysis Techniques for Censored Data
The Effects of Chemical Potential on the Transient Heat-Transfer and Power Generation of Thermoelectric Generator
Research and Big Data Analysis on the Risk Factors of Banks Based on the AHP-EWM Model 79  Yingyu Peng (Shenzhen University, China), Wentao Wang (Wuhan  University, China), and Qiuya Zhao (Shenzhen University, China)
Big Data Analysis and Calculation of the Contribution of Probit-RBF-Based Digital Financial Inclusion and Effectiveness Research
Study on Water Resources Allocation Based on Double Dam Coupling Model and Analytic Hierarchy Process

Physical Design of Local-Volume Ignition for Inertial Confinement Fusion  Pan Liu (Tianfu Innovation Energy Establishment, China), Zhangchun  Tang (University of Electronic Science and Technology of China,  China), Qiang Gao (Nuclear and Radiation Safety Center, MEE, China),  and Wenbin Xiong (Nuclear and Radiation Safety Center, MEE, China)	94
Research on the Application of Algorithms Based on the Greedy Algorithm and Optimal Model 10 Diancong Wu (Fuzhou University, China), Jian Lang (Fuzhou University, China) China), and Guoqiang Liu (Fuzhou University, China)	00
Basic Principles of Wireless Power Transfer and Comparisons Between Electromagnetic Induction and Microwave Wireless Charging	04
Research on On-Line Testing Mechanism of Strain Monitoring Sensor During Bridge Structure Load Test	07
of Transport, China)  Stability Calculation and Buckling Finite Element Analysis of Non-Metallic Shells	14
Intelligent Failure Analysis of High Temperature Energy Conversion Devices 12  Yang Liu (Shanghai Institute of Space Power-Source, China), Chunyu Wu (Shanghai Institute of Space Power-Source, China), Yang Li (Shanghai Institute of Space Power-Source, China), Shuaifei Yang (Shanghai Institute of Space Power-Source, China), Yaqin Zhou (Shanghai Institute of Space Power-Source, China), Jiawei Zhao (Shanghai Institute of Space Power-Source, China), and Shichao Liu (Shanghai Institute of Space Power-Source, China)	20
Dynamic Analysis and Information Digitization of Spectral Elements of String and Beam Structures	23

Information System Establishment and the Practice of Periodic Safety Reviews of Nuclear  Power Plants	127
Wenbin Xiong (Nuclear and Radiation Safety Center, MEE, China), Qiang Gao (Nuclear and Radiation Safety Center, MEE, China), Chunhua Qiu (State Nuclear Security Technology Center, CAEA, China), Zhongxun Li (Nuclear and Radiation Safety Center, MEE, China), Ci Chen (Nuclear and Radiation Safety Center, MEE, China), Lin Wang (Nuclear and Radiation Safety Center, MEE, China), and Xiuping Yan (Nuclear and Radiation Safety Center, MEE, China)	
Research on Environmental Adaptability of High Temperature Transducer	.33
New Leakage Dynamics Model Based on Thermal-Hydraulic-Mechanical Coupling Theory	.37
Design and Performance Assessment of Combined Heat and Power Unit Incorporating Parabolic Trough Solar Energy	149
A Novel Multiple Sources Heating System with Thermodynamic Analysis Based on a Biomass-Fired Cogeneration System	153

An Advanced Compressed Air Energy Storage System Integrated with a Coal Power Unit
Radius Estimation of Teegarden's b Based on Analysis of Data from the CARMENES
Modelling and Structure Optimization Analysis of Warship Damage Control Command Information System
Research on Real-Time Monitoring and Tracking Method of Ship Trajectory
Virtual Modeling and Parameters Optimization of Six Bar Press Based on ADAMS  Shuhua Zhou (Zhejiang Economic Vocational and Technical College, China), Xiaoping Ye (Lishui University, China; Zhejiang Province Key Laboratory of Aerospace Metal Tube Forming Technology and Equipment, China; Key Laboratory of Digital Design and Intelligent Manufacturing for Creative Cultural Products of Zhejiang, China), Zhangping You (Lishui University, China; Zhejiang Province Key Laboratory of Aerospace Metal Tube Forming Technology and Equipment, China; Key Laboratory of Digital Design and Intelligent Manufacturing for Creative Cultural Products of Zhejiang, China), Jing Ma (Nanjing Xiaozhuang University, China), Wenhui Zhang (Nanjing Xiaozhuang University, China; Zhejiang Province Key Laboratory of Aerospace Metal Tube Forming Technology and Equipment, China; Key Laboratory of Digital Design and Intelligent Manufacturing for Creative Cultural Products of Zhejiang, China), and Yangfan Ye (Zhejiang Engineering Geophysical Survey and Design Institute Co., Ltd, China)
Design of Real-Time 3D Visualization System Based on Image Fusion Technology

Transmutation Neutronics Properties Research Based on Accelerator-Driven Subcritical Experimental Facility VENUS-1  Wenbin Xiong (Nuclear and Radiation Safety Center, MEE, China), Qiang Gao (Nuclear and Radiation Safety Center, MEE, China), Huiying Yu (State Power Investment Corporation Limited, China), Xiaohua Fu (Yanlong Technology Co.Ltd, CNNC, China), and Jian Cao (Nuclear and Radiation Safety Center, MEE, China)	187
Modal Calculation Applied in the Study of Vehicle Cab Through Fluid-Structure Coupling  Model	194
Haiqiang Long (Chongqing City Management College, China)	
Gate Stack Structure Applied to Field-Effect Transistor	198
The Research of MOSFETs Based on Different Gate Stack Technology and Structure	. 205
A Comparative Analyze of FinFET and Bulk MOSFET SRAM Design	. 211
Research on the Application of Computer Digital Retrieval Technology in the Construction of Library and Information Database	219
Research on Photothermal Switching Technology of Tropical Photovoltaics  Yongzhuo Cheng (Datang Hainan Energy Development Co., Ltd., China),  Lingpei Gongye (Datang Sanya Future Energy Research Institute Co.,  Ltd., China), Yanpeng Liu (New Energy Branch of Datang Hainan Energy  Development Co. Ltd., China), Hongfen Tang (China Datang Corporation  Science and Technology General Research Institute, China), Yinghua  Dong (China Electric Power Research Institute, China), and Shuangqing  Zhang (China Electric Power Research Institute, China)	224
A Study on the Method of Microcontroller key Control	. 228
Management Database for SQL-Based Digital Older Communities Systems  Xiaoyu Guo (Jinan University, China), Haoran Liu (Beijing University of Technology, China), and Xiao Xiao (Beijing Jiaotong University, China)	232
Design and Implementation of Supermarket Management System Based on Database	. 238
Study on Intelligent Environmental Monitoring System of Agricultural Greenhouse Through Internet of Things	244

Development of high Stress and Large Capacity Conductor for Large Crossing Transmission	
Lines  Zhen Liu (China Electric Power Research Institute, China), Jian Zhang (China Electric Power Research Institute, China), Jiao Zhu (Construction Branch of State Grid Jiangsu Electric Power Co., Ltd., China), Dongyang Lin (Construction Branch of State Grid Jiangsu Electric Power Co., Ltd., China), Shengchun Liu (China Electric Power Research Institute, China), and Cheng Yao (China Energy Engineering Group Jiangsu Power Design Institute Co., Ltd., China)	248
Fault Causes Analyses and Solution of Fixed Fittings of Slider Type Tube Busbar	252
Numerical Investigation of the Thermal Performance of Lattice Structure	257
The Advance of Adversarial Attack and Defense	262
Restoration of Earthquake Disaster in Urban & Surroundings Areas by using Remote Sensing Images	266
Volcano Identification and Volcanic Activity Monitoring by Remote Sensing	271
A Platform of Containers Based on High Availability Kubernetes Cluster	278
Research Advanced in the Image Segmentation	282
Research on Intelligent Networked new Energy Vehicles Based on Mining Algorithm and Big Data Analysis	290
An Interregional Computer Input-Output Model Based on MRIO and Big Data Analysis	295
Application of Internet of Things Technology in Building Energy Consumption Intelligent  Monitoring and Prediction System	301

A Convenient Efficiency Calibration Method for Volume Radioactive Sources of HPGe Gamma Detectors	306
Detectors	500
Simulation of the Spatial Weighting Function of ex-Core Detector in Advanced Sodium-Cooled Fast Reactor	310
Reducing Electromagnetic Interference in Printed Circuit Board	314
Future Development of Redundant Array of Independent Disks	320
Design of Foreign Matter Intelligent Detection System for Dialysis Barrel Blow Molding Conveying Line	324
A Bandgap-Optimization-Induced Sensitivity Enhancement Effect in a Novel Ionization Gas Sensor with Composite Nanostructure  Xin Chen (Shanghai Jiao Tong University, China) and Haoyu Zhang (Shanghai University, China)	328
Research on Space Radiation Effect of New Mass Storage	332
Probe Design of Reflective Fiber Optic Hydrogen Sensor  Zexuan Li (Wuhan University of Technology, China), Shiran Tang (Wuhan  University of Technology, China), Qinxu Guo (Wuhan University of  Technology, China), and Han Song (Wuhan University of Technology,  China)	337

Research on Failure Treatment of Anchor Cable Anti Slide Pile Based on 3D Modeling and	
	341
Yi Huang (Chengdu Engineering Corporation Limited, China; Sichuan	
Urban Underground Space Survey Design and Construction Technology	
Engineering Laboratory, China), Liang Li (Chengdu Engineering	
Corporation Limited, China), Yuyan Ma (Chengdu Engineering Corporation	
Limited, China; Sichuan Urban Underground Space Survey Design and	
Construction Technology Engineering Laboratory, China), Lijuan Cheng (Chengdu Engineering Corporation Limited, China; Sichuan Urban	
Underground Space Survey Design and Construction Technology	
Engineering Laboratory, China), and Ru Yan (Chengdu Engineering	
Corporation Limited, China; Sichuan Urban Underground Space Survey	
Design and Construction Technology Engineering Laboratory, China)	
Research on Seismic Time History Analysis of Underground Structures Based on Computer Architecture of 2D Model Based on Complex Artificial Intelligence Damping Machine Method Xugang Chen (Chengdu Engineering Corporation Limited, Power China, China), Yi Huang (Chengdu Engineering Corporation Limited, Power China, China; Sichuan Urban Underground Space Survey Design and Construction Technology Engineering Laboratory, China), Lijuan Cheng (Chengdu Engineering Corporation Limited, Power China, China; Sichuan Urban Underground Space Survey Design and Construction Technology Engineering Laboratory, China), Yuyan Ma (Chengdu Engineering Corporation Limited, Power China, China; Sichuan Urban Underground Space Survey Design and Construction Technology Engineering Laboratory, China), and Ru Yan (Chengdu Engineering Corporation Limited, Power China, China; Sichuan Urban Underground Space Survey Design and Construction Technology Engineering Laboratory, China)	345
Analysis and Research on Safety Performance Parameters of Tunnel Blasting Based on 3-D Model Calculation and Computer Intelligent Modified Time History Method	349
Generation 3D Irregular Aggregates with Revised Random Algorithm using Discrete Element	353
Method	ددر
Zewen Tan (Guangxi Xinfazhang Communication Group Co., Ltd., China),	
and Jiangsheng Qin (Guangxi Xinfazhang Communication Group Co., Ltd., China)	
Analysis and Research on Backscattering Effect of Underwater Imaging	356
Yang Shi (Tianjin University of Technology, China)	200

Research on the Application of Computer Electronic Information Transmission Control Technology	360
Siyu Gong (Tianjin University of Technology, China)	
Support Vector Classification for Automatic Watering Machine	364
Symmetric Cryptographic Algorithm Based on Permutation  Yihua Ma (Shandong Vocational College of Science and Technology,  China) and Youliang Cao (Shandong Vocational College of Science and  Technology, China)	369
Simulation Analysis of Packaging Box for Free Fall Airdrop  Yuancheng Pan (PLA Army Academy of Artillery and Air Defense, China)  and Kaiping Yu (PLA Army Academy of Artillery and Air Defense, China)	374
Research on Optimal Strategy of Cyclists Based on Curve Fitting and Hamiltonian Function  Can Yin (University of South China, China), Huijie Bai (University of South China, China), Shijie Fang (University of South China, China), and Shengji Zhang (University of South China, China)	379
Power Profile Model Based on Logistic Model  Ruocheng Shao (Jilin University, China), Yuhang Wang (Jilin  University, China), and Jiating Gao (Jilin University, China)	383
State Sprint Model: An Optimized Output Power Relation with Course Position	388
Lubricating Oil Viscosity of Squeeze Film Damper-Analysis of Dynamic Characteristics of Rotor System Wind-Mill Impact	396
Research and Analysis of Grey Prediction Intelligent Identification Control Model Based on Greenhouse Irrigation	404
Dynamic Performance Simulation Analysis of Fuel Cell Vehicle Based on ADVISOR	410
Research on the Parameters Design of the Power System of the Extended-Range City Bus  Gang Tong (Shenyang Aerospace University, China) and Senmiao Wu (Shenyang Aerospace University, China)	415

Research on the Application of Internet of Things and Artificial Intelligence Technology	410
in Smart Classroom  Xiaoming Hu (Wuhan Railway Vocational College of Technology, China),  Jintao Su (Wuhan Railway Vocational College of Technology, China),  Yujie Dai (Wuhan Railway Vocational College of Technology, China),  Jinlei Xiong (Wuhan Railway Vocational College of Technology, China),  Xiaoling Yu (Wuhan Railway Vocational College of Technology, China),  and Mengen Zhang (Wuhan Railway Vocational College of Technology,  China)	418
Design of University Management System for Student and Faculty	. 426
Drilling Process Optimization and Borehole Geospatial Database Design Based on Big Data  Tianfeng Shi (The Second Prospecting Team of Shandong Coal Geology Bureau, China), Li Jiao (The Second Prospecting Team of Shandong Coal Geology Bureau, China), and Yexuan Song (The Second Prospecting Team of Shandong Coal Geology Bureau, China)	431
Taking-out Food Information Management System  Xiang Wang (Donghua University, China) and Weike Zhang (Beijing Normal  University - Hong Kong Baptist University United International  College, China)	439
Research Advanced in the Object Detection Based on Deep Learning	445
A Novel Method of Power Cable Fault Detection with Fiber Current Sensor Based on GMM and FBG	452
Fast Charging Technology for Electric Vehicles	. 457

Study on Computer Intelligent Parameter Convergence Method for Portal Section of Shallow
Tunnel Under Eccentric Pressure Based on 3-D Modeling
Yang Shen (Chengdu Engineering Corporation Limited, China), Yi Huang
(Chengdu Engineering Corporation Limited, China; Sichuan Urban
Underground Space Survey Design and Construction Technology
Engineering Laboratory, China), Lijuan Cheng (Chengdu Engineering
Corporation Limited, China; Sichuan Urban Underground Space Survey
Design and Construction Technology Engineering Laboratory, China),
Gang Sun (Chengdu Engineering Corporation Limited, China), and Ru Yan
(Chengdu Engineering Corporation Limited, China; Sichuan Urban
Underground Space Survey Design and Construction Technology
Engineering Laboratory, China)
Numerical Study on Type Comparison of Submarine Cable Landing Floating Airbag
Radar Scattering Cross Section Calculated Verification of Standard Model Based on
FASTEM-STUDIO 471
Tingting Dai (Marine Department of Satellite Tracing and Metering,
China), Yan Su (Marine Department of Satellite Tracing and Metering,
China), Nanping Mao (Marine Department of Satellite Tracing and
Metering, China), Xiaodong Sun (Marine Department of Satellite Tracing and Metering, China), Xudong Zhang (Marine Department of Satellite
Tracing and Metering, China), Guoqing Liu (Marine Department of
Satellite Tracing and Metering, China), and Yong Liu (Marine
Department of Satellite Tracing and Metering, China)
Department of Sutetime Trucing and Metering, China)
Author Index 475