

PROCEEDINGS OF SPIE

International Conference on Smart Transportation and City Engineering 2021

Zhengliang Li
Fengjie Cen
Editors

26 – 28 October 2021
Chongqing, China

Organized by
China Merchants Chongqing Communications Technology Research & Design Institute Co., Ltd.
Chongqing University (China)
Chongqing Jiaotong University (China)

Sponsored by
AEIC Academic Exchange Information Centre (China)

Published by
SPIE

Volume 12050
Part One of Two Parts

Proceedings of SPIE 0277-786X, V. 12050

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

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 *International Conference on Smart Transportation and City Engineering 2021*, edited by Zhengliang Li, Fengjie Cen, Proc. of SPIE 12050, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510649750

ISBN: 9781510649767 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2021 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

INTELLIGENT SIGNAL AND INFORMATION COMMUNICATION TECHNOLOGY

- 12050 02 **A conceptual framework of underground pipeline relocation management through building information modeling and geographic information system integration [12050-62]**
- 12050 03 **Investigation of lane-changing decision-making models for autonomous vehicles [12050-87]**
- 12050 04 **Robust vehicle classification using sound signals and attention module [12050-14]**
- 12050 05 **Optimization of emergency material distribution path for public emergencies [12050-70]**
- 12050 06 **Optimization of drone and truck emergency delivery using artificial bee colony-Clarke-Wright algorithm [12050-100]**
- 12050 07 **Analysis on research hotspots and trends of cooperative vehicle infrastructure system based on mapping knowledge domains [12050-133]**
- 12050 08 **Research on drainage capacity of road plastic blind trench based on numerical simulation [12050-40]**
- 12050 09 **Automatic information retrieval with semantic analysis for green building evaluation [12050-24]**
- 12050 0A **Research on influencing factors of follow-up distance in curves based on driving simulator [12050-89]**
- 12050 0B **Automatic roadway stack calibration based on geographic information system secondary development technique [12050-69]**
- 12050 0C **Building information modelling implementation in prefabricated building research field and barriers analysis [12050-16]**
- 12050 0D **The life convenience analysis for Shenzhen urban area based on POI data [12050-66]**
- 12050 0E **Civil engineering process file information management system [12050-61]**
- 12050 0F **Study on the influence of fire parameters on vehicle driving performance [12050-157]**
- 12050 0G **Study on optimal evaluation of route design scheme in mountain highway reconstruction and expansion [12050-58]**
- 12050 0H **Research on vehicle speed estimation method based on microphone array [12050-57]**

- 12050 0I **Finite element analysis of the construction of the Tower of Pisa** [12050-163]
- 12050 0J **Civil engineering professional certification management information system** [12050-51]
- 12050 0K **Multi-detector layout method of transit signal priority control comprehensively considering the priority strategies and speed fluctuations** [12050-31]
- 12050 0L **Research on screening methods of autonomous driving dangerous test cases based on Carmaker** [12050-73]
- 12050 0M **A report of defective automobile recalls in China from 2004 to 2020** [12050-241]
- 12050 0N **Evaluation methods of automatic driving behavior based on the actual road test** [12050-127]
- 12050 0O **Research on three-dimensional visualization modeling of roadbed slope structure, presentation of vector information and development of display module** [12050-119]
- 12050 0P **The internet of things integrated management system of civil engineering laboratory** [12050-59]
- 12050 0Q **Research on construction of three-dimensional visual model of roadbed slope and its lightweight display** [12050-88]
- 12050 0R **Data cleaning system and method based on IC card data characteristics** [12050-169]
- 12050 0S **Deflection prediction analysis of corrugated steel web composite box-girder bridge based on MEC-BP neural network** [12050-1]
- 12050 0T **Optimal path decision algorithm based on data fusion** [12050-65]
- 12050 0U **Study on stability calculation of overloaded abandoned dredge site based on particle flow theory** [12050-118]
- 12050 0V **Numerical analysis of vibration isolation trench under dynamic compaction** [12050-128]
- 12050 0W **Research on current status of autonomous emergency braking vulnerable road users test and evaluation in new car assessment programme** [12050-120]
- 12050 0X **Research on deceleration lane length for B-type trumpet interchange** [12050-152]
- 12050 0Y **Dynamic management system of large-scale water conservancy project construction based on ArcGIS** [12050-234]
- 12050 0Z **Research on risk prediction methods of informationized water conservancy projects** [12050-146]
- 12050 10 **Operation management architecture of power communication backbone transmission network based on big data** [12050-186]
- 12050 11 **Dynamic scheduling strategy of shared vehicles based on time series** [12050-167]

- 12050 12 **Experimental study on the dust suppression effect of water cannon mud in drilling and blasting tunnel** [12050-176]
- 12050 13 **A study on the development of the Busan coastal line office environment with vertical landscapes** [12050-209]
- 12050 14 **Comparison and selection of feeder transit between flex-route transit and fixed-route transit** [12050-182]
- 12050 15 **Research on the concept and application of highway cost control and management in the whole process** [12050-231]
- 12050 16 **Application of building information modeling in the project management life cycle** [12050-185]
- 12050 17 **Development and depth application of building information modeling 5D technology in construction industry** [12050-162]
- 12050 18 **Research on development of a handy building information model application tool for decoration project** [12050-188]

SMART TRANSPORTATION AND TRANSPORTATION LOGISTICS PLANNING

- 12050 19 **Research on coordination and optimization of rail transit and feeder bus operation in suburban section** [12050-129]
- 12050 1A **Research on highway accident prediction based on interactive highway safety design model** [12050-39]
- 12050 1B **Study of expressways with heavy traffic flow during occupying-road construction** [12050-125]
- 12050 1C **Speed limit model of expressway in rain and fog** [12050-64]
- 12050 1D **Smart planning for waterway transportation of imported iron ore in the Yangtze River Delta** [12050-135]
- 12050 1E **The integrated design of integrated transport hub: taking Xizhimen as example** [12050-10]
- 12050 1F **Analysis of influencing factors of mountain secondary highway accidents based on logistic regression model** [12050-45]
- 12050 1G **Comprehensive transportation planning research under the background of a strong transportation country: taking Ziyuan County as an example** [12050-107]
- 12050 1H **Multi-criteria and multi-class traffic user equilibrium model under uncertainties** [12050-197]
- 12050 1I **Reliability calculation of connectivity considering travel cost** [12050-99]
- 12050 1J **Reinforcement learning in intelligent transportation systems: recent developments** [12050-34]

- 12050 1K **Shenzhen Expressway Intelligent Management and Maintenance System and its application** [12050-20]
- 12050 1L **Vehicle-to-vehicle blind spot monitoring system test method** [12050-90]
- 12050 1M **Resident travel path planning based on risk assessment of epidemic-related areas** [12050-27]
- 12050 1N **Traffic safety evaluation based on unascertained measure model** [12050-28]
- 12050 1O **Research on the basis of the setting of the dedicated left-turn lane at the two-phase intersection** [12050-78]
- 12050 1P **Application of interpolation method in data processing of dangerous cargo transportation in the Yangtze River** [12050-55]
- 12050 1Q **The analysis about the setting methods of a smart traffic marking** [12050-9]
- 12050 1R **Construction of seismic disaster scenario for road traffic network in mountainous city** [12050-5]
- 12050 1S **Research on the optimization of urban logistics terminal distribution route based on mileage-saving algorithm** [12050-4]
- 12050 1T **Seepage analysis of highway subgrade in Guizhou mountainous area based on numerical simulation** [12050-35]
- 12050 1U **Research on layout optimization in sea-rail transportation** [12050-46]
- 12050 1V **Analysis of the influencing factors of traffic accidents based on the logistics method** [12050-50]
- 12050 1W **Performance evaluation of bus transfer nodes based on Advanced Public Transportation System data** [12050-93]
- 12050 1X **Reliability analysis of dynamic travel time of public transport based on Advanced Public Transportation System data** [12050-95]
- 12050 1Y **Study on the strategic planning of combination port in China** [12050-23]
- 12050 1Z **Study on traffic organization design of expressways with heavy traffic flow during occupying-road construction** [12050-74]
- 12050 20 **Research on improvement of urban rail transit energy consumption model** [12050-97]
- 12050 21 **Traffic congestion recognition based on information entropy** [12050-86]
- 12050 22 **Research on new material scale model technology of rail transit vehicles based on similarity theory** [12050-243]
- 12050 23 **Optimization method for urban intersection and empirical research from the perspective of safety** [12050-108]

- 12050 24 **Facilities design of small clusters of pedestrians release at section crosswalk** [12050-84]
- 12050 25 **Research on the construction of highway traffic measurement standardization system** [12050-3]
- 12050 26 **Research on the interchange hub system of combined public transport** [12050-103]
- 12050 27 **Research on the spatial pattern of traffic accessibility and economic connection in Guanzhong urban agglomeration** [12050-156]
- 12050 28 **Research on the status quo of risk control in land and island transportation in China** [12050-81]
- 12050 29 **Research on application of automatic driving main-routes logistics in China** [12050-92]
- 12050 2A **A noise-immune extreme learning machine for short-term traffic flow forecasting** [12050-134]
- 12050 2B **Information security risk assessment methods for the transportation industry** [12050-112]
- 12050 2C **Research on autonomous emergency braking two-wheeler test and evaluation method combined with traffic accident characteristics** [12050-122]
- 12050 2D **Research on the setting method of the left-turn lane of the bus** [12050-104]
- 12050 2E **Research on path design and collision avoidance strategy of automated guided vehicle transportation system** [12050-192]
- 12050 2F **Overview of highway ecological route selection** [12050-170]
- 12050 2G **Prediction method of urban traffic carbon emission reduction rate based on grey relational analysis** [12050-225]

SMART GRID AND ENERGY-SAVING SAFETY SYSTEMS

- 12050 2H **City electricity forecast based on the GM (1,1) model of metabolism** [12050-13]
- 12050 2I **Study on the application of intelligent security technology in ports** [12050-85]
- 12050 2J **Research on location selection of electric vehicle charging station based on improved immune algorithm** [12050-37]
- 12050 2K **Cyber security risk analysis and evaluation for intelligent vehicle gateway** [12050-8]
- 12050 2L **Simulation analysis and optimization of thermal management for a certain type of locomotive battery charger** [12050-94]

- 12050 2M **Electrical conductivity of graphite modified asphalt mixture** [12050-91]
- 12050 2N **Safety assessment of anti-overturning of single pier of bridge** [12050-126]
- 12050 2O **Research on comprehensive evaluation method of green ecological road based on extension cloud model** [12050-67]
- 12050 2P **Research on urban carbon balance based on system dynamics: a case study of Tianjin city** [12050-144]
- 12050 2Q **Overall architecture design for smart water network construction** [12050-183]
- 12050 2R **Research and practice on index system of county multi-layer water utilization control** [12050-236]
- 12050 2S **Application of the high-density resistivity method to detect the hidden trouble in the mine sewage dam** [12050-177]
- 12050 2T **Comparative study on energy consumption of AAC green prefabricated dwellings based on BIM technology** [12050-159]
- 12050 2U **Efficiency improvement of intelligent water resources and hydraulic transient detection** [12050-238]
- 12050 2V **Collision-proof safety rating model of wave beam guardrail based on entropy weight technique for order preference by similarity to an ideal solution** [12050-18]
- 12050 2W **Analysis of water resources supply and demand structure in Beijing–Tianjin–Hebei region from the perspective of water footprint** [12050-179]
- 12050 2X **Key technology research on water networking based intelligent water construction** [12050-239]
- 12050 2Y **The performance of distributed rooftop photovoltaic power generation system: a case of Anhui Province, China** [12050-200]
- 12050 2Z **Research on operation and maintenance platform of high voltage transmission line slope** [12050-145]
- 12050 30 **Health monitoring method of transmission tower based on association rule algorithm** [12050-187]
- 12050 31 **Experimental case analysis of solar air collector and heating system in rural areas of North China** [12050-147]

Part Two

- 12050 32 **Technical and economic analysis of high water collecting tower and conventional natural tower** [12050-196]

- 12050 33 **Research on new energy cooperation based on system dynamics model** [12050-216]
- 12050 34 **Evaluation of distribution network dispatching management level based on the construction demand of smart city distribution network** [12050-150]
- 12050 35 **A study on water quality prediction by a hybrid dual channel CNN-LSTM model with attention mechanism** [12050-149]
- 12050 36 **Study on energy-saving thermal environment of residential envelope reconstruction based on ECOTECT** [12050-158]
- 12050 37 **Research on building energy consumption modeling and spatial analysis method in China** [12050-227]
- 12050 38 **Prediction of subjective charging behavior of electric vehicles based on improved deep residual network** [12050-21]
- 12050 39 **Characteristics of sandbody and sedimentary facies of Yan 8 reservoir of Yan'an formation in X Area** [12050-232]
- 12050 3A **Analysis on the multi-year change of water quality and pollution causes in Luoyuan Bay** [12050-218]
- 12050 3B **Research and accounting of VOCs emissions from key industrial sources in a city** [12050-211]

SMART CITY AND SMART CONSTRUCTION INSPECTION

- 12050 3C **Study on the effect of reinforcing method of inclined jet grouting pile to control the uneven settlement of soft soil subgrade** [12050-244]
- 12050 3D **Consideration of parking allocation in urban commercial center based on the carrying capacity of road network** [12050-102]
- 12050 3E **Effect of chord compression on the ultimate strength of ring-stiffened tube-gusset KT-type and X-type joints** [12050-98]
- 12050 3F **Quality index and measurement method of public space in existing residential district** [12050-175]
- 12050 3G **Research on the support system of strengthening and rebuilding project in a university** [12050-114]
- 12050 3H **Response analysis of different brace forms erected in the foundation pit excavation of metro station to deformation values** [12050-121]
- 12050 3I **Numerical study of the effects of artificial island on water environment: a case study of Ocean Flower Island in Hainan, China** [12050-56]
- 12050 3J **Research on the application of intelligent building technology based on DMBP in Western China** [12050-2]

- 12050 3K **Design of combined pipe support with large span steel structure** [12050-115]
- 12050 3L **Analysis of influencing factors of construction characteristics for calcium carbide residue stabilized soil** [12050-111]
- 12050 3M **Correlation between intelligent compaction index and compaction degree of asphalt pavement** [12050-72]
- 12050 3N **Analysis of urban residential spaced design under the guidance of epidemic prevention** [12050-219]
- 12050 3O **Research on the improvement of urban waterfront area design: focused on smart city construction** [12050-191]
- 12050 3P **Research on the smart tourism based on AR visualization design application** [12050-213]
- 12050 3Q **Discussion on the evolution of digital city management to smart city management in prefectural cities** [12050-165]
- 12050 3R **Analysis of urban community disaster characteristics and study on emergency management mechanism** [12050-190]
- 12050 3S **A study on the path to realize the conservation and utilization of historical buildings and the synergistic development of cities** [12050-155]
- 12050 3T **Design of remote test system for structural reinforcement of high-rise buildings under strong earthquake environment** [12050-230]
- 12050 3U **Study on preparation and properties of waterborne epoxy-emulsified asphalt material** [12050-7]
- 12050 3V **A design of railway intelligent obstacle detection system** [12050-15]
- 12050 3W **Seismic performance analysis of precast segmental bridge columns with self-centering energy dissipation device** [12050-26]
- 12050 3X **Characteristic analysis and behavior prediction method of converging behavior in urban expressway weaving section** [12050-77]
- 12050 3Y **Calculating method of arch rib installation alignment of large span cable hoisting arch bridge** [12050-131]
- 12050 3Z **Study on the sliding resistance and mechanical properties of two-component epoxy resin anti-sliding thin layer** [12050-109]
- 12050 40 **Influence of hopper inclination at bottom of silo on separation of mixture** [12050-83]
- 12050 41 **Study on the application of modified bitumen technology in the maintenance engineering of secondary highway** [12050-138]
- 12050 42 **Analysis of rail corrugation characteristics based on PSD** [12050-82]

- 12050 43 **Study on mechanical characteristics of large section tunnel construction in soft surrounding rock** [12050-17]
- 12050 44 **Geometric reconstruction of buildings by using dimension features** [12050-141]
- 12050 45 **Research on longitudinal deformation characteristics of shield tunnel segment under water level change** [12050-60]
- 12050 46 **Stability analysis and landslide forecast of XiaoJiang gravel soil slope in Baihetan area** [12050-164]
- 12050 47 **Vibration frequency of modified wave beam guardrail based on collision simulation and vibration acceleration analysis** [12050-41]
- 12050 48 **Research on impact resistance of pier protection device** [12050-194]
- 12050 49 **Research on elastic recoverable protection structure** [12050-178]
- 12050 4A **Analysis of key parameters in the bearing capacity evaluation of continuous rigid frame bridges** [12050-44]
- 12050 4B **Road capacity calibration of medium and small cities based on radial basis function neural network** [12050-71]
- 12050 4C **Effect of geo-synthetics location on the uneven settlement of roadbed** [12050-80]
- 12050 4D **Comparative experimental study of the influence of steel strand tensioning process on the strand force uniformity in steel strand stay cables** [12050-161]
- 12050 4E **Analysis of factors affecting stress and displacement of corrugated steel pipe culvert with large span and high depth** [12050-6]
- 12050 4F **Smart city development: research on major infrastructure policy and project appraisal in the UK** [12050-19]
- 12050 4G **Research and application of post-doped fire-retardant epoxy asphalt tunnel pavement** [12050-139]
- 12050 4H **Research on deformation characteristics of frost heaving and thaw collapse of the high-speed railway subgrade in seasonal frozen areas** [12050-221]
- 12050 4I **Study on deformation coordinated control structure and construction technology of road section containing structure** [12050-228]
- 12050 4J **Study on structural design and construction technology of road widening in retaining wall section** [12050-229]
- 12050 4K **Experimental study on single line wetting compression of coarse-grained soil** [12050-222]
- 12050 4L **Research on application of reinforcement method for soft ground along beach** [12050-237]

- 12050 4M **Numerical simulation of flood control and drainage and water environment improvement project in Shangyu** [12050-193]
- 12050 4N **Calculation and analysis of diversion tunnel structure based on ANSYS** [12050-233]
- 12050 4O **Structural design of number one tunnel on a new line** [12050-198]
- 12050 4P **Construction safety assessment of high-piled wharf based on BIM technology** [12050-174]
- 12050 4Q **Test research of dynamic behavior of medium and low speed maglev train-rail-girder system** [12050-143]
- 12050 4R **Internal force calculation of half through arch bridge based on elastic foundation beam algorithm** [12050-201]
- 12050 4S **Internal force calculation of long span suspension bridge under vertical load based on elastic foundation beam algorithm II** [12050-217]
- 12050 4T **LVS guidance based output-feedback path-following control for underactuated surface vessels** [12050-153]
- 12050 4U **Study on the application of aerobic composting technology of organic solid waste in urban communities** [12050-224]
- 12050 4V **Improving emergency response to natural disasters: considering the potential risks of an investment decision method of urban critical infrastructure** [12050-204]
- 12050 4W **Visualized analysis in China's architectural industrialization research field based on Citespace** [12050-207]
- 12050 4X **Study of wind loads on curved free-standing canopy roofs** [12050-205]
- 12050 4Y **Study of lateral-force resistance performance of integration of shelf-structure and main-structure shelf structure system** [12050-189]

MONITORING REMOTE SENSING TECHNOLOGY AND SENSING IMAGE RECOGNITION

- 12050 4Z **Research on the standard status and test methods of driver attention monitoring system** [12050-148]
- 12050 50 **Research on the accessibility of intelligent mass transit system based on Arc GIS** [12050-242]
- 12050 51 **Research on internal trumpet interchange** [12050-11]
- 12050 52 **Out-of-sequence measurement processing method based on multi-sensor fusion filtering** [12050-124]
- 12050 53 **Critical path identification method of intersection group considering path relevance** [12050-30]

- 12050 54 **Dynamic risk assessment and early warning technology for oil terminal based on catastrophe theory** [12050-79]
- 12050 55 **Aircraft image recognition in airport flight area based on deep transfer learning** [12050-22]
- 12050 56 **Creation of high definition map for autonomous driving within specific scene** [12050-47]
- 12050 57 **Interferometric synthetic aperture radar data selection based on topographic factors** [12050-68]
- 12050 58 **Stability analysis and disease treatment of Nanmu Bridge slope clone** [12050-49]
- 12050 59 **Analysis of heart rate variability of drivers on various roadway conditions** [12050-117]
- 12050 5A **An aircraft heading release strategy based on speed obstacle method** [12050-110]
- 12050 5B **Classification of terrestrial laser scanning data based on multi-dimensional geometry features** [12050-36]
- 12050 5C **Analysis of braking effect of advanced driver assistance system in the scenario of cut-in** [12050-168]
- 12050 5D **Research on monitoring system of subgrade slope dangerous rock based on Harris corner detection algorithm** [12050-166]
- 12050 5E **Research on automatic identification methods for apparent damage of concrete structure bridge based on YOLOv4** [12050-48]
- 12050 5F **Study on stability analysis and treatment measures of dangerous rock** [12050-53]
- 12050 5G **Research on image algorithm of road slope dangerous rock based on fusion template** [12050-172]
- 12050 5H **Application and development of weather radar predicting windshear function in civil aviation** [12050-63]
- 12050 5I **Application of BIM, VR, and GIS technologies in water environmental in-situ monitoring and management** [12050-25]
- 12050 5J **Application of improved grey system in tunnel monitoring** [12050-101]
- 12050 5K **Research on subjective evaluation method of navigation guidance level-2 automatic driving system** [12050-96]
- 12050 5L **Micromechanical simulation of ring tension crack test of asphalt concrete based on computer tomography recognition** [12050-54]
- 12050 5M **Application of MEMS sensors in abnormal deformation monitoring of metro tunnel structure** [12050-75]

- 12050 5N **Research status and prospect of tunnel blasting excavation method based on MWD technology** [12050-208]
- 12050 5O **Research on Intelligent Safety Monitoring and Control System for Work-at-Height (ISMCS-WH)** [12050-160]
- 12050 5P **Comparison and prospect of deformation monitoring technology in engineering construction** [12050-240]
- 12050 5Q **Current status and prospects of research on rockburst prediction in deep tunnels** [12050-199]
- 12050 5R **Investigation of sampling frequency impacts on turbulence intensity analysis** [12050-203]
- 12050 5S **Remote detection method of concrete bridge surface cracks based on digital image** [12050-235]
- 12050 5T **Stability analysis by finite element method and treatment measures of slide slope in open-pit coal mine** [12050-223]
- 12050 5U **Research on real-time calculation of geological disaster monitoring data based on GNSS technology** [12050-184]
- 12050 5V **Deformation and digitization analysis of after-treatment methods in soft soil** [12050-154]
- 12050 5W **Stratigraphic and structural characteristics of Yan 9 oil-bearing group in D area of Ordos Basin** [12050-215]
- 12050 5X **Geological hazard risk assessment of oil and gas gathering and transportation pipeline based on ARCGIS** [12050-173]
- 12050 5Y **Spatial distribution characteristics of nutrients in Dianchi lakeside** [12050-226]
- 12050 5Z **Remote sensing analysis of urban expansion in Guanzhong-Tianshui economic zone** [12050-206]
- 12050 60 **Assessing the accessibility of urban green spaces in the central Wuhan based on geographic information system and remote sensing** [12050-212]
- 12050 61 **The accessibility analysis of urban green spaces based on VHR images: a case study of Chongqing** [12050-210]
- 12050 62 **The spatio-temporal evolution law of beach morphological features: taking Qujiang River in Longyou County as an example** [12050-140]
- 12050 63 **Comprehensive geophysical methods and core digitization: a case study of a polymetallic mining area in Northeast China** [12050-220]